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GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP



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Transforming the skill landscape

Human Resource and Skill Requirements in the Electronics and IT Hardware Sector

(2013-17, 2017-22)



cutting through complexity

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Acknowledgement

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We would like to thank all NSDC's industry and training partners for their active participation. The success of the study has been possible through their collaborative efforts.

In addition, we convey our gratitude to all those who have, in some way or other, contributed towards the successful completion of this study.

Executive Summary

Industry Overview

Electronics & IT Hardware industry is poised to witness strong growth over the next decade driven by domestic consumption

Key Growth Drivers

Growing demand

- Increasing consumer and business demand for electronic and IT hardware products is expected to touch the INR 24 lakh crore mark by 2020.
- With imports of electronic products expected to touch the INR 18 lakh crore mark by 2020, the government is making concerted efforts to encourage domestic manufacturing in the sector.

Government initiatives driving demand

- Central and state governments are among the largest demand drivers for the electronics industry. Their spending touched INR 2,620 crore in FY13.
- Key programmes include the 'Aakash' tablet, the UIDAI project, the National Knowledge Network (NKN) and the National Optic Fiber Network (NOFN).

Electronics sector on the upswing

Lack of domestic manufacturing

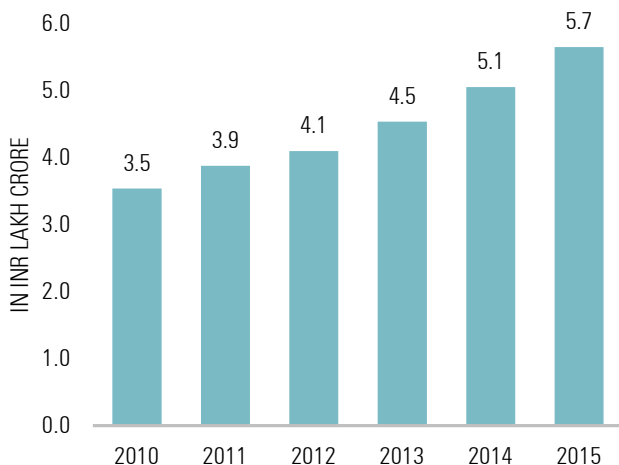
- Several subsectors in the electronics industry have virtually no manufacturing facilities in the country — from tablets to servers to semiconductors to strategic electronics.
- Poor infrastructure, a long-drawn-out approval process and an inverted duty structure act as impediments for domestic manufacturing facilities.

Policy support

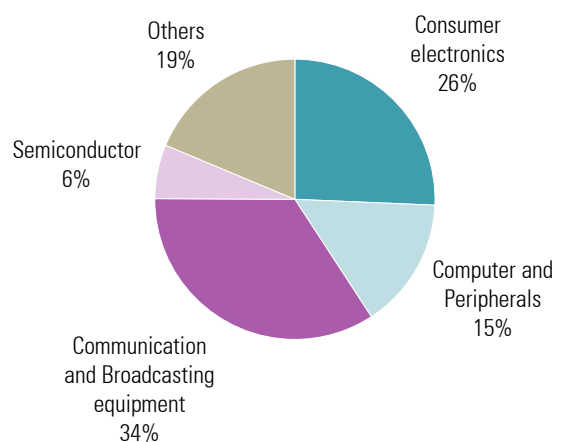
- Schemes like the Electronic Manufacturing Cluster Scheme, Modified Special Initiatives Package Scheme and Preferential Market Access Scheme have been launched to promote domestic manufacturing in the sector.
- Several state governments have also established ESDM policies to encourage the sector.

Market Size

Market size of the electronics and IT hardware sector



Break-up of the Indian electronics and IT hardware sector



- Rapid growth in the demand for electronics, clubbed with a sluggish domestic production, has widened the demand-supply gap in the industry. While demand for electronics stood at INR 6 lakh crore in FY13, goods worth INR 216,000 crore were produced in India.
- The top five players are responsible for about 15 percent of the sector's revenue, reflecting the largely fragmented nature of the sector in the country.

Sources: KPMG in India analysis

Demographic characteristics of workforce

Emerging technologies and product categories mandate adequate focus on up-skilling the existing workforce

Demand for Specialist Roles & Niche Segments

- Manpower requirement for specialist roles like system integrator is on the raise
- Niche areas like automotive and medical electronics would add to increasing specialist roles
- Smart phones, tablets and DTH segments are also expected to witness significant growth in human resource requirement

Migration

- Migration is a major challenge. High cost of living in Electronics hubs like Bengaluru, NCR, Kolkata discourage employment led migration from rural and semi urban regions

Modes of recruitment

- Recruitment is predominantly through industry personnel visiting colleges and ITIs
- Government schemes like Apprenticeship play a crucial role in supplying technical manpower for manufacturing segment

Skill Premium

- No premium is attached to people who get trained in this sector
- Skill premium seems to be absent since the trained manpower is barely recognized, as the sector is not keen on investing in training

Changing skill Requirements

- New technologies emerging, such as cloud computing and mobile applications leading to shift in the manpower needs of electronics and networking sector as new roles are being created
- The demand for software roles earlier has now shifted toward mobile applications.
- The demand for hardware technicians has been replaced with the demand for networking engineers

Recruitment Preferences

- Organizations focus on basic knowledge of technical operations for recruitment in manufacturing
- Soft skills and product knowledge are the key criteria considered for recruitment in sales & marketing
- Prior experience (mostly in unorganized) is seen as an important consideration in repair and maintenance segment

Attrition

- Attrition is generally low in the manufacturing segment
- High attrition levels exist across sales& marketing, especially for front-end workers. The attrition amongst the entry and mid level is more than 30% annually.

Incremental human resource requirement (2013-17, 2017-22) and skill gaps

Current workforce of over 4.3 million in 2013 is expected to reach 8.9 million by 2022

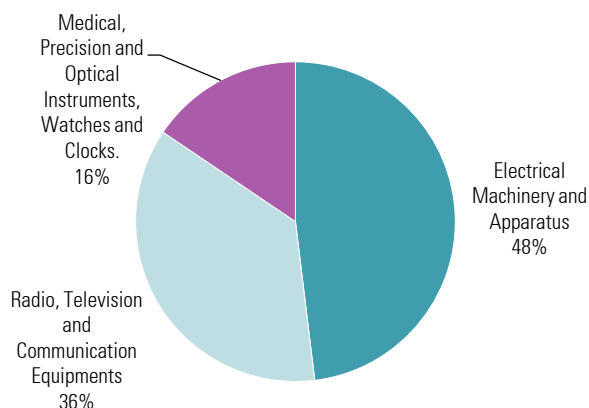
Electronics & It Hardware is one of the emerging sectors for employment growth in India. Industry currently employs over 4.3 million people across manufacturing, Sales and marketing (including Retail) and Repair & Maintenance segments.

Policy initiatives on promoting manufacturing along with increasing disposable income would drive the growth for the sector. Industry is expected to witness an addition of 4.61 million during 2013-22. Repair and Maintenance segment would contribute to maximum growth of employment.

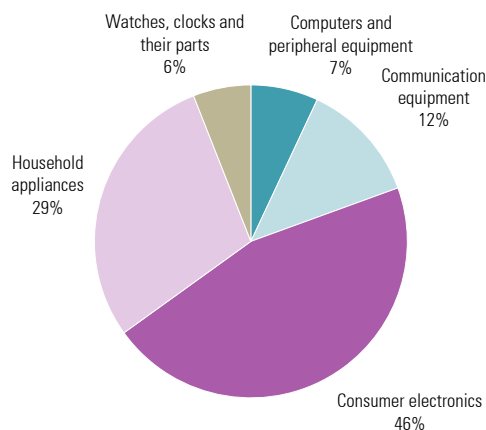
Segment	Employment (in Million)			Employment Growth 2013-17	Employment Growth 2017-22	Employment Growth 2013-22
	2013	2017	2022	(In millions)	(In millions)	(In millions)
Design & Manufacturing	1.45	1.75	2.06	0.30	0.31	0.61
Sales & Marketing	1.58	2.33	3.34	0.75	1.01	1.76
Repair, installation and Maintenance	1.30	2.16	3.54	0.86	1.38	2.24
Total	4.33	6.24	8.94	1.91	2.70	4.61

An analysis of the breakup of workforce by product categories indicates that consumer electronics and household appliances would account for major share of employment currently. Skill requirements have significant variations across product categories especially in Manufacturing and Repair & Maintenance segments

Product Category Wise Distribution- Design & Manufacturing



Product Category Wise Distribution- Repair and Maintenance



Source: Primary Interactions, KPMG Analysis

Technical incompetency

- Industry participants highlighted the concern of low employability of new entrants into the workforce due to technical incompetency. The situation becomes more burdensome for small- to medium-sized players, which have to invest capital and time to train the employees
- The ITIs from which the sector players source professionals for this category lack the curricula and content that is relevant to the current or future requirements of the sector. While this is being addressed partly by the scheme for the adoption of it is by companies, all companies cannot afford the resources and bandwidth to follow this approach. Hence, the ITIs that are not responsive to employers' requirements drive the type 1 skill gap

Demand for multi-skilled employees

- The electronics manufacturing and design sectors are still being opened up and in lots of manufacturing plants the need for niche operating skills together with the computer knowledge has been the primary requirement
- To match up with such a rapid pace growth and requirements of manufacturing sector, Indian machine makers will be required to not only invest capital but also build a strong innovation and design manpower pool

Increase in demand for sales, repair and after-sales

- There is significant increase in the demand for consumer electronic products, smart phones, tablets and set-top boxes, which are creating jobs not only for installation but also for sales, after-sales and repair services
- Some generic skills, such as basic communication and soft skills, are also required

Quick adoption to new products in the sector

- New technology products, such as solar and LED, are gaining attention. It is imperative to expedite their adoption to promote the upcoming subsectors and technologies

Adoption of new technologies driving demand

- New technologies such as cloud computing and mobility are transforming the IT hardware sector. Companies require professionals skilled in cloud management, remote infrastructure management and mobile computing devices
- The trend towards wearable computing devices is likely to increase in the next decade, which would lead to significant demand for skilled employees

Recommendation	Implications
Provide large talent pool by providing more training in the electronics sector	<ul style="list-style-type: none"> ▪ Acknowledge and offer incentives to workers based on improvised skills. The professionals who possess such niche skills can be employed as trainers in training centres, which would serve as additional income source for them ▪ More training institutes that can impart niche skills, which demand a premium in the sector, must be included in course curriculum, which would create a large talent base
Introduction of research-based courses in more institutions across India	<ul style="list-style-type: none"> ▪ There is a need to spread awareness among school students to motivate them to pursue a career in research ▪ The government must encourage research-based engineering programmes in popular institutions, besides other engineering options, to encourage more people to pursue such courses
Online portal assisting job search in the electronics sector	<ul style="list-style-type: none"> ▪ There should be a common central database for updates on vacancies across electronic firms, including all job roles firms in each cluster
Specialised training for high technology machine operations	<ul style="list-style-type: none"> ▪ ITIs located in major hubs must be upgraded with latest technology and converted into centres of excellence offering courses in operating high-end machinery and equipment and machine operations. This is possible only with sector collaborations
Establishing of centres of excellence for research and design	<ul style="list-style-type: none"> ▪ Strategic electronic, industrial electronics and medical electronics require knowledge on semiconductor research and design. Hence, new courses should be introduced by establishing CoEs in all these areas ▪ System integration, a key emerging skill, and niche skills would be required across the semiconductor design, VLSI and chip design processes
Private sector participation for infrastructure provision to industrial training institutes	<ul style="list-style-type: none"> ▪ A large number of public-private partnership programmes should be initiated wherein funds are provided to private players interested in establishing institutes ▪ This could be further extended to another model wherein training institutes with poor financial capacity, which cannot procure latest technology, can purchase second-hand machines from private players or lease them
<ul style="list-style-type: none"> ▪ Matching international standards and quality control 	<ul style="list-style-type: none"> ▪ With many global firms establishing manufacturing plants in India, there is an increasing need for quality testing and product certification processes ▪ For exports, international quality control standards should be adhered to, so that the manufacturing quality of India is in line with international standards.
<ul style="list-style-type: none"> ▪ Designing course content in line with global trends 	<ul style="list-style-type: none"> ▪ Major MNCs in electronics research and design in the manufacturing segment follow international standards for export markets; hence, tapping into this opportunity would provide large skilled workmanship
<ul style="list-style-type: none"> ▪ Introduction of management principles in curriculum 	<ul style="list-style-type: none"> ▪ The severe lack of understanding on management principles at the middle-management level should be addressed

Table of Contents - Detailed Report

S. No	Section	Page
1.	Context and approach	5
2.	Industry classification	7
3.	Industry overview	11
3.1	Growth of the industry	12
3.2	Key growth drivers	16
3.3	Government policy initiatives	18
3.4	SWOT analysis of the sector	25
4.	Sub-sectoral overview	26
5.	Geographical clusters	43
6.	Demographic characteristics of workforce	46
7.	Incremental human resource requirement (2013-17, 2017-22) and skill gaps	48
7.1	Human resource growth projections	49
7.2	Select list of key job roles	50
7.3	Skill gaps in select key job roles	51
8.	Training infrastructure	54
9.	Recommendations for stakeholders	59

Abbreviations

IT-BPO	Information Technology-Business Process Outsourcing
UIDAI	Unique Identification Authority of India
NKN	National Knowledge Network
NoFN	National Optic Fibre Network
ESDM	Electronic System Design and Manufacturing
GDP	Gross Domestic Product
OEM	Original Equipment Manufacturer
FY	Financial Year
SME	Small and Medium Enterprises
FTA	Free Trade Agreement
PTA	Preferential Trade Agreement
SMAC	Social Media, Mobility, Analytics, Cloud computing
WTO	World Trade Organisation
ETDC	Electronics Test and Development Centre
CMET	Centre for Materials for Electronics Technology
WEBEL	West Bengal Electronics Industry Development Corporation Limited
PSU	Public Sector Undertaking
ER&D	Engineering research and design
GIC	Global in-house Centres
IC	Integrated Circuits
QA	Quality Assurance
TSMC	Taiwan Semiconductor Manufacturing Corporation
VLSI	Very Large Scale Integration
AMD	Advanced Micro Devices
PCB	Printed Circuit Board
CTV	Color Television
FDI	Foreign Direct Investment
NeGP	National eGovernance Plan
R&D	Research and Development
CoTS	Commercial off the Shelf
NIC	National Industrial Classification

Abbreviations

NPE	National Policy on Electronics
MSIPS	Modified Special Incentive Package Scheme
EMC	Electronic Manufacturing Cluster
PMA	Preferential Market Access
SEZ	Special Economic Zone
PCMM	People Capability Maturity Model
VAT	Value Added Tax
CST	Central Sales Tax
RAC	Refrigeration and Air-conditioning
UV	Ultra Violet
STB	Set Top Box
DTH	Direct To Home
DAS	Digital Addressable System
RFQ	Request for Quote
PC	Personal Computer
SSC	Sector Skill Council
DEITY	Department of Electronics and Information Technology

Context and approach

Context and approach

Brief background	<p>NSDC had conducted sector-wise skill gap studies for 19 high priority sectors in 2008–09 .</p> <ul style="list-style-type: none">▪ KPMG has been engaged as a consultant to help evaluate the skill gap across 25 sectors and develop actionable recommendations for its stakeholders.▪ Mandate includes sector and sub-sector level analysis, demand-supply projection, estimation of incremental man-power requirement between 2013-2017 and 2017-2022, identification of key-employment clusters, and SWOT analysis of each sector▪ Study also aims to take qualitative insights from stakeholders on enablers and challenges for each sector, way forward in terms of specific policy level actionable recommendations,
Inclusions over the previous study	<ul style="list-style-type: none">▪ Study led by industry – Sector Skill Councils and a panel of professionals from different sub-sectors were consulted for their inputs on industry trends, key takeaways in terms of skill requirement, qualitative insights to understand specific interventions required for each sector and to validate the quantitative results and recommendations▪ 6 sectors were added to the list of NSDC priority sectors for studying the skill gaps <p>Updated study also includes</p> <ul style="list-style-type: none">▪ Identification of top 20 job-roles in each sector, case studies around good training practices, sub-sector level indicators and growth factors▪ Study also includes understanding of existing training infrastructure, work-force characteristics and employment clusters,▪ Macro economic factors, central and state governments policies and their envisaged impact▪ Synchronisation of the sector wise demand from the district level skill gap studies▪ Recommendations for key stakeholders - Industry, NSDC, Training organizations and Government▪ Environment scans every year till 2015-16 including SWOT analysis for the sector

Industry classification

Manufacturing

Division 26 : Manufacture of computer, electronic and optical products	
261 Manufacture of electronic component and semiconductor design	
2610 Manufacture of electronic component and semiconductor design	26101 Manufacture of electronic capacitors, resistors and similar components
	26102 Manufacture of electron tubes, diodes, transistors and related discrete devices
	26103 Manufacture of Integrated Circuits
	26107 Manufacture of microprocessors
262 Manufacture of computers and peripheral equipment	
2620 Manufacture of computers and peripheral equipment	26201 Manufacture of desktop and laptop computers, and computer servers
	26202 Manufacture of magnetic and optical storage devices
	26203 Manufacture of monitors and keyboards
	26204 Manufacture of printers and scanners
263 Manufacture of communication and broadcasting equipment	
2630 Manufacture of communication equipment	26301 Manufacture of radio and television studio and broadcasting equipment
	26302 Manufacture of telephone and facsimile equipment
	26303 Manufacture of data communications equipment, such as bridges, routers, and gateways
	26305 Manufacture of pagers, cellular phones and other mobile communication Equipment
264 Manufacture of consumer electronics	
2640 Manufacture of consumer electronics	26401 Manufacture of televisions, television monitors and displays
	26403 Manufacture of audio recording and duplicating systems
	26409 Manufacture of other electronic consumer goods

Sales (Wholesale and retail)

46494	Wholesale of watches, clocks and optical goods
4651	Wholesale of computers, computer peripheral equipment and software
4652	Wholesale of electronic and telecommunications equipment and parts
46596	Wholesale of scientific, medical and surgical machinery and equipment
46599	Wholesale of other machinery, equipment and supplies n.e.c. including computer-controlled machine tools and computer-controlled sewing and knitting machines

4759 Retail sale of electrical household appliances, furniture, lighting equipment and other household articles in specialized stores	47591 Retail sale of household furniture
	47592 Retail sale of household utensils and cutlery, crockery, glassware, china and pottery
	47593 Retail sale of gas stoves, cooking/kitchen appliances
	47594 Retail sale of refrigerators, washing machines and other electrical/electronic household goods
	47595 Retail sale of musical instruments
	47599 Retail sale of other household appliances n.e.c. (security systems, such as locking devices, safes, and vaults, without installation or maintenance services etc.. , wooden, cork and wickerwork goods, sewing and knitting machine and other household utensils and durables n.e.c.)

Repair, Installation and Maintenance

9511	Computers and peripheral equipment
9512	Communication equipment
9521	Consumer electronics
9522	Household appliances
95294	Watches, clocks and their parts

*Note: This class includes the manufacture of semiconductors and other components for electronic applications
Sources: National Industrial Classification (NIC) standards 2008, Ministry of Statistics and Program Implementation*

Industry Classification

The Electronics and IT Hardware industry classification

Major subsectors and sub-segments

Subsector	Sub-segments
Electronic component and semiconductor design	<ul style="list-style-type: none">▪ Design▪ Fabrication▪ ATMP (Assembly Test Mark Pack)▪ Passive components
Consumer electronics	<ul style="list-style-type: none">▪ Household electronic appliances▪ DTH, Set Top Box▪ Smart phones
Communication and broadcasting	<ul style="list-style-type: none">▪ Routers, switches, hubs▪ Fibre optics
Computers and peripherals	<ul style="list-style-type: none">▪ Laptops, notebooks▪ Storage servers▪ Tablets▪ Office automation
Other Electronics	<ul style="list-style-type: none">▪ Automotive electronics▪ Strategic electronics▪ Industrial electronics▪ Medical electronics▪ Solar panels▪ LED products

Value chain



Sources: NIC 2008; KPMG in India analysis

Industry overview

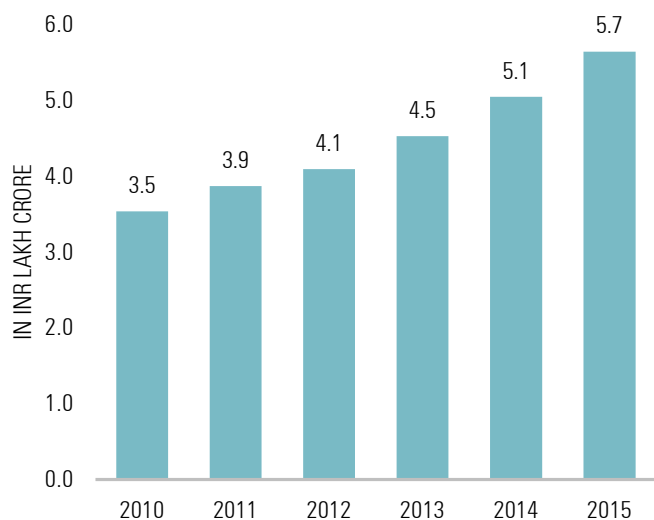
Industry Overview

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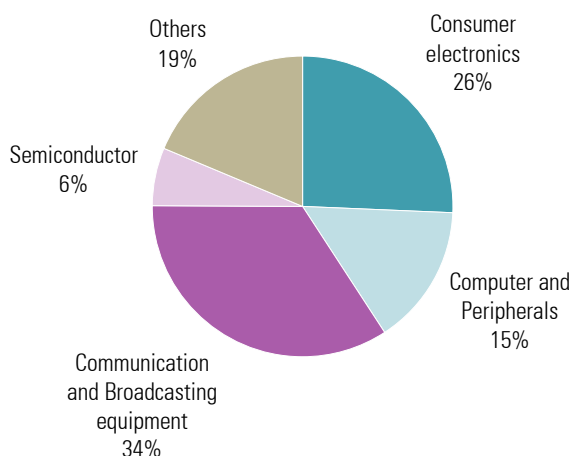
Overview of the electronics and IT hardware sector

- Another challenge India faces is that the manufacturing of electronic products, which primarily takes place in the country, is low-value addition and mainly focuses on last-mile assembly
- The electronic products segment constitutes the largest segment of India's electronics and IT hardware market with an estimated 79 percent market share in 2012. Semiconductor design constitutes 15 percent of the market with electronic component and semiconductor designs and others accounting for the rest.
- Semiconductor design and electronic products export constituted the bulk of export revenues with electronic component and semiconductor designs and manufacturing services constituting only a small percentage.

Market size of the electronics and IT hardware sector



Break-up of the Indian electronics and IT hardware sector



- Rapid growth in the demand for electronics, clubbed with a sluggish domestic production, has widened the demand-supply gap in the industry. While demand for electronics stood at INR 6 lakh crore in FY13, goods worth INR 216,000 crore were produced in India.
- The top five players are responsible for about 15 percent of the sector's revenue, reflecting the largely fragmented nature of the sector in the country.
- The SME sector has a significant presence in the lower/medium end of the value chain, especially in the electronic component and semiconductor design sector.
- The contribution of the electronics sector to the GDP has steadily increased over the past decade

Source: Annual Report 2012-13, DEITY, Government of India; KPMG in India analysis; Press articles

Industry Overview

Policy thrust to boost the domestic manufacturing segment would play a key role in augmenting the investment growth

Overview

- With the revival of the global economy, the electronics industry was expected to pick up steam and reach USD 1.86 trillion in 2013, up 4.4 percent from USD 1.78 trillion in 2012.
- Rapid growth in consumer electronics in emerging economies and the burgeoning demand for smartphones and tablets are key growth drivers of the overall electronics market.
- In India, the sector is expected to touch the INR 24 lakh crore mark by 2020 with imports accounting for INR 18 lakh crore. The Indian government is increasing its focus on this sector and aims to transform it from a consumption-driven market to one with manufacturing capability to meet local and export-related demand while simultaneously focusing on producing high-value-add electronic products.
- The electronics and IT hardware is a high-tech sector and requires workforce to possess requisite technical skills to succeed in the sector.
- Limited domestic manufacturing in the sector is restraining employment — a majority of jobs have been created either in the low-end electronic component and semiconductor design subsector or in the sales/marketing division of electronic companies.
- Also, the sector requires people with varied skills and experience — from high school graduates to postgraduates and people with technical skills in different areas.

Growing demand

- Increasing consumer and business demand for electronic and IT hardware products is expected to touch the INR 24 lakh crore mark by 2020.
- With imports of electronic products expected to touch the INR 18 lakh crore mark by 2020, the government is making concerted efforts to encourage domestic manufacturing in the sector.

Government initiatives driving demand

- Central and state governments are among the largest demand drivers for the electronics industry. Their spending touched INR 2,620 crore in FY13.
- Key programmes include the 'Aakash' tablet, the UIDAI project, the National Knowledge Network (NKN) and the National Optic Fiber Network (NOFN).

Electronics sector on the upswing

Lack of domestic manufacturing

- Several subsectors in the electronics industry have virtually no manufacturing facilities in the country — from tablets to servers to semiconductors to strategic electronics.
- Poor infrastructure, a long-drawn-out approval process and an inverted duty structure act as impediments for domestic manufacturing facilities.

Policy support

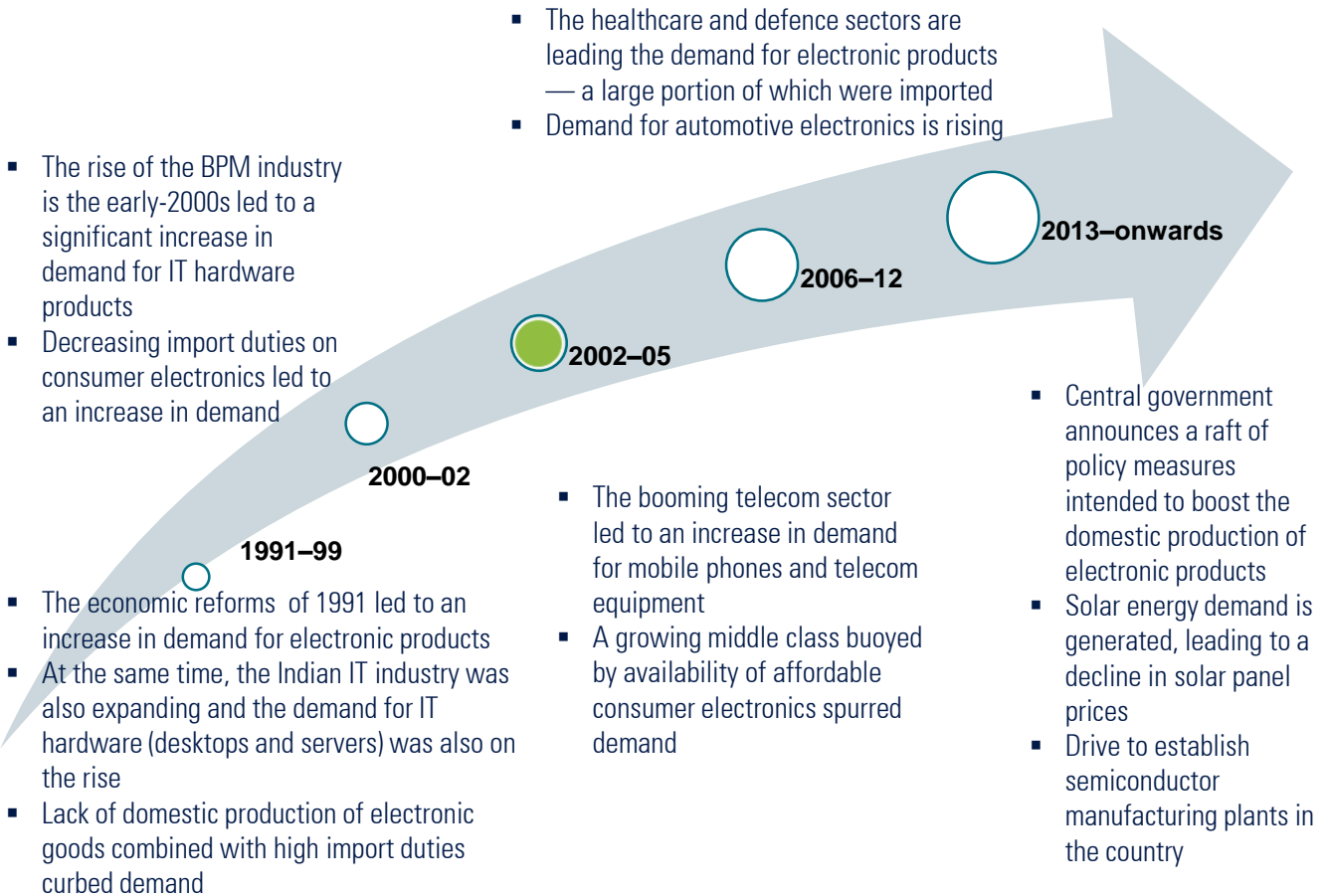
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Sources: Annual Report 2012–13, DEITY, Government of India; KPMG in India analysis; Press articles

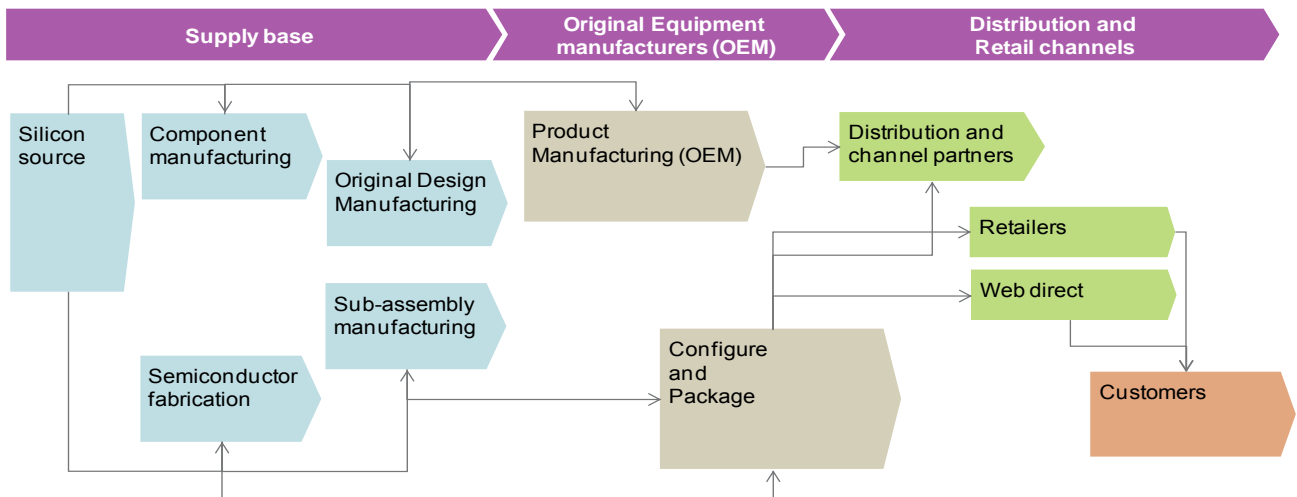
Industry Overview

Growth of end-user industries along with demand for consumer electronics have contributed to the rapid evolution of the industry...

Evolution of electronics and IT hardware



Value chain — electronics and IT hardware



Source: KPMG in India analysis; Press articles

Industry Overview

Sector is one of the most competitive industries globally, with several countries jostling for supremacy in an ever-changing mix

United States

- The US remains the world's largest market for electronics and IT hardware
- US remains a major hub for design and R&D with manufacturing being outsourced to other nations that offer low-cost services
- The US continues to host a large number of semiconductor fabs

Japan

- Japan boasts of being home to the second-most advanced electronics industry in the world, behind only the US
- It continues to dominate the consumer electronics segment and electronic sub-components, and prefers to use China as a base for assembling these components into finished products

Mexico

- Mexico has the world's sixth-largest electronics industry (and it is the third-largest manufacturer of computers), with exports of over US\$70 billion only to the US in 2011
- Mexico's proximity to the US has led many leading electronics firm to establish a manufacturing base in the country

China

- From modest beginnings in the early-1990s, China has emerged as the world's manufacturing base for all electronics, from laptops to iPhones
- Firms use China as a base for assembling components imported from the US, South Korea and Japan

South Korea

- South Korea has emerged as the world's fourth-largest electronics exporter on the back of leading firms like Samsung and LG
- Semiconductors (memory chips), consumer electronics and mobile handsets constitute the leading export products of the country

Source: Press articles; KPMG in India analysis

Dynamic nature of the industry mandates focus on building skills among existing and future workforce in line with the technological changes

Imports expected to touch INR 18 lakh crore by 2020

- Imports are expected to reach INR 18 lakh crore for the INR 24 lakh crore Indian electronics sector. To prevent this, demand for manufacturing jobs in the sector should increase significantly

Moving up the value chain

- The electronics manufacturing scene is moving up the value chain — from electronic component and semiconductor designs to consumer/automotive/medical electronics. In the near future, the semiconductor manufacturing segment is likely to increase demand for highly skilled resources

Convergence of technologies

- The rise of SMAC (social media, mobility, analytics, cloud) and the convergence of technologies is generating demand for multi-skilled resources — the boundaries between smartphones, computers and tablets are getting blurred with each passing year
- There is increasing convergence between industrial and strategic electronics — a workforce skilled on one type can easily move to the other

Mobile devices gaining ground

- From consumer to IT to industrial electronics, mobile devices are gaining ground across the entire spectrum of the electronics and IT hardware sector. This will demand a workforce proficient in the manufacturing of such devices and their components

Factors holding back the sector

- The domestic electronics and IT hardware manufacturing sector was the first one to be hit by the zero Customs duty regime, as a result of the implementation of the IT Agreement (ITA 1) of the WTO
- India has entered a Free Trade Agreement (FTA)/Preferential Trading Agreement (PTA) with several countries and more agreements are being negotiated in which the electronics hardware from these countries shall be imported at a preferential rate of duty, which is lower than the normal tariff rate

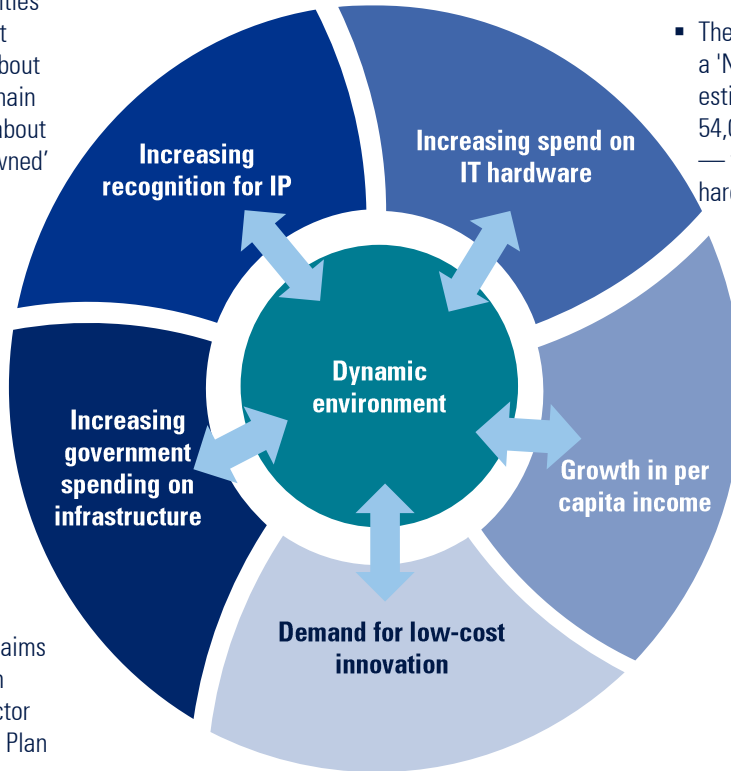
Duty structure expected to change

- India also faces several disadvantages, primarily related to infrastructure and taxation. The lack of quality roads, ports and airports, and uninterrupted and affordable power supply contribute to the operating costs for players planning to establish presence in India.
- Similarly, high excise duty and other indirect taxes in many cases lead to situations where the cost of manufacturing in the country is higher than the cost of importing them

Industry Overview

Increasing Government spending, growth in per capita income and demand for low-cost innovation are among the key growth drivers for the industry

- India needs to focus on IP to create business opportunities and generate employment
- Currently, India creates about 90 percent of the value chain but gets 'credit' for only about 10 percent. If the IP is 'owned' by India, then the entire revenue from IP creation would get credited to the country



- The Government of India aims to spend over INR 60 lakh crore in infrastructure sector during the 12th Five-Year Plan (2012-17).
- This will lead to demand for goods and machinery that require electronic systems and sub-systems

- The Indian government has announced a 'National e-governance Plan' with an estimated budget of more than INR 54,000 crore for automating processes — this is likely to boost demand for IT hardware

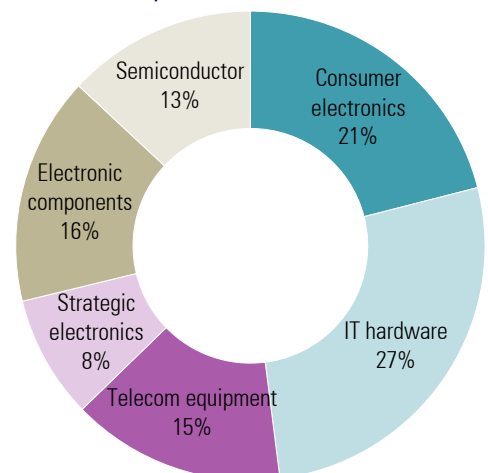
- The growth in per capita income has been the major trend driving this market. About 10 million households are estimated to have income levels above INR 6 lakh per annum.
- With an annual growth rate of 20 percent, this segment offers significant opportunities for electronics products

- India is a price-sensitive market and its unique socio-economic requirements drive substantial demand for cost-effective and robust products
- There can be a market for products that meet basic requirements at penetration price points

Demographic and workforce characteristics

- The electronics and IT hardware industry in India provided direct employment to about 1.9 million individuals in 2012–13, up from ~770,000 in 2007-08, a CAGR of 20 percent
- A break down of employment across various subsectors is provided in the accompanying graphic
- The electronics and IT hardware sector, which is expected to touch the INR 60,000 crore on mark in 2014, has always recruited professionals with function-specific specialist skills
- Be it traditional functions, such as production, sales, design and development and quality assurance, or new functions, such as materials, legal and training, this sector has always had a demand for specialists

Electronics and IT hardware sector employment, 2012; 100% = 1.9 million



Source: Annual Report 2012–13, DEITY, Government of India; KPMG in India analysis; Press articles

The National Policy on Electronics intends to create an ecosystem for a globally competitive Electronic System Design and Manufacturing (ESDM) sector in the country to achieve a turnover of about INR 24 lakh crore by 2020

National Policy on Electronics 2012

Overview

- A draft National Policy on Electronics (NPE) was released for public consultation in October 2011. After taking into consideration the comments from various stakeholders, the Union Cabinet has approved the National Policy on Electronics (NPE) 2012 on 25 October 2012. The policy is expected to create an indigenous manufacturing ecosystem for electronics in the country.

Key objectives

- To create an ecosystem for a globally competitive Electronic System Design and Manufacturing (ESDM) sector in the country to achieve a turnover of about INR 24 lakh crore by 2020 involving investment of about INR 6 lakh crore and employing about 28 million people at various levels
- To build on 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 a turnover of INR 3.3 lakh crore by 2020
- To increase export in the ESDM sector from INR 3.3 lakh crore to INR 4.8 lakh crore by 2020
- To significantly increase the availability of skilled manpower in the ESDM sector with special focus on augmenting postgraduate education and producing about 2,500 PhDs annually by 2020

Strategies

- **Creating a viable ecosystem:** The government plans to create a viable ecosystem to attract Indian and foreign companies to invest in the nation's electronics and IT hardware sector. This will involve provision of fiscal incentives for investment, setting up of electronic manufacturing clusters, preferential market access to domestically manufactured electronic products, setting up of semiconductor wafer fabrication facilities and an industry-friendly and a stable tax regime
- **Human resource development:** A sustainable ecosystem will also require steady supply of trained graduates. To ensure this, it is essential to involve the private sector, universities and institutions of learning to scale up requisite capacities at all levels for the projected manpower demand. A specialized institute for semiconductor chip design is also proposed
- **Focus on strategic electronics:** The focus is on creating long-term relationships between the armed forces, the government and companies involved in the development of strategic electronics

M-SIPS has emerged as an attractive scheme for encouraging capex intensive projects in the country

Modified Special Incentive Package Scheme (M-SIPS)

- The central government has offered a set of incentives for electronics and IT hardware units within electronics manufacturing clusters by way of a Modified Special Incentive Package Scheme (M-SIPS). The salient features of M-SIPS include:
- Companies are provided with a subsidy equivalent to 25 percent of capital expenditure if the manufacturing unit is not in an SEZ and 20 percent of capital expenditure if the unit is in an SEZ. This CAPEX subsidy is available for investments made within 10 years from the date of approval of the project
- Reimbursement of central taxes and duties (like custom duties, excise duties and service tax) for 10 years in select high-tech units like fabs and semiconductor chips

The establishment of EMCs is an integral part of the strategy to make India a leading destination for the sector

Electronic Manufacturing Cluster (EMC) scheme

- Clusters have emerged as an important feature of the electronics and IT hardware sector worldwide. A developed cluster can give a unit located in it a cost advantage of 5–8 percent because of various reasons such as increased supply chain responsiveness, consolidation of suppliers, decreased time-to-market, superior access to talent and low logistics costs
- The establishment of EMCs is an integral part of the strategy to make India a leading destination for the sector. The financial assistance for establishing is for both Greenfield EMCs and Brownfield EMCs. The scheme largely addresses infrastructure and logistics requirements of the ESDM units within the cluster
- Assistance to each EMC will be provided through separate Special Purpose Vehicle (SPV) for the development of common infrastructure and logistics within the EMC — not for individual units. The cost of land and buildings for individual units do not qualify for support under the scheme

Preferential Market Access (PMA) policy will help Indian companies face competition from global players

Preferential Market Access (PMA) policy

- With a view to increase the share of domestically manufactured electronic products, the central government, in February 2012, introduced a policy for providing preference to such goods in government procurement programmes
- The extent of government procurement from domestic manufacturers will not be less than 30 percent of the total procurement value of that electronic product(s). The policy is expected to strengthen the cyber security ecosystem in the country as well as provide a boost to the domestic manufacturing

Karnataka

Key objectives

- Emerge as the leading contributor to India's ESDM sector by accounting for at least 10 percent of the INR 24 lakh crore target by 2020
- Generate over 20 percent of the country's total ESDM exports target of INR 4.8 lakh crore in 2020
- Develop core competencies in specific ESDM verticals such as telecom, defense electronics, avionics and energy
- Generate at least 240,000 new jobs, 25 percent of India's PhDs and 5,000 patent filings in the ESDM sector in Karnataka by 2020

Policy incentives

- Preferential market access: In line with the Government of India policy, preferential market access shall be given to 'Karnataka ESDM companies' for the ESDM products procured by all government departments of the state for the next seven years (till 2020)
- ESDM innovation centres: Karnataka will set up three ESDM innovation centers that will provide complete infrastructure to entrepreneurs and companies that want to take their product concept and implement a working prototype. Such innovation centers will have all the requisite design tools such as VLSI design tools, prototype development facilities, testing facilities, characterization labs and compliance and certifications labs along with requisite manpower and component stocks
- Semiconductor design fund: To stimulate the creation of fabless design companies and semiconductor IP, which will be required in the ESDM sector, the government is expected to launch a semiconductor IP and fables fund that will provide funding to Karnataka ESDM companies for their establishment, growth and debt/working capital requirements in the next seven years
- Electronics Manufacturing Clusters: Karnataka will promote the creation of seven high-class ESDM manufacturing clusters (EMCs) to provide quality infrastructure facilities necessary to attract investment in the ESDM sector, including EMS and component manufacturing. These clusters will be established by 2020

Innovation incentives

- Promote filing of patents: The target is to file 3,000 domestic and 2,000 international patents in ESDM by Karnataka ESDM companies by 2020. The government shall reimburse up to 50 percent of the actual costs (including filing, attorney, search and maintenance fees) with a maximum of INR 100,000 for filing a domestic patent and up to INR 500,000 for filing an international patent
- Incentivize R&D: The Karnataka government shall give R&D grants in the form of reimbursement equaling up to 20 percent of the actual R&D expenses (including manpower costs) incurred annually by Karnataka ESDM companies, subject to a maximum of two percent of their annual turnover

	West Bengal
<p style="text-align: center;">Key objectives</p>	<ul style="list-style-type: none"> ▪ Bengal’s share in electronics production to 15 percent by 2020 ▪ The government plans to enhance the availability of skilled manpower in the ESDM sector with the focus on augmenting postgraduate education ▪ The state government plans to develop standards and certification for electronic products and services to strengthen the quality assessment infrastructure in West Bengal ▪ The government plans to develop a mechanism for effective e-waste disposal in the state ▪ The state government intends to emerge as the leading state in the area of chip design, embedded software industry and very-large-scale integration (VLSI) technologies
<p style="text-align: center;">Policy incentives</p>	<ul style="list-style-type: none"> ▪ Administrative initiatives: The government will facilitate a single-window clearance system for investors and review procurement policies to give preference to local manufacturers and developers while procuring hardware and software for public projects ▪ Infrastructural incentives: The government will initiate the development of clusters in select cities like Kolkata, Falta, Asansol, Kharagpur, Purulia, Kalyani and Siliguri to provide infrastructural support to SMEs and large units. It will also establish a ‘hardware cell’ to assist investors and develop a ‘design center’ ▪ Focus on new verticals: The state government will try to attract investments in focused verticals like lightning, smart meters, security systems, set-top boxes, industrial and medical electronics, LCD and plasma devices, solar photovoltaic, LED equipment, device-level packaging and assembly test mark pack ▪ Financial incentives: IT hardware units located in select cities will be provided with financial incentives, such as state capital investment subsidy, to be payable in annual installments, interest/training subsidy, waiver of electricity duty and employment generation subsidy
<p style="text-align: center;">Innovation incentives</p>	<ul style="list-style-type: none"> ▪ IP promotion: The government will promote the creation of intellectual property on design, automation and embedded systems ▪ R&D institutions: The state government will establish R&D institutions with required IT infrastructure to promote and transform West Bengal into a knowledge-based economy ▪ IT hubs and incubation centers: The government will establish IT hubs and incubation centers in tier II and III cities such as Falta, Haldia, Barjora, Purulia, Durgapur, Asansol, Kalyani, Siliguri and Kharagpur

	Andhra Pradesh
Key objectives	<ul style="list-style-type: none"> ▪ The state government plans to convert existing clusters such as FAB city and Aeronautical SEZ into centers of excellence and create four hubs covering NEWS (north, east, west and south) for multiproduct electronics SEZs ▪ The government intends to establish a common facilitation center/incubation center/cluster with full-fledged testing facilities to meet global standards such as EMC, safety testing, RF and other functional testing ▪ The government plans to create a fund under the management of a working committee with an equal stake to promote design, manufacturing, assembling and innovation and packing businesses ▪ The state government plans to introduce a single-window system for necessary permissions and clearances
Policy incentives	<ul style="list-style-type: none"> ▪ Regulatory incentives: The electronics hardware industry is exempted from the purview of statutory power cuts and select inspections and certifications. A nodal wing will be created within the IT&C department ▪ Incentives for MSMEs and entrepreneurs: Various financial incentives such as recruitment assistance, capital equipment subsidy and subsidy on lease rentals will be provided to startups, women, SC/ST entrepreneurs and MSMEs ▪ Incentives for tier II locations: Besides financial incentives, the electronic hardware units established in tier 2 locations will be provided with free city profiling and detailed report on tier 2 locations. Local units established in these locations will be included in domestic, national and international trade delegations ▪ Priority project incentive for ESDM: The government will offer a package of incentives to priority projects in the ESDM sector for manufacturing, including PV/Fab/semiconductor design and manufacturing, assembling, testing and packaging plants ▪ Encourage local products: The state government plans to encourage the use of 'made in India' products for various government initiatives, such as UID and SSA, and other e-governance initiatives
Innovation incentives	<ul style="list-style-type: none"> ▪ R&D: A sum of INR 0.15 crore as recruitment assistance will be provided for employing a minimum of 150 employees within two years of commencement of operations ▪ Incubation centers and electronic hardware parks: The government will establish incubation centers and electronic hardware parks in tier II and III locations to promote the local units established in these locations

	Madhya Pradesh
Key objectives	<ul style="list-style-type: none"> ▪ The state government plans to maximize direct and indirect employment generation opportunities for the youth. ▪ The government intends to attract investments and facilitate the establishment of local arms of global IT companies and electronic hardware manufacturers in the state. ▪ The government intends to create a pool of talented, skilled and technical manpower. ▪ The government plans to encourage the adoption of internationally accepted quality certifications.
Policy incentives	<ul style="list-style-type: none"> ▪ Single-window clearance: The department of IT, Government of Madhya Pradesh, intends to attract investments in the sector by establishing the MP Trade & Investment Facilitation Corporation (MP-TRIFAC) to act as a single-window for regulatory clearances ▪ Quality certification incentives: The government will reimburse 75 percent of the cost incurred by the company on securing quality certification in Capability Maturity Model (CMM/CMMI) and Peoples Capability Maturity Model (PCMM) programmes ▪ Financial incentives: Various financial incentives, such as stamp duty concessions, power and electricity incentives, entry tax and subsidies on interest and capital investment, will be given by the government to IT units ▪ Land incentives: The government plans to reserve 60 percent of the total IT investment areas for IT operations and rest for the ancillary and support services and provide rebate on the lease of government lands ▪ Regulatory incentives: IT units will be exempted from regulatory acts and policies such as the Madhya Pradesh Shops and Establishment Act, 1958, and will be permitted for self-certification of the registers and forms under multiple acts such as the Payment of Wages Act, Minimum Wages Act, Employment Exchange Act and Water and Pollution Act

	Punjab
Key objectives	<ul style="list-style-type: none"> ▪ The state government plans to encourage electronic hardware investment in the state
Policy incentives	<ul style="list-style-type: none"> ▪ Preferential market access: The state government has announced plans to award PMA to entrepreneurs establishing electronic hardware units ▪ Financial incentives: Electronic hardware units will be provided with financial incentives, such as 80 percent retention of VAT and CST, exemptions from electricity and stamp duty and property tax and capital investment incentives for SMEs ▪ Online clearance system: The government plans to introduce an online form submission and tracking system for applicants ▪ Infrastructural incentives: The government has established the Punjab State Electronics Development and Production Corporation to promote the electronics industry in the state. It has also set up an electronics town in Mohali
Innovation incentives	<ul style="list-style-type: none"> ▪ Incubation center: The government plans to establish an incubation center in Mohali for electronic systems and semiconductor design entrepreneurs ▪ Task force: A task force will be set up to transform Mohali into a knowledge destination

Industry Overview

SWOT analysis for the sector

Strengths	<ul style="list-style-type: none"> ▪ Huge consumption market ▪ Government schemes facilitate demand generation — NKN, NOFN, tablets for the education sector, digitization policy and broadband push ▪ Adequately developed EMS industry — to be a significant contributor to ecosystem development ▪ Significant resident talent in semiconductor design and embedded software domains
Weaknesses	<ul style="list-style-type: none"> ▪ Reliance on imports for all critical components ▪ Convoluted tax and duty structure — imports made cheaper than local products ▪ Debilitating FTAs with Thailand and Japan ▪ Lack of subsidies/incentives for support industries makes local manufacturing expensive ▪ Inadequate domestic standards and testing facilities ▪ Slow and delayed policy implementation ▪ Inadequate local product innovation and IP creation
Opportunities	<ul style="list-style-type: none"> ▪ Significant local demand as an influencer to attract investment ▪ Government policies — MSIPs, EMC and local Fabs — favor attractive manufacturing investments ▪ Export potential — huge consumption market in the Middle East; emerging growth markets in North Africa and Latin America ▪ Upcoming Greenfield projects – Two semiconductor manufacturing facilities ▪ Rising manufacturing costs in China leading to India as an alternative destination ▪ Existing R&D capabilities can be encouraged to develop ‘made in India’ products and generate local IP
Threats	<ul style="list-style-type: none"> ▪ The established manufacturing ecosystem in China poses a major threat ▪ Emergence of other low-cost manufacturing destinations such as Vietnam ▪ Inadequate/fledgling ecosystem for components and raw materials ▪ Depreciation of the rupee as a short-term threat

Sub-sectoral overview

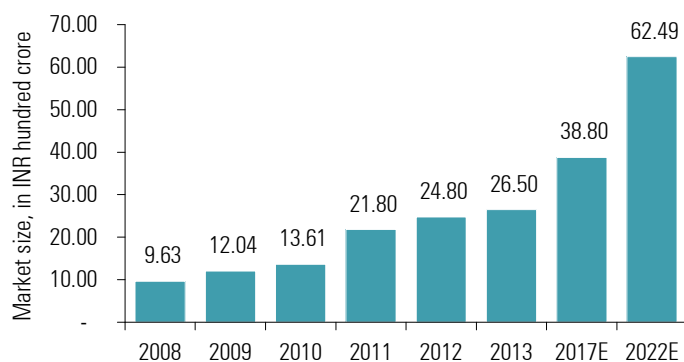
Sub-sectoral overview

Electronic Component And Semiconductor Design subsector is a key segment driving the growth of the other segments of the industry

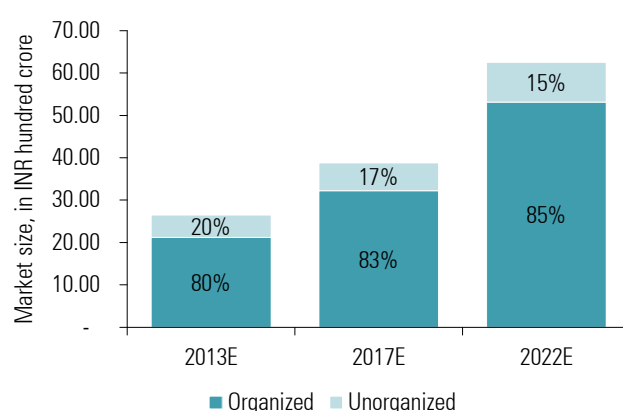
Our view of electronic component and semiconductor design subsector

- The electronic component and semiconductor design industry — responsible for producing transformers, resistors, electronic tubes and electromechanical components — forms the backbone of the electronics manufacturing industry
- The Indian electronic component and semiconductor designs segment grew rapidly during the 1980s and the early-1990s due to liberalization and the boom in the electronics industry. The International Trade Agreement (ITA), signed at the World Trade Organization (WTO) in 1997, eliminated all Customs duties on IT products, thereby creating an environment of direct competition between Indian component manufacturers and international players
- Intensified competition weakened the cost competitiveness of Indian manufacturers, forcing many companies to exit the market
- In India, the demand for electronic component and semiconductor designs exceeded INR 6,810 crore in 2012–13, with domestic output of 40 percent of the total demand. A significant share (~30 percent) of the component production is exported, leaving only about 25 percent for domestic consumption, which is used in the production of local equipment
- Key Indian players include Samtel Group (display panels), Moser Baer (storage media and solar panels), Hical Magnetics (converters and inductors), MIC Electronics (lighting systems) and the State-owned Bharat Electronics Limited (strategic electronic component and semiconductor designs). Some prominent foreign players in the field include Flextronics, SCI Systems and Solectron

Market size of the electronic component and semiconductor design subsector

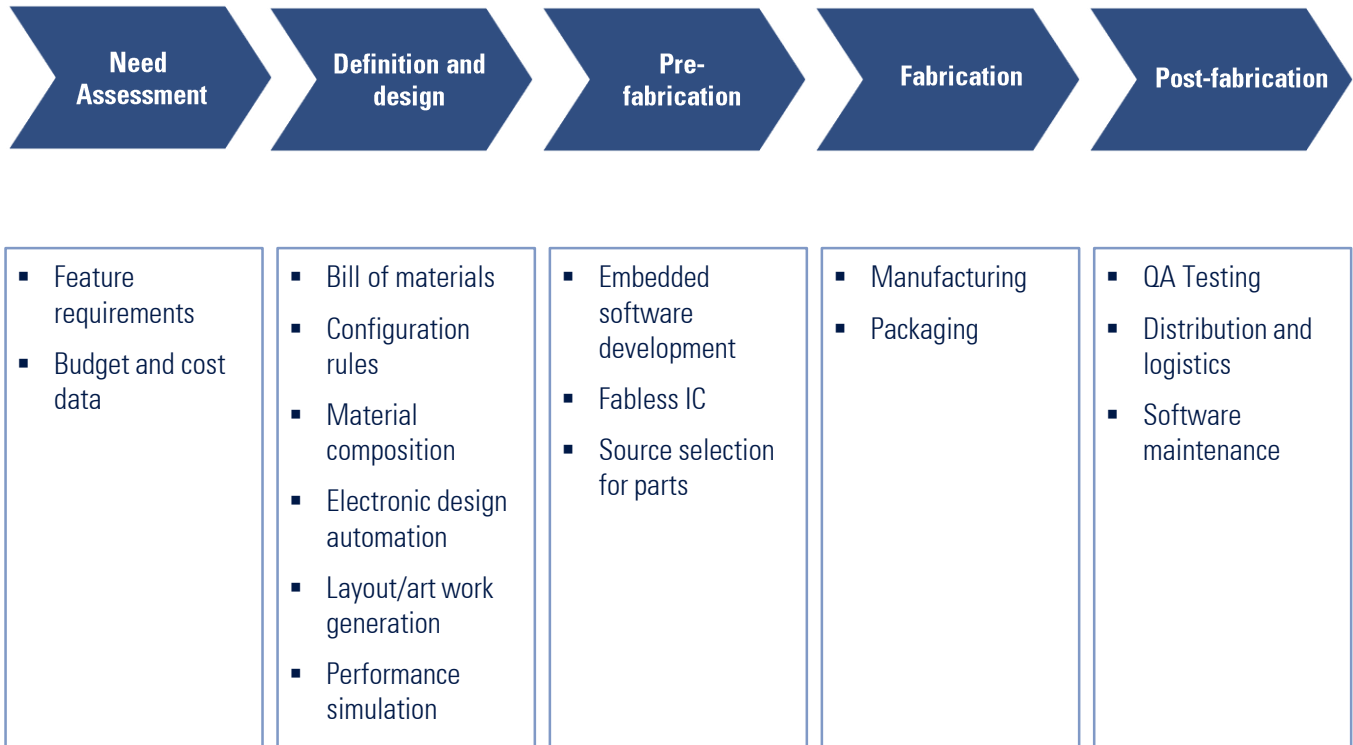


Share of organized and unorganized sector, electronic component and semiconductor design subsector



- India's electronic component and semiconductor design market is dominated by electro-mechanical and associated components with 27 percent and 29 percent shares, respectively. There has been no significant change in their market composition over the years and this trend is likely to continue in the near future
- The electronic component and semiconductor design market size increased from INR 963 crore in 2008 to INR 2,650 crore in 2013 and is estimated to touch INR 6,240 crore by 2022
- The organized sector will increase its market share from 80 percent in 2013 to 85 percent in 2022, with increasing competition in the sector expected to drive out small enterprises that constitute the unorganized sector

Value chain of the electronic component and semiconductor design subsector



- Need assessment: Based on customer requirements, product functionality and budget, data analysis is performed to ascertain estimated cost and design feasibility
- Definition and design: Definition will include preparing bill of materials, finalizing configuration rules and material composition of the component
- Design includes designing hardware specifications and developing tools for producing active component systems. For passive components, design stage key activities include layout/art work generation, e.g. developing a layout for integrated resistors and its performance simulation
- Pre-fabrication: Key activities in the pre-fabrication stage include embedded software development and fabless IC (no fabrication integrated circuit development) and finalizing sources of parts supply
- Fabrication: This includes manufacturing and packaging of active components
- Post-fabrication: Quality assurance testing and distribution/logistics arrangement are post-fabrication activities for components. This also includes software maintenance for active components

Policy thrust on manufacturing and capital goods sector in India would drive sub sectoral growth

Key trends

- Emergence of new product categories: Emerging high-growth areas for domestic manufacturing include LED lighting, automotive electronics, energy meters, solar energy and IT products, such as tablets. They are in addition to the existing segments such as telecommunications, consumer electronics and industrial electronics
- Increasing government spending: The Indian government has been one of the primary demand drivers for electronic component and semiconductor designs due to increasing expenditure in aerospace and defence programmes required to address the changing security situation. Additionally, the central and state governments have launched new initiatives in e-governance and education domains, leading to a rise in demand for IT products
- Strong consumer demand for white goods: India has emerged as one of the fastest growing markets for white goods and several domestic companies are investing in capacity to manufacture their sub-systems within the country. In most cases, these domestic firms act as suppliers to large domestic/foreign companies that have a presence in the country.

Opportunities

- New manufacturing facilities: Several electronics companies are in the process of establishing new manufacturing facilities in India, which are expected to drive the demand for electronic component and semiconductor designs in the future.
- Export opportunities: Indian electronic component and semiconductor design manufacturers can leverage the growing electronic market in neighboring countries such as Sri Lanka, Bangladesh, Nepal and Pakistan to expand their market.
- Encourage collaboration with foreign companies: Rapid innovations in manufacturing technologies require significant capital investments. The collaboration of Indian manufacturers with international players is essential to provide access to technical knowledge and capital. Such collaboration is likely to ensure high standards of quality in manufacturing, increasing the products' acceptability in the global market

Challenges

- Zero import duty regime: The zero import duty structure encourages the import of finished electronic goods, leading to a decline in demand for electronic component and semiconductor designs. As a result, the import of electronic component and semiconductor designs from China has increased significantly over the past decade.
- Need for high capital investment: To compete with low-cost destinations such as China and Taiwan, India needs to keep pace with technological advancements. Consequently, the capital required to establish and maintain a manufacturing facility has increased manifold
- Unfavorable tax structure: When compared with China and Taiwan, India's duty and taxation structure makes the final product expensive, as there is no duty on the import of electronic component and semiconductor designs. This allegedly unfavorable structure has resulted in high tax rates for products with high value addition

Government initiatives to boost niche segments like semiconductors will increase demand for highly skilled resources...

Key trends

- Consumer electronics driving demand: Consumer electronics and wireless handsets/mobile technologies are expected to be the most important semiconductor revenue drivers in the next couple of years. The trend of low-power chips, which prolong battery life, especially of portable devices, is on the rise
- Rise of 450mm wafer technology: The industry is moving toward the adoption of 450mm wafer technology, the latest standard in silicon wafer production. Intel, Samsung, and TSMC (Taiwan Semiconductor Manufacturing Company) have invested heavily in this technology and will have fabs built and operational in 2015.
- Decrease in demand from PC manufacturers: For almost two decades, PC manufacturers have been leading demand for semiconductors, with Intel and AMD being the main beneficiaries. However, the past few years have witnessed smartphones and tablets eating into the PC market share and the traditional market structure of the semiconductor industry is undergoing readjustment

Opportunities

- Rising domestic demand: The Indian market is witnessing rising demand for electronic products, and all of them require semiconductors. The Indian government is also introducing an incentives package for semiconductor manufacturers to facilitate the establishment of fabrication plants in the country to reduce the import bill and promote a semiconductor ecosystem
- Government initiatives: The Indian government has made concerted efforts to attract semiconductor manufacturers to flourish in the country. This includes introducing a set of incentives ranging from tax/customs cuts and several other subsidies
- Investment by Japanese companies : In recent years, several Japanese technology companies have considered investing in India. With Japan being one of the leaders in semiconductor technology, this trend bodes well for India

Challenges

- Lack of a complete ecosystem: Most companies in India operate in integrated design, embedded software or VLSI design segments. From the perspective of a semiconductor company, this has led to an incomplete ecosystem. Several key links, such as systems engineering, venture capital and IP protection, are currently missing from the ecosystem
- Need for high capital investment: To compete with low-cost destinations such as China and Taiwan, India is required to keep pace with technological advancements. As a result, the capital required to establish and maintain a manufacturing facility has increased manifold
- Shortage of skilled manpower: Another issue affecting the growth of the Indian semiconductor industry is the dearth of skilled manpower at all levels of engineering projects, especially in design services. The absence of institutions imparting technical training relevant to this segment has further aggravated the situation.

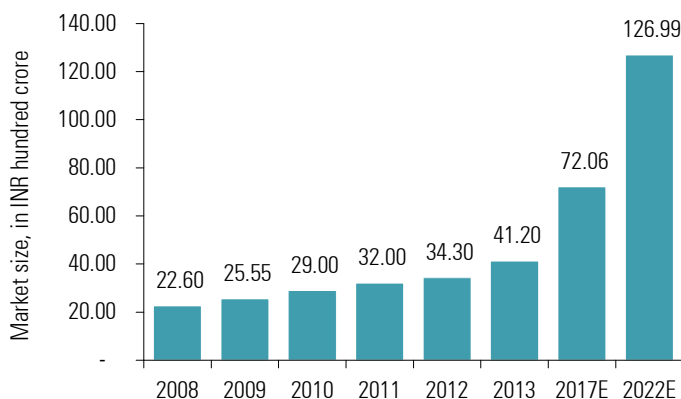
Sub-sectoral Overview

Consumer Electronics subsector has witnessed the entry of all leading global players with the focus of manufacturing shifting to India....

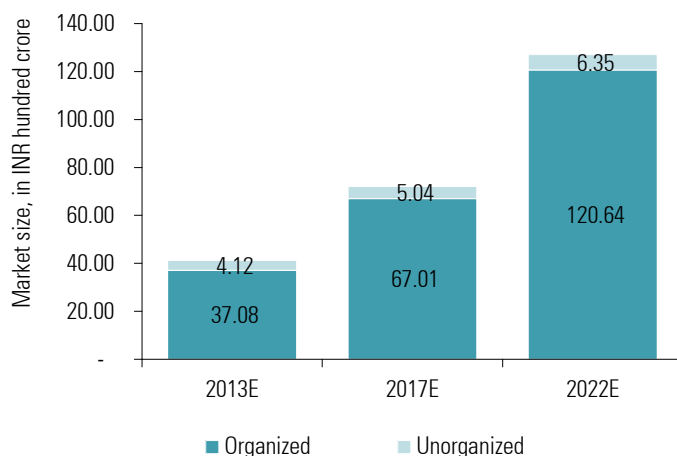
Overview of consumer electronics subsector

- Consumer electronic manufacturing was launched in India in the 1950s by the production of radio sets. It was followed by the production of black-and-white TV sets in the 1960s and color TV (CTV) sets in 1982
- The Indian government initiated the liberalization of policies for the segment in 1992, relaxing controls such as licensing and the use of brand names
- In 1994, the Indian market was open to major consumer electronic manufacturing multinational companies (MNCs), such as Panasonic, Sony, LG and Samsung
- In 2001, non-tariff barriers on imports were removed, and in 2004 the Free Trade Agreement (FTA) with Thailand was implemented, resulting in the reduction of import duties on CTVs, color picture tubes, refrigerators and air conditioners. This led to increased competition with international manufacturers
- Advancement in technology and higher competition are driving price reductions across various consumer durable product segments such as computers, mobile phones, refrigerators and TVs
- Growth in demand from rural and semi-urban market to outpace demand from urban market; companies are increasingly shifting focus to tier 2 and 3 centers

Market size of the consumer electronics subsector



Share of organized and unorganized sector - consumer electronics subsector



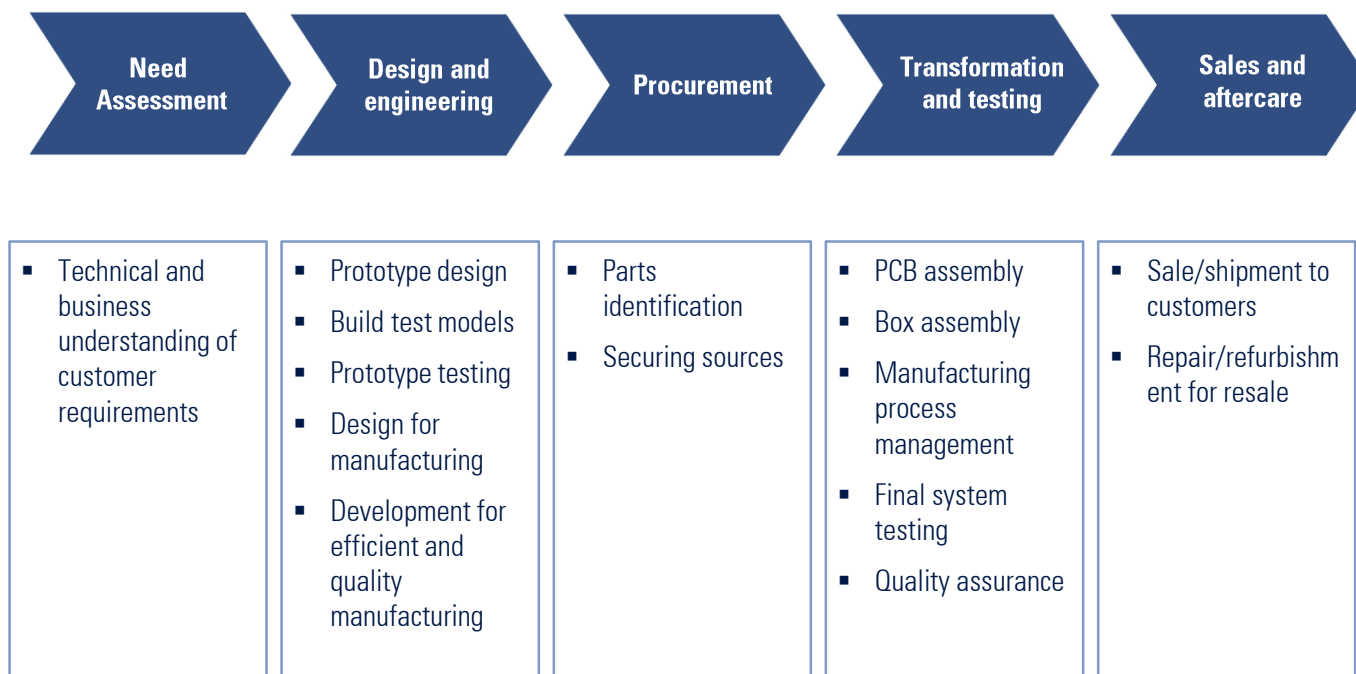
- India's consumer electronics market is estimated to touch INR 12,690 crore by 2022, up from an estimated INR 7,200 crore in 2015, and INR 4,120 crore in 2013
- The organized sector is likely to increase its market share from 90 percent in 2013 to 95 percent in 2022; the increasing presence of established Indian and foreign firms in tier II and III markets is expected to impact the sales of small and unorganized players

Sources: Press articles; KPMG in India analysis; Annual Report 2012–13, DEITY, Government of India

Sub-sectoral overview

Value chain of Consumer Electronics subsector

Value chain of the consumer electronics subsector



- **Need assessment:** This function involves identifying customer requirements and converting them into technical and business aspects of production
- **Design and engineering:** R&D is applied to build test models of a potential new product or enhancing existing products with a view to develop prototype models and test them. Once a prototype is accepted for further development, it is designed to ensure efficient and high-quality manufacturing, with complete design engineering
- **Procurement:** Strategic and commodity parts are identified and vendors are assigned for predicted volumes of production
- **Transformation and testing:** Components and circuit boards are assembled using surface mount technologies (SMT) according to design-engineering specifications with a combination of manual and automated systems to assemble final systems and manage manufacturing process
- **Testing** involves a combination of manual and automated procedures and is used to test units coming out of the assembly line
- **Sales/aftercare:** Finished goods are sold and shipped to end customers. Aftercare usually includes repair of returned products and repair/refurbishment of repurchased units to be sold

India has the potential to emerge as an export hub in Consumer Electronics to the South-Asia and Middle East markets

Key trends	<ul style="list-style-type: none">▪ Increase in organized retail: The liberalization of retail FDI norms by the Indian government in 2012 has paved the way for the entry of foreign companies in the consumer electronics retail space. Several Indian firms, including Croma, eZone and Reliance Digital, have already been gaining market share from the unorganized sector, offering easy finance schemes and improved customer services to attract customers▪ Urban youth driving demand: The changing lifestyle of India's urban youth, which uses updated technology and is generally equipped with the best electronic items available, is expected to drive demand for consumer electronics in future▪ Internet emerging as a new channel: The increase in internet penetration as well as the spread of smartphones has led to the rise of e-tailers involved in selling consumer electronics. Several leading consumer electronics firms have also adopted the internet as a medium for selling their products directly to consumers.
Opportunities	<ul style="list-style-type: none">▪ Growing per capita income: India's per capita GDP has nearly tripled since 2000, rising from US\$455 to US\$1,489 in 2012. This is expected to rise to over US\$2,000 by 2017, and will continue to be the primary demand driver for the consumer electronics in the country.▪ Export opportunities: Several foreign firms have already established, or have plans to set up, manufacturing facilities in the country. These facilities can be used to export products to the South Asian region as well as several East African countries.▪ Untapped rural market: India's burgeoning rural market is emerging as the next growth area for consumer electronic companies.
Challenges	<ul style="list-style-type: none">▪ Rapid technological progression: In recent years, the consumer electronics space has been characterized by rapid technological advancements, shortening product cycles. Moreover, these advancements come at a huge cost and require vast investments in developing R&D capabilities. Only a few Indian companies possess the skills and capital required to ensure long-term success in such a scenario▪ Significant cost of rural expansion: Consumer electronics companies are establishing manufacturing operations in rural areas, as land and labor costs in these areas is lower as compared to those in urban regions. However, expanding operations in rural markets requires significant infrastructural investments. Expenditure on the transportation of inventory to rural areas is substantial due to the lack of logistical infrastructure▪ Threat from Chinese imports: China is the electronics manufacturing hub for all leading consumer electronics firms. As a result, Chinese contract manufacturers have gained economies of scale and technological expertise which only a few Indian firms can match

Sources: Press articles; KPMG in India analysis

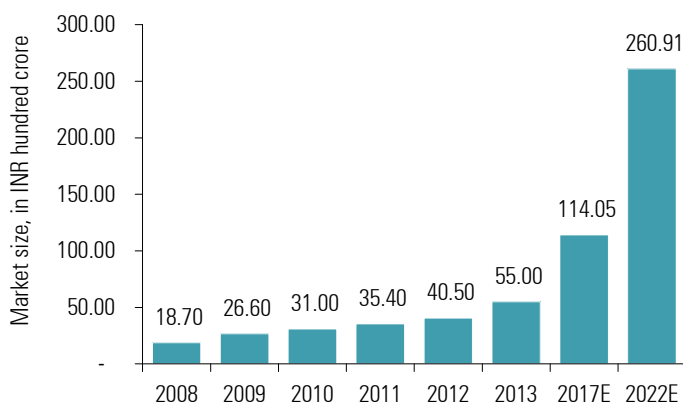
Sub-sectoral overview

While the huge sub subscriber base in India is driving the Communication and Broadcasting subsector, lack of domestic manufacturing remains a concern

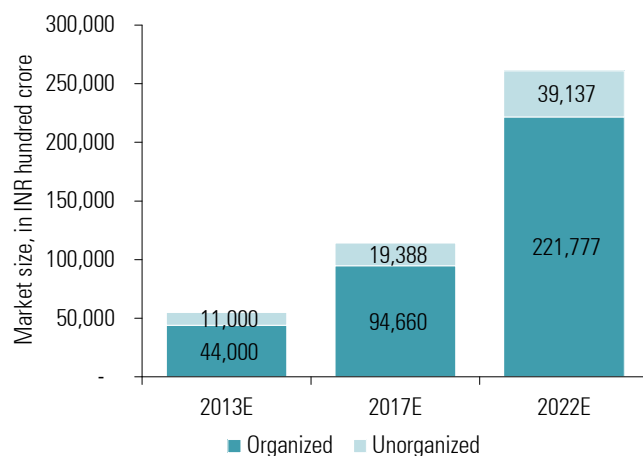
Our view of communication and broadcasting subsector

- India has emerged as the second-largest wireless market in the world with over 900 million subscribers contributing significantly to the nation's economic and social development
- Indian firms typically manufacture telecom switches with technical and financial collaboration from foreign firms
- About 180 million units of mobile phones were produced in India in 2012-13 — a growth of 9 percent over the previous year. In value terms, domestically manufactured mobile handsets stood at about INR 3460 crore in 2012-13, which is 23.5 percent higher than 2011-12 (about INR 2800 crore)
- Some of these handsets are being exported to more than 80 countries around the world
- India's Department of Telecom has directed all Indian telecom providers to acquire security clearances before purchasing equipment and software from foreign vendors, and it requires foreign vendors to transfer technology to Indian manufacturers within three years of any sale
- Government initiatives, such as the National Knowledge Network (NKN) and the National Optic Fiber Network (NOFN), are expected to drive demand from academic institutions and rural areas
- In recent years, firms from China and Japan have made inroads into the Indian communication market, giving tough competition to established players

Market size of the communication and broadcasting subsector



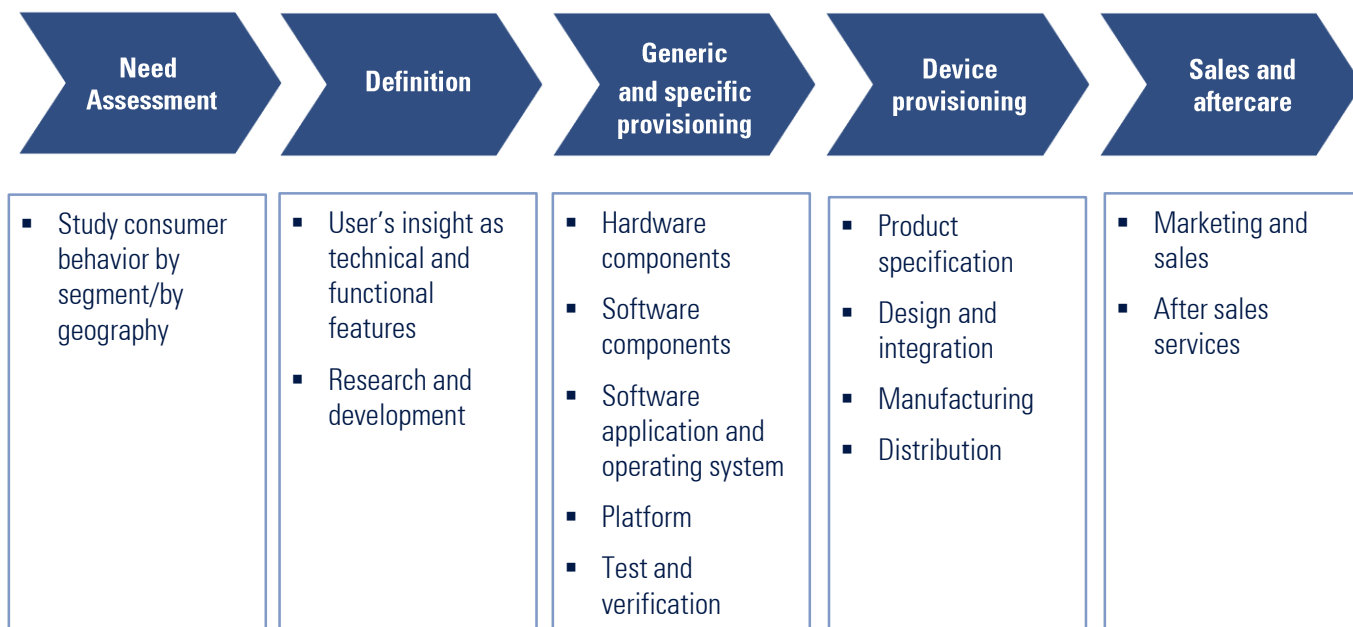
Share of the organized and unorganized - communication and broadcasting subsector



- India's communication and broadcasting equipment market is estimated to reach INR 26,090 crore in 2022, up from the projected INR11,400 crore in 2017 and INR 5,500 crore in 2013
- The market share of the unorganized sector is estimated to decrease from 25 percent in 2013 to the projected 17 percent in 2017 and 15 percent in 2022. The emergence of domestic mobile phone manufacturers will be the biggest disruptor in the industry
- Also, the increasing size of the Indian telecom industry is expected to encourage several foreign equipment manufacturers to establish manufacturing facilities in India

Sources: Press articles; KPMG in India analysis; Annual Report 2012-13, DEITY, Government of India

Value chain for the communication and broadcasting subsector



- Need assessment: As telecom equipment, namely mobile handsets, are required to be designed for different geographic markets and according to different price points, incorporating consumer behavior — by segment or by geography — is an integral part of the design process
- Definition and technology: The user's insight is built into technical and functional features of the telecom equipment in finalizing design specification. Research and development is performed to develop technology suitable for the product
- Generic and specific provisioning: In this stage, hardware design (proprietary or standard), its development and manufacturing are completed. Standardized software, such as environment engines, also get finalized
- In specific provisioning, platform/reference design, a combination of software and hardware components is finalized after developing the software application, operating system and software system (an integration of different software components). Testing is done to ensure smooth operating performance
- Device provisioning: End-use device specifications are finalized for design and integration like platform, hardware component and software application. Physical assembly and production are conducted and distribution of products is arranged
- Sales and aftercare: This includes devising a marketing and sales strategy for direct marketing to end-customers and brand-owned sales channel through dealers and distributors. After-sales service refers to repair and maintenance activities

India needs to build an ecosystem for manufacturing products in Communication and Broadcasting subsector— including mobile devices and networking equipment

Key trends	<ul style="list-style-type: none">▪ Growth of the telecom sector: The Indian telecom sector is expected to continue on its growth path in the coming decade as well. The introduction of 3G/4G technologies as well as increase in the use of broadband are expected to drive demand for telecom equipment and new models of mobile handsets▪ Rise of Indian players: During its first decade, the Indian mobile telecommunication industry was dominated by foreign players. However, the past few years have been witness to the rise of India firms — especially in the mobile handset segment. Firms like Karbonn and Micromax have established facilities in the country and are giving strong competition to foreign players.▪ Large players continue to dominate the market: Large telecom equipment manufacturers such as Cisco and Ericsson continue to dominate the market; additionally, mobile device firms like Samsung, Apple and Nokia have held a majority of the market share over the past decade
Opportunities	<ul style="list-style-type: none">▪ Government initiatives: The Indian government has launched several initiatives to bridge the ‘digital divide’ between urban and rural areas and harness the digital revolution to increase the spread of education. programmes like the National Knowledge Network (NKN) and the National Optic Fiber Network (NOFN) are expected to require investments in telecom equipment worth billions▪ Growth from rural areas: The next wave of growth in the communication and broadcasting equipment sector will come from rural areas, where rising income is driving demand.▪ Expanding media sector: The Indian media sector continues to expand rapidly, with over 800 channels now being beamed to Indian households; this number is expected to cross the 1,000 mark by 2015. This will drive demand for broadcasting equipment
Challenges	<ul style="list-style-type: none">▪ Lack of domestic capability in high-end equipment: Indian telecom equipment manufacturers have been largely restricted to the lower-end of the spectrum, focusing on commoditized products — products where American and European players are no longer present. Access to high-end routers, switches and other networking equipment is restricted from Indian companies▪ Low-cost imports: Over the past decade, China has emerged as the global hub of telecom equipment manufacturing. Players like Huawei and ZTE have become telecom behemoths and have flooded the India market with low-cost equipment▪ Lack of an electronics manufacturing ecosystem: India lacks an ecosystem for manufacturing communication and broadcasting equipment; this acts as a barrier for players who wish to enter the sector

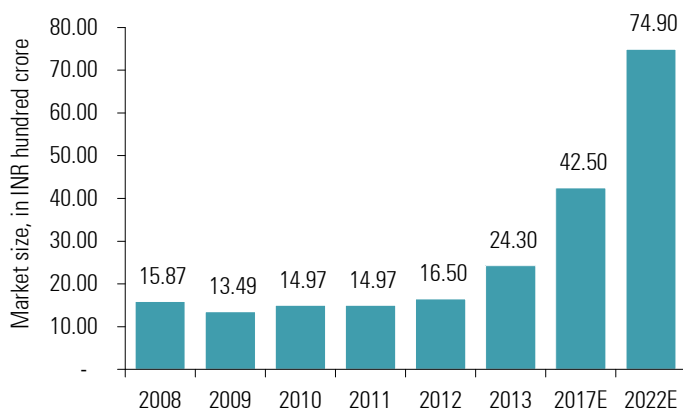
Sub sectoral overview

While India has emerged as a market leader in IT services, country has lagged far behind China in manufacturing computer hardware products

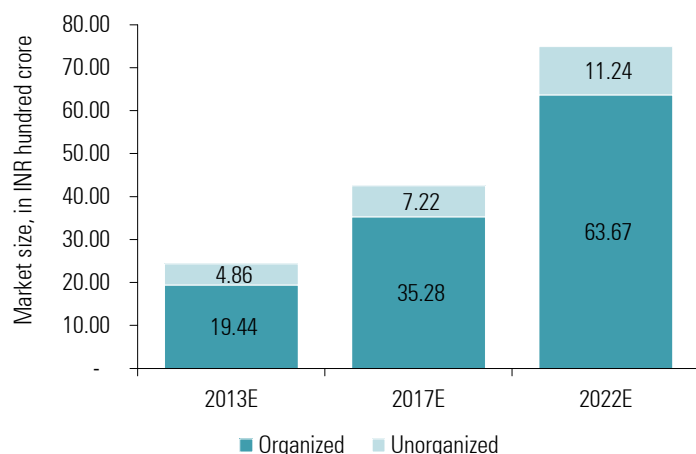
Our view of computers and peripherals subsector

- The rapid growth of the Indian IT-BPO services industry over the past two decades has driven the demand for IT hardware, including PCs, servers, notebooks, printers and other associated peripherals
- Moreover, Indian companies across the length and breadth of the country have adopted IT to transform their businesses, further driving demand for IT hardware
- Indian companies have had a presence in the IT hardware segment since the late-1980s, focusing on assembling desktop PCs using components imported from China, Taiwan and Malaysia
- Over the past few years, the market has witnessed a decline in demand for desktop PCs, while demand for laptops has increased. More recently, the rise of tablets poses a threat to the laptop market
- HP is the largest PC vendor in India, followed by Dell and Lenovo. In the absence of any government orders, the Indian PC market has performed dismally in 2013, re-emphasizing the fact that with current economic sentiments and political scenario, enterprises are deferring their purchases
- Companies like HCL Infosystems, Zenith Computers and Wipro have been involved in manufacturing desktop PCs as well as notebooks; they have also branched out into servers and storage systems
- The dawn of the new millennium saw the influx of several foreign companies such as IBM, Dell, Toshiba and Apple. Companies involved in computer peripherals, such as SanDisk, Logitech and Seagate, also entered the field

Market size of the computers and peripherals subsector



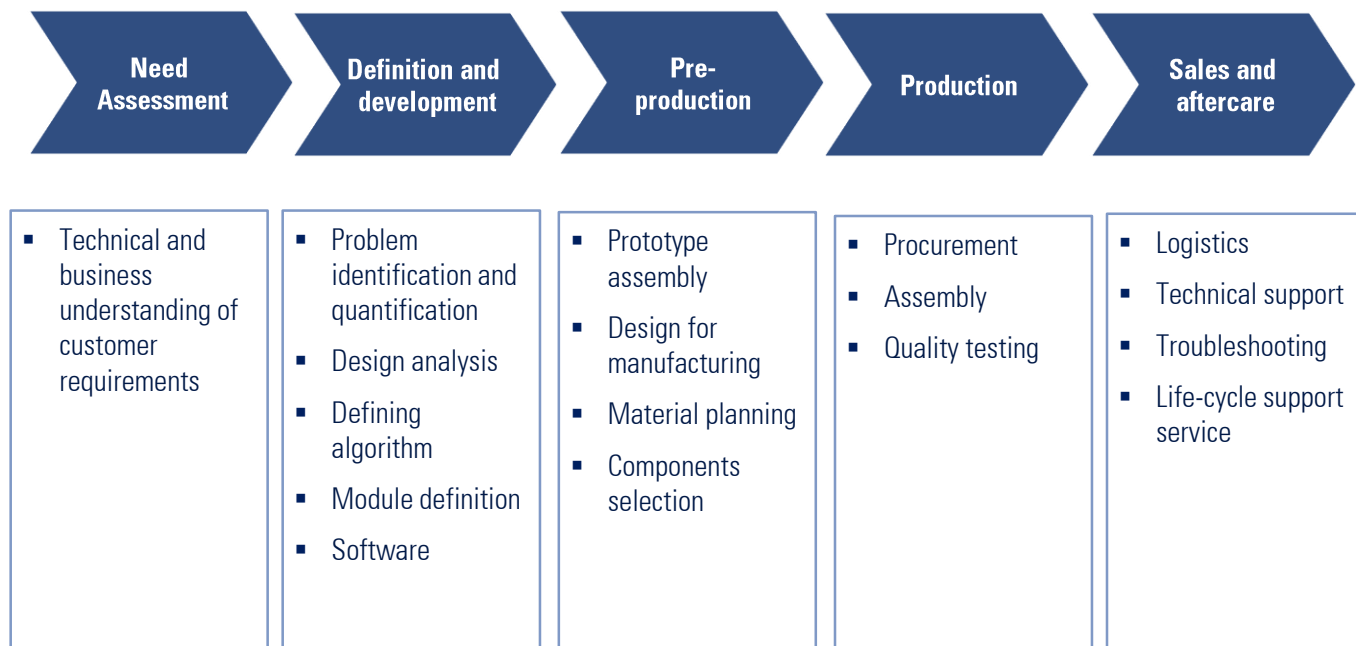
Share of the organized and unorganized sector - computers and peripherals



- India's computers and peripherals market is estimated to reach INR 7,490 crore in 2022, up from INR 2,430 crore in 2013 and the projected INR 4,200 crore in 2017
- The market share of the unorganized sector is estimated to decrease from 20 percent in 2013 to the projected 15 percent in 2017 as well as in 2022 largely due to the decreasing price gap between branded and assembled computer products. In addition, falling prices of computer products is also helping the organized sector to make inroads in tier 2 and 3 centers as well
- However, the continuing large-scale imports of computers and peripherals from China and other Asian countries remains a challenge for the government

Sources: Press articles; KPMG in India analysis; Annual Report 2012-13, DEITY, Government of India

Value chain for the computers and peripherals subsector



- **Need assessment:** For this, a cross-functional team comprising people with background in engineering, manufacturing, materials management and sales and marketing assess the technical and business aspects of customer requirements. These are then pursued further by the definition team
- **Definition and development:** Based on the need assessment, the engineering team works to define customer application requirements and finalize the precise hardware requirements/software configuration. The design concept is then chalked out considering the hardware configuration and cost estimates during the complete manufacturing process
- **In development phase,** With the aid of algorithm engineering, verification of algorithm results and behavior is ascertained. Definition module includes packaging of various units which has a well-defined interface with the other components, and developing the enabling software for hardware to function.
- **Pre-production:** The pre-production process begins with prototype assembly to identify the manufacturing process and finalize the product design. The design for manufacturing analysis is performed to point out cost reduction and system improvements at the prototype level. Further, to achieve desired quality and price level, best available components are identified for the product design.
- **Production:** Best-in-class components at competitive prices need to be procured from the existing/new vendors developed for assembly process. Assembly services shall provide complete box-build and full system assembly for the computing hardware and finally conclude the production process with functional and system testing.
- **Sales and Aftercare:** This includes post sales trouble-shooting and repair and maintenance. Managing and providing life-cycle support service for the product.

Sub sectoral overview

Demand for low-cost mobile computing devices will drive demand in the Computers and Peripherals sub-sector

Key trends	<ul style="list-style-type: none">▪ Increasing share of branded PC: During the 1990s and the first half of 2000s, the PC market in India was dominated by the unorganized sector. Small firms and local assemblers had cornered a large share of the market, especially in the SoHo segment. However, the past few years have witnessed a reversal in this trend, with branded PCs steadily improving their market share. In 2012, they had cornered 64 percent of the domestic PC market.▪ Consumers adopting low-cost PCs: India remains a cost-conscious market as far as PCs are concerned, with sub-INR30, 000 PC's representing the largest segment. Firms are also adapting to this changing market, and focusing on releasing stripped-down versions of their products sold abroad in the domestic market.▪ Tablets gaining popularity: India is moving at a brisk pace in becoming one of the largest markets globally for tablets. India has witnessed high tablet sales in the past couple of years. It recorded a total shipment of 2.66 million tablets in 2012, which amounted for 901 percent y-o-y growth as compared to 2011.
Opportunities	<ul style="list-style-type: none">▪ Rising government spending: Several state governments in India have launched schemes to provide free laptops to school and college students. States like Tamil Nadu and Uttar Pradesh have been at the forefront; they bought several million units from PC manufacturers. With more state governments expected to adopt such schemes, demand for laptops will continue to increase.▪ Additionally, the central government has also launched several e-governance initiatives as part of its National e-governance Plan (NeGP), which will involve rapid computerization of all citizen services and will lead to rising demand for PCs.▪ Demand from tier II and III towns: Demand for PCs in India has been traditionally driven by enterprises and consumer residing in tier 1 cities. However, the past couple of years have seen rising demand from tier 2 and 3 towns, and companies are now strengthening distribution channels to reach out to customers in these towns.
Challenges	<ul style="list-style-type: none">▪ Dominance of foreign companies: Foreign PC firms, including Hewlett-Packard, Dell and Lenovo, have garnered a majority share of the India market and have continued to post strong growth. Indian manufacturers have seen their market share dwindle and have been consigned to the lower end of the spectrum.▪ Limited incentives for investment: With no natural advantage for manufacturing and with uniform taxation across the value chain, sizable investments, especially at the components and sub-assembly level, have evaded the segment.▪ Decreasing margins: Increasing competition in the sector, coupled with falling global prices for most computer peripherals has led to razor thin margins for most companies. As a result, there are fears that the industry might move towards an oligopolistic structure.

Sources: Press articles; KPMG in India analysis

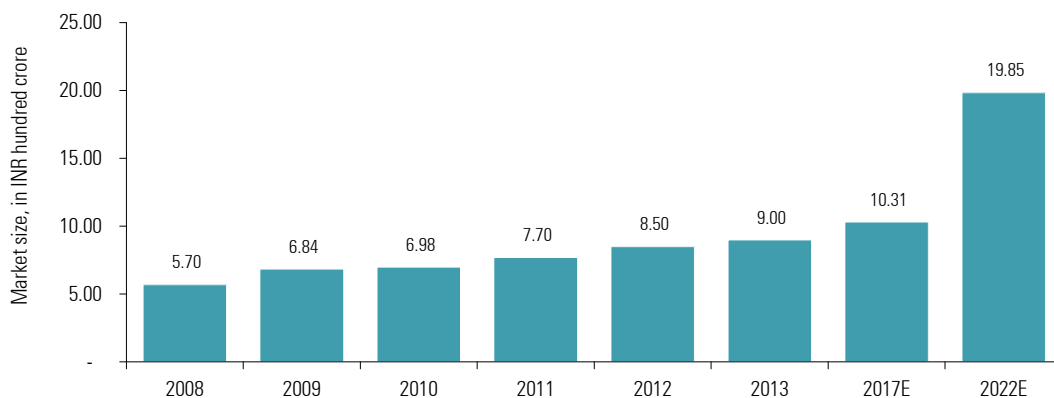
Sub sectoral overview

Other Electronics subsector include emerging segments like automotive , strategic electronics and industrial electronics...

Our view of other subsectors

- The others subsector includes strategic, medical, automotive and industrial electronics and the manufacturing of solar panels
- Strategic electronics is a niche segment characterized by sophisticated technologies that are generally held as closely-guarded secrets by companies and countries
- In recent years, the preference for domestic industry has increased over direct imports. A shift towards the 'develop and make' model has taken precedence over the earlier 'buy' and 'buy-and-make' policies
- As a result, opportunities for Indian companies are increasing. Driven by geo-political considerations, India is expected to be one of the top five markets for defence equipment by 2015
- In India, the medical electronics industry has witnessed double-digit growth in recent years and this growth trajectory is expected to continue due to the rising incidence of chronic diseases, increased urbanization and a growing elderly population
- India's large automobile market is also attracting a host of automotive electronics players to set up shop in the country. Moreover, several Indian auto component players are contemplating moving up the value chain into auto electronics
- The continuing decline in solar panel prices is encouraging several India companies to set up manufacturing facilities

Market size of the strategic electronics subsector

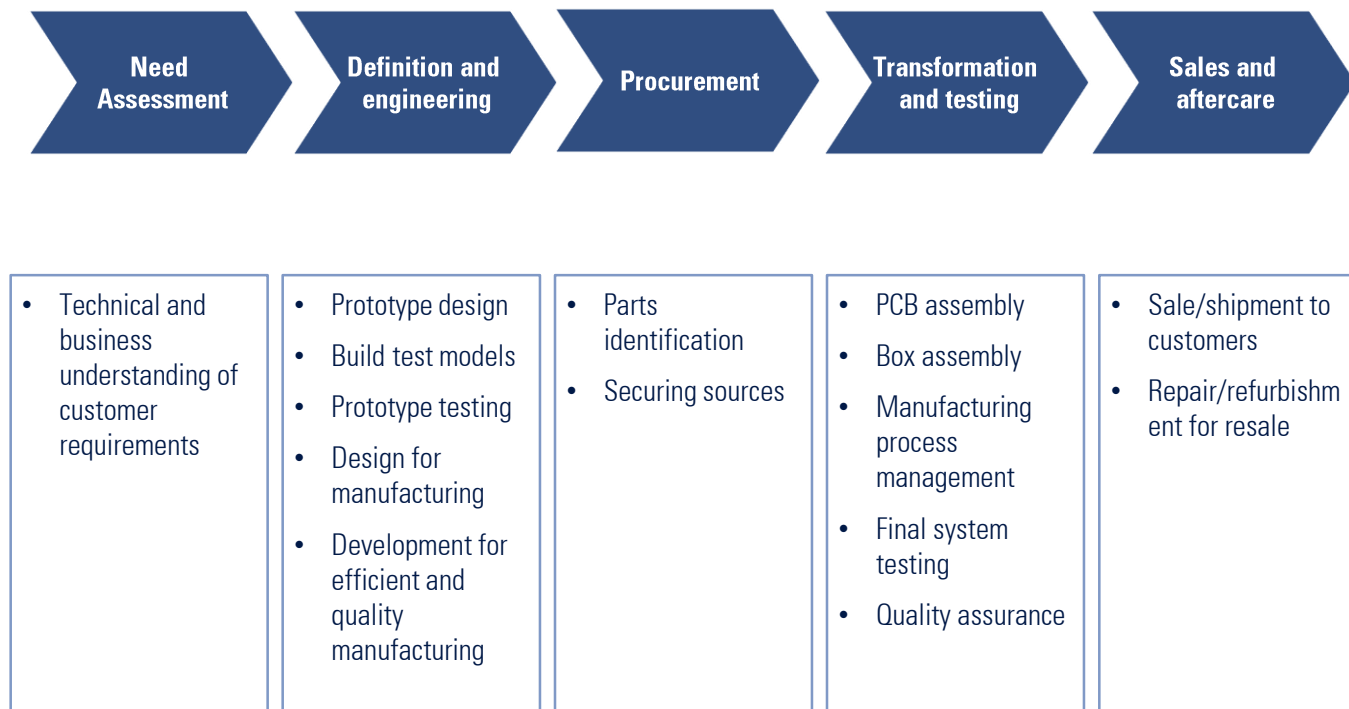


- India's strategic electronics market is estimated to touch INR1980 crore in 2022, up from INR 900 crore in 2013 and the projected INR1030 crore in 2017
- In addition, the market for medical electronics is estimated to reach INR 38,400 crore by 2020, up from INR 6,000 crore in 2010
- Key trends in the medical electronics industry include convergence across health care products and industry segments, disease-specific research work and customization, and the emergence of home-based care

Sub sectoral overview

Value chain of the Other Electronics subsector

Value chain for the other subsector



- **Need assessment:** This function involves identifying the customer requirements and converting them into technical and business aspects of production.
- **Design and engineering:** R&D is applied to build test models of a potential new product or enhancements to existing products with a view to develop prototype models and perform its testing. Once a prototype is accepted for further development, it is designed to ensure efficient and high quality manufacturing, with complete design engineering.
- **Procurement:** Strategic and commodity parts are identified and vendors are tied-up for predicted volumes of production.
- **Transformation and testing:** Components and circuit boards are assembled using surface mount technologies (SMT) according to design-engineering specifications with a combination of manual and automated systems to assemble final systems and manage manufacturing process.
- **Testing** involves a combination of manual and automated procedures is used to fully test units coming off the assembly line.
- **Sales/aftercare:** Finished goods are sold and shipped to end customers. Aftercare will include repair of returned products and repair/refurbishment of repurchased units to be sold.

Sub sectoral overview

High entry barriers resulting from cost of R&D to get relevant technologies is a challenge for the growth of the segment

Key trends	<ul style="list-style-type: none">▪ Emergence of multi-vendor platforms: Large strategic electronic systems with the defense forces can be categorized as Commercial off-the-Shelf (COTS) systems; 'make' systems (indigenous development or manufacturing-based on Transfer of Technology (ToT), or a combination of the two). Since they are complex in nature, such systems are no longer developed by a single vendor▪ Offset clause in defense deals helping domestic players: As per the latest Defense Procurement Policy released by the Ministry of Defense, all contracts with foreign vendors will have an offset clause. This offset, ranging between 30-50 percent of the deal value, mandates foreign firms to invest in technologies and production of strategic electronic products within India. In most cases, this is implemented in partnership with Indian firms, which provides them with the much-needed skills and expertise in the sector
Opportunities	<ul style="list-style-type: none">▪ Increasing defence outlay: India's defence outlay crossed INR 20,000 crore in 2013-14 and is expected to continue growing over the next decade. Moreover, a large fraction of the Indian armed forces' inventory is obsolete and requires immediate replacement; these two factors will primarily drive demand for strategic electronics in the country▪ Rise of network-centric warfare: 'Network-centric warfare' — the concept of networking sensors, commanders and shooters to increase speed of operations — is dominating strategy discussions of defense forces across the world. Implementing this concept requires several electronic systems, which, in turn, drive the demand for strategic electronics.▪ Export potential: Indian companies, especially in the strategic and automotive electronics space, wish to export their products to the East Asian market as well as explore options in Africa and the Middle East
Challenges	<ul style="list-style-type: none">▪ Dominance of foreign companies: In recent years, American and European firms have started winning a bulk of major defence contracts awarded by India. From combat aircraft to tanks to helicopters, foreign firms use electronic component and semiconductor designs made by other American and European firms. This deprives Indian firms of a large revenue source▪ High entry barriers: Strategic electronics is considered a national asset and companies are reluctant to share know-how with other companies/countries. This makes the task for Indian companies tough, as they have to spend considerable amount of R&D efforts to get relevant technologies

Geographical clusters

Geographical clusters

Karnataka, Tamil Nadu and Delhi/NCR are the key production hubs for the sector

Maharashtra

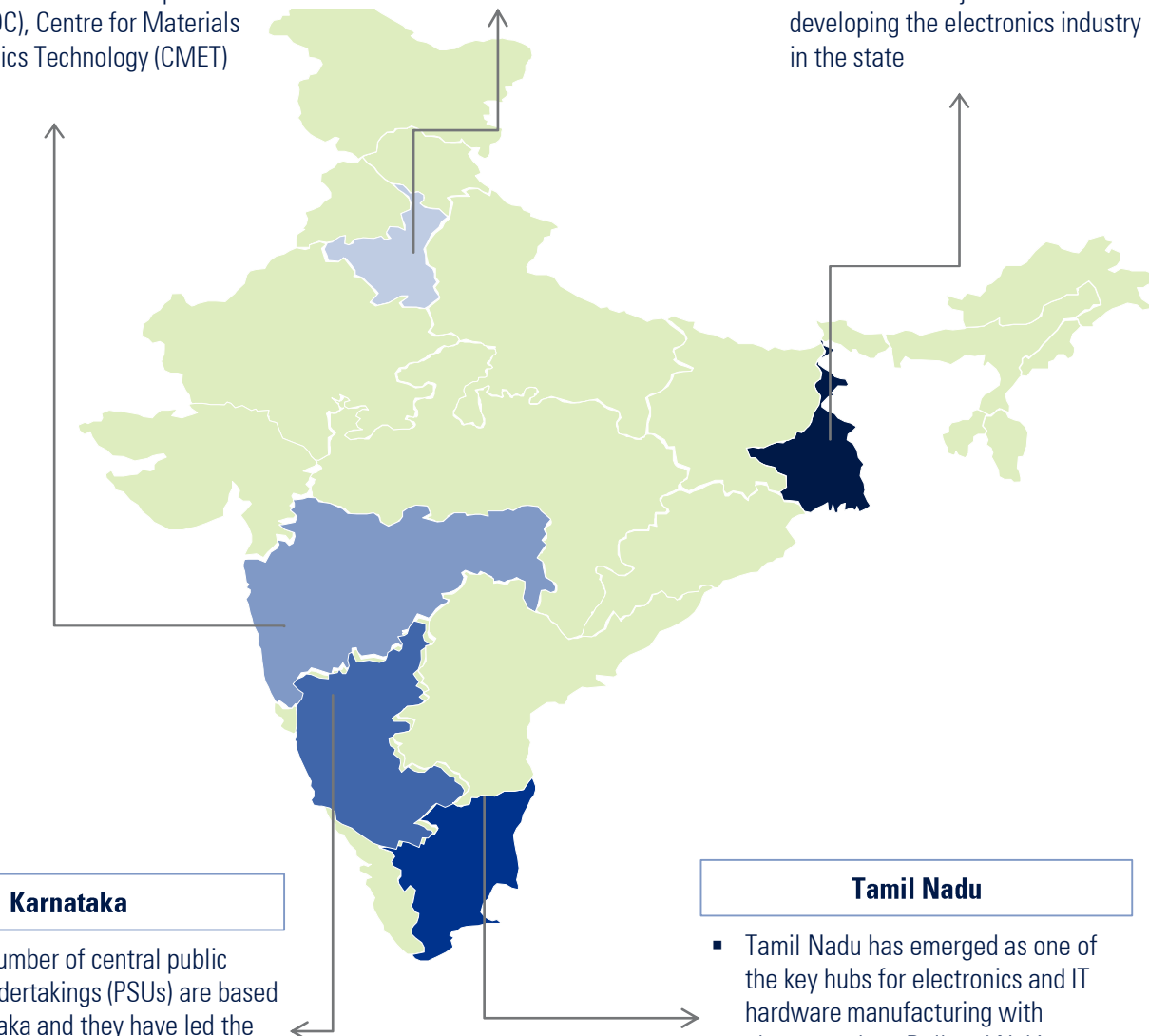
- Pune and Aurangabad have emerged as hubs for the electronics sector in Maharashtra.
- Maharashtra is also home to important research institutes like Electronics Test and Development Centre (ETDC), Centre for Materials for Electronics Technology (CMET) etc

Haryana/Delhi NCR

- Noida, Gurgaon and Faridabad have led the growth of the consumer electronics sector in Haryana and Delhi NCR
- The facilities in these regions mainly cater to the domestic market

West Bengal

- West Bengal hosts electronics units for Videocon and Philips
- The West Bengal Electronics Industry Development Corporation Limited (WEBEL) was established in 1974 with the objective of developing the electronics industry in the state



Karnataka

- A large number of central public sector undertakings (PSUs) are based in Karnataka and they have led the growth of electronics manufacturing
- Players like Bharat Electronics Limited gave birth to an electronics cluster in and around Bengaluru

Tamil Nadu

- Tamil Nadu has emerged as one of the key hubs for electronics and IT hardware manufacturing with players such as Dell and Nokia establishing facilities in the state
- Recent policies by the state government have also given a boost to the sector

Sources: State Government websites; Press articles; KPMG in India analysis

Geographical clusters

The presence of Public Sector Units, as well as the booming IT-ITeS sector, have enabled Karnataka to become a destination for investments



- Haryana and the adjoining Delhi/NCR have emerged as an electronics manufacturing hub over the past decade. From Japanese and Korean consumer electronics firms to mid-size electronic component and semiconductor design manufacturing units, the NCR is now host to an entire electronics ecosystem
- Several global telecom equipment manufacturers have also established captive operations in the NCR area. However, these are focused on design and testing operations rather than manufacturing equipment



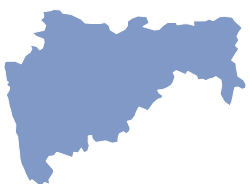
- Karnataka, especially Bengaluru, in many respects, can be identified as the birthplace of India's electronics and IT hardware industry, primarily due to the establishment of several PSUs in the city.
- Today, Bengaluru continues to be a hub for engineering research and design (ER&D) outsourcing services, with several American and European companies having global in-house centres (GIC) in the city.



- The Sriperumbudur manufacturing zone around Chennai has emerged as a cluster for electronics and IT hardware manufacturing companies. From Nokia's mobile handset manufacturing plant in 2006 to Dell's PC manufacturing facility in 2007, Tamil Nadu has been at the forefront of the electronics boom in India
- Sriperumbudur's proximity to Chennai's port enables companies to use their plants for exports as well, giving Tamil Nadu an advantage over other states



- West Bengal hosts electronics units for Videocon and Philips. In recent years, the IT hardware industry has also emerged in the state
- The West Bengal Electronics Industry Development Corporation Limited (WEBEL) was established in 1974 with the objective of developing the electronics industry in the state



- Pune and Aurangabad have emerged as hubs for the electronics sector in Maharashtra
- Maharashtra is also home to important research institutes like Electronics Test and Development Centre (ETDC), Centre for Materials for Electronics Technology (CMET) etc

Demographic characteristics of workforce

Demographic characteristics of workforce

Emerging technologies and product categories mandate adequate focus on up-skilling the existing workforce

Demand for Specialist Roles & Niche Segments

- Manpower requirement for specialist roles like system integrator is on the raise
- Niche areas like automotive and medical electronics would add to increasing specialist roles
- Smart phones, tablets and DTH segments are also expected to witness significant growth in human resource requirement

Migration

- Migration is a major challenge. High cost of living in Electronics hubs like Bengaluru, NCR, Kolkata discourage employment led migration from rural and semi urban regions

Modes of recruitment

- Recruitment is predominantly through industry personnel visiting colleges and ITIs
- Government schemes like Apprenticeship play a crucial role in supplying technical manpower for manufacturing segment

Skill Premium

- No premium is attached to people who get trained in this sector
- Skill premium seems to be absent since the trained manpower is barely recognized, as the sector is not keen on investing in training

Changing skill Requirements

- New technologies emerging, such as cloud computing and mobile applications leading to shift in the manpower needs of electronics and networking sector as new roles are being created
- The demand for software roles earlier has now shifted toward mobile applications.
- The demand for hardware technicians has been replaced with the demand for networking engineers

Recruitment Preferences

- Organizations focus on basic knowledge of technical operations for recruitment in manufacturing
- Soft skills and product knowledge are the key criteria considered for recruitment in sales & marketing
- Prior experience (mostly in unorganized) is seen as an important consideration in repair and maintenance segment

Attrition

- Attrition is generally low in the manufacturing segment
- High attrition levels exist across sales & marketing, especially for front-end workers. The attrition amongst the entry and mid level is more than 30% annually.

**Incremental human
resource
requirement
(2013-17, 2017-22)
and skill gaps**

Incremental human resource requirement (2013-17, 2017-22) and skill gaps

Current workforce of nearly 4.3 million in 2013 is expected to reach 8.9 million by 2022

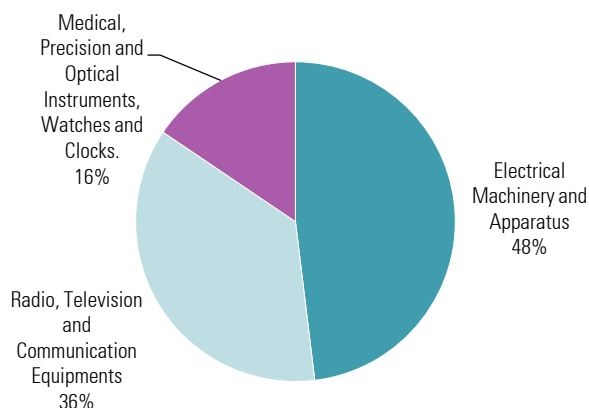
Electronics & It Hardware is one of the emerging sectors for employment growth in India. Industry currently employs over 4.3 million people across manufacturing, Sales and marketing (including Retail) and Repair & Maintenance segments.

Policy initiatives on promoting manufacturing along with increasing disposable income would drive the growth for the sector. Industry is expected to witness an addition of 4.61 million during 2013-22. Repair and Maintenance segment would contribute to maximum growth of employment.

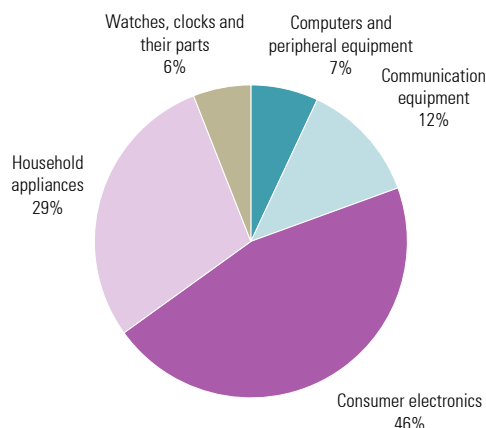
Segment	Employment (in Million)			Employment Growth 2013-17	Employment Growth 2017-22	Employment Growth 2013-22
	2013	2017	2022	(In millions)	(In millions)	(In millions)
Design & Manufacturing	1.45	1.75	2.06	0.30	0.31	0.61
Sales & Marketing	1.58	2.33	3.34	0.75	1.01	1.76
Repair, installation and Maintenance	1.30	2.16	3.54	0.86	1.38	2.24
Total	4.33	6.24	8.94	1.91	2.70	4.61

An analysis of the breakup of workforce by product categories indicates that Consumer electronics and household appliances would account for major share of employment currently. Skill requirements have significant variations across product categories especially in Manufacturing and Repair & Maintenance segments

Product Category Wise Distribution- Design & Manufacturing



Product Category Wise Distribution- Repair and Maintenance



Source: Primary Interactions, KPMG Analysis

Incremental human resource requirement (2013-17, 2017-22) and skill gaps

Select list of key job roles

No.	Job title	Subsector
1	Soldering technician	All subsectors
2	Incoming QC technician	All subsectors
3	Sales associate	All subsectors
4	Set top box (STB) Installer	Communication and broadcasting
5	Material inspector	Consumer electronics
6	Machine operator	Consumer electronics
7	Electrical product test technician	Consumer electronics
8	Production manager	Consumer electronics
9	Supervisor	Consumer electronics
10	Field technician	Consumer electronics
11	Circuit imaging operator	Electronic component and semiconductor design
12	Through hole assembly operator	Electronic component and semiconductor design
13	Pick and place assembly operator	Electronic component and semiconductor design
14	TV repair technician	Electronic component and semiconductor design
15	Remote helpdesk technician	IT hardware
16	Assembly line operator	IT hardware
17	Test and repair technician	IT hardware
18	IT coordinator	IT hardware
19	LED manufacturing manager	Others (LED design)
20	System Integrator	Strategic electronics

Source: National Occupational Standards- Electronics Sector Skill Council of India; KPMG in India analysis

Incremental human resource requirement (2013-17, 2017-22) and skill gaps

Skill gaps in select key job roles

Job Role	Key skill requirements
Assembly Supervisor	<ul style="list-style-type: none"> ▪ Understanding of various work processes and assembly procedure for different products as developed by the engineering team ▪ Supervisor shall have understanding of organization's standards on maintenance of facilities and equipment ▪ Understanding of production planning processes and resources and training required for carrying out production activities ▪ Understanding of maintenance schedule for equipment and machines, importance of checking assembled product at various stages ▪ Awareness with factors that need to be considered to avoid disruption of normal process of operation ▪ Understanding of health and safety norms while carrying out mechanical assembly operations, handling electronic components ▪ Understanding of electronics of components such as diode, transformer, LED, transistor, capacitor, resistor, inductor, thermistor, ICs ▪ Should be able to read values of resistors, capacitors, diodes and integrated circuits with specific reference to color coding, polarity, orientation, tolerance
Field technician — AC/washing machine/refrigerator	<ul style="list-style-type: none"> ▪ Understanding of company's products and recurring problems reported in consumer appliances ▪ Good communication skills do engage with customers ▪ Understanding of various electronics involved in the type of appliance, models of different appliances and their common and distinguishing features ▪ Good interpersonal skills while handling field calls and dealing with customers ▪ Ability to read and explain relevant reference sheets, manuals and documents ▪ Ability to educate customers on precautions to be taken post repairs to avoid recurrence of problem and inform about contractual issues such as warranty, cost of service and module replacement
Through hole assembly operator	<ul style="list-style-type: none"> ▪ Understanding of basic electronics and component identification, components and forming ▪ Ability to handle hand tools for manual assembly, lead forming tools, cutter, cutting machine, Through-hole insertion machine types and their functions and controls ▪ Understanding of basics of soldering and types of soldering such as dry and cold solder ▪ To know the regulation of operating speed and temperature of machine ▪ Understanding of precautions related with electro-static discharge (ESD) ▪ To be able to work on multiple machines at a time, as instructed ▪ Ability to work as a team and deliver assembled PCBs to next work process on time

Incremental human resource requirement (2013-17, 2017-22) and skill gaps

Skill gaps in select key job roles

Job Role	Key skill requirements
Set top box (STB) Installer	<ul style="list-style-type: none"> ▪ Understanding of spectrum utilization, optimum signal strength/ signal quality for good reception ▪ STB Installer shall be aware with functions of the set top box , televisions remote control and tuners ▪ Ability to understand reasons for frequently occurring faults, causes and solutions ▪ Structure of cable, parameters and the implications on signal ▪ safety standards and practices to be followed while using power connection, stair to climb, first aid ▪ Understanding of compatible products such as LCD/ LED TV, Projectors, PCs connectivity of STB via additional device/ PC ▪ Safety precautions to be followed while using set top box by customer ▪ to use hand tools such as lead tester, spanner, cutter, etc. and to operate machines/meters such as drilling machine, angle meter, satellite meter, etc
Masking Machine operator	<ul style="list-style-type: none"> ▪ Understanding of different types of capacitors and special safety precautions to be taken during the processing of capacitors ▪ Understanding of related SOPs, instructions and quality standards ▪ FIFO system of inventory control and handling of raw materials ▪ routine maintenance of machines and basic repairs ▪ 5S standards (sorting, setting, standardize, sustain, shining) + safety, security ▪ Ability to understand and sort-out commonly occurring machine and component defects ▪ Ability to troubleshoot and rectify when capacitor gets stuck in the masking machine ▪ Understanding of process and documentation
Production manager	<ul style="list-style-type: none"> ▪ Understanding of key manufacturing process, ROI, planning and control mechanism ▪ Identification and planning of resources necessary in the manufacturing with respect to manufacturing facility , test equipment, competent manpower etc. ▪ Understanding of best practices and analysis and review of the manufacturing process in terms of technology, capacity & efficiency from time to time. ▪ Ability to understand existing process and propose next level of improvement ▪ Coordination with procurement and supply chain team for timely availability of raw material ▪ Understanding of production, planning and control process

Incremental human resource requirement (2013-17, 2017-22) and skill gaps

Skill gaps in select key job roles

Job Role	Key skill requirements
Soldering technician	<ul style="list-style-type: none"> ▪ Understanding of various types of soldering techniques, solder wire, flux and their use for different types of soldering requirements ▪ Understanding of types of capacitors such as film capacitor, electrolytic capacitor, ceramic etc. and testing process ▪ The user/individual on the job needs to know and understand how to operate the testing machine/equipment and to use rulers, calipers, multi-meter, gauges or micro-meters, voltmeters, ammeters, oscilloscopes and bridge test instruments ▪ Ability to understand instructions for processes and out- oral and written ▪ Ability to identify and resolve problem during testing process and maintain equipment
Incoming QC technician	<ul style="list-style-type: none"> ▪ Understanding of raw material used at each stage of manufacturing process ▪ Understanding of prices of different products/components utilized in the manufacturing process ▪ Managing material handling operators and drivers in order to avoid unpleasant situations ▪ Reporting issues about materials received to vendors ▪ Understanding of documents used in the material handling and inspection ▪ Technician should have know-how of calibration validity of measuring equipment and applicable least counts ▪ Understanding of basic electronics-identification of components such as diode, transformer, LED, photo transistor, capacitor, resistor, inductor and how to read their values
Sales Associate	<ul style="list-style-type: none"> ▪ Sales Associate shall have understanding of consumer appliances, functionalities and specifications ▪ Good communication skills, personal hygiene and personality ▪ Understanding of basic electrical and electronics involved in the working of the appliance ▪ Understanding of various sales channels and promotions method ▪ Ability to read and understand reference sheets, manuals and documents ▪ Functional computer and analytical skills ▪ Good customer care and interpersonal skills

Training Infrastructure

Training Infrastructure

Select Training Infrastructure

Subsectors	List of electronics research centres and institutions in India
All subsectors	<ul style="list-style-type: none"> ▪ Indian Institute of Technology (various) ▪ Industrial Training Institute (various) ▪ National Institute of Technology (various) ▪ Electronic Test and Development Centre, Pune ▪ National Institute of Electronics & Information Technology, Delhi ▪ Institution of Electronics and Telecommunication Engineers, Bengaluru ▪ Indian Institute of Science, Bengaluru ▪ Advanced Training Institute for Electronics & Process Instrumentation, Hyderabad ▪ Technology Development Center, Nainital ▪ Central Electronics Engineering Research Institute, Pilani ▪ Centre For Electronics Design And Technology, Bengaluru
Electronic component and semiconductor design	<ul style="list-style-type: none"> ▪ India Electronics and Semiconductor Association
Others	<ul style="list-style-type: none"> ▪ Automotive Research Association of India ▪ Defence Research and Development Organisation ▪ Defence Research and Development Laboratory ▪ School of Automotive Technology, Chennai ▪ Naval Science and Technological Laboratory, Vizag ▪ Electronics and Radar Development Establishment, Bengaluru ▪ Laser Science and Technology Centre, Delhi ▪ International Centre for Automotive Technology, Manesar ▪ Defence Avionics Research Establishment, Bengaluru ▪ Defence Electronics Application Laboratory, Dehradun ▪ Defence Electronics Research Laboratory, Hyderabad
Communication and broadcasting	<ul style="list-style-type: none"> ▪ Indian Railways Institute of Signal Engineering and Telecommunications, Secunderabad ▪ Center for Excellence in Telecom Technology and Management, Mumbai ▪ Institute of Telecom Technology and Management, Delhi
Computers and peripherals	<ul style="list-style-type: none"> ▪ Indian Institute of Hardware Technology, Delhi

Source: Press articles, Company website; KPMG in India analysis

Training infrastructure

Select Training Infrastructure

Industrial Training Institutes

- Industrial Training Institutes (ITIs) are government-run training organizations that offer vocational training in several areas, including electronics.
- Most of ITI's impart training in technical trades like instrument mechanic, electrician, fitter, plumber, diesel mechanic, electrical mechanic, Information Technology, Mechanic Computer Hardware, Refrigeration & Air Conditioning, Turner, Welder, etc
- There are also specialised short term courses in Advanced Training Institute (ATI) which enhances the skills of candidates.

NIELIT, Chandigarh

- NIELIT is an autonomous scientific society under the administrative control of Department of Electronics & Information Technology (DEITY), Ministry of Communications and Information Technology, Government of India, was set up to carry out Human Resource Development and related activities in the area of Information, Electronics & Communications Technology (IECT).

ETDC, Pune

- ETDC, Pune offers test & calibration services since 1980 to various industries in & around Pune. It has offered on-site services to as far away as Nasik, Aurangabad, Sivassa & Indirasagar. Its clientele covers entire spectrum of industry- MNCs, Government, PSUs, Private and Defense.
- ETDC reports have wide acceptability. It has a wide pool of skilled manpower & is equipped with high-precision test & calibration facilities.

Indian Institute of Technology, Mumbai

- The Department of Electrical Engineering (EE) is one of the major Departments of IIT Bombay since its inception in 1958. The department is very active in teaching and research in the areas of Communications and Signal Processing, Control and Computing, Power Electronics and Power Systems, Microelectronics and VLSI design, and Electronic Systems.
- Along with other IIT's located across the country, IITB has emerged as one of the leading centers for electronics engineering in the country.

ATIEPI, Hyderabad

- The Advanced Training Institute for Electronics & Process Instrumentation (ATI-EPI) was set up in the year 1974 by the Government of India with the assistance of Inter National Labor Organisation / Swedish International Development Authority to cater to the Training requirement of industries/organisations by offering both Short Term and Long term courses in the field of Electronics & Process Instrumentation.

Technology Development Center, Nainital

- TDE Nainital aims to develop human resources to meet the essential requirements for transfer of technology in assembly and manufacturing of electronics items and parts.

Subsector

Across the electronics and IT hardware sector

Technical incompetency

- Industry participants highlighted the concern of low employability of new entrants into the workforce due to technical incompetency. The situation becomes more burdensome for small- to medium-sized players, which have to invest capital and time to train the employees. The originating points for this skill gap are two fold.
- The ITIs from which the sector players source professionals for this category lack the curricula and content that is relevant to the current or future requirements of the sector. While this is being addressed partly by the scheme for the adoption of it is by companies, all companies cannot afford the resources and bandwidth to follow this approach. Hence, the ITIs that are not responsive to employers' requirements drive the type 1 skill gap
- For several small and medium players whose workforce management strategies are not evolved or absent, investing in capacity building initiatives for education and training is not a rational response. This makes factors such as attrition significant deterrent for employees. Further, lack of strict inter-firm linkages in similar sectors facilitates skill development. These are causal factors symptomatic of type II skill gap

Subsector

Electronics components and semi conductor design

Demand for multi-skilled employees

- The electronics manufacturing and design sectors are still being opened up and in lots of manufacturing plants the need for niche operating skills together with the computer knowledge has been the primary requirement. More so when the manufacturing sector itself is expected to embrace quickly many technological advancements in near future.
- To match up with such a rapid pace growth and requirements of manufacturing sector, Indian machine makers will be required to not only invest capital but also build a strong innovation and design manpower pool
- Niche skilled workers, operators, supervisors are the key job roles in this sub sector

Subsector

Consumer electronics, communication and broadcasting

Increase in demand for sales, repair and after-sales

- There is significant increase in the demand for consumer electronic products, smart phones, tablets and set-top boxes, which are creating jobs not only for installation but also for sales, after-sales and repair services
- Some generic skills, such as basic communication and soft skills, are also required
- Marketing and after-sales are considered as potential areas for job creation in future

Subsector

Other Electronics

Quick adoption to new products in the sector

- New technology products, such as solar and LED, are gaining attention. It is imperative to expedite their adoption to promote the upcoming subsectors and technologies
- Multi-skilled and cross-skilled professionals are considered mandatory across all subsectors
- The role of system integrators is considered important, besides that of researchers and design engineers

Subsector

Computers and peripherals

Adoption of new technologies driving demand

- New technologies such as cloud computing and mobility are transforming the IT hardware sector. Companies require professionals skilled in cloud management, remote infrastructure management and mobile computing devices
- The trend towards wearable computing devices is likely to increase in the next decade, which would lead to significant demand for skilled employees
- There is growing demand for professionals skilled in analytics and statistics in this sub sector besides those skilled in sales and services of related products

Recommendations for stakeholders

Recommendations for Stakeholders

Demand for niche skilled workers: creation of large talent pool by additional skilling

- There is significant demand for niche skills workers in this sector
- Though attrition levels across, especially for L1 workers, are not high, there is substantial movement of people within the same sector
- Lack of training infrastructure to impart skills related to new technologies needs to be addressed
- High competitive wages for L1 and L2 job roles drive workers to switch jobs within the sector
- People who have learned skills through in-house training of the company tend to change jobs quickly and demand premium for their skills

Recommendation 1: Provide large talent pool by providing more training in the electronics sector

- Acknowledge and offer incentives to workers based on improvised skills. The professionals who possess such niche skills can be employed as trainers in training centres, which would serve as additional income source for them
- More training institutes that can impart niche skills, which demand a premium in the sector, must be included in course curriculum, which would create a large talent base

Lack of research: the electronics sector lacks entrepreneurship and research skills

- Increased number of jobs and preferences for IT development facilitates cross-sectoral movement
- In India, there are limited postgraduate courses focussed towards research
- Courses on entrepreneurship and potential benefits must be included to create job opportunities in future
- Significant requirements in the design and development area of the electronic sector are likely to create niche job opportunities for researchers and scientists
- High premium wages can attract talented professionals, who can help improve the quality of work to match it with global standards

Recommendation 2: Introduction of research-based courses in more institutions across India

- There is a need to spread awareness among school students to motivate them to pursue a career in research
- A large number of students still go abroad to pursue master's courses since several universities outside India focus on research
- The government must encourage research-based engineering programmes in popular institutions, besides other engineering options, to encourage more people to pursue such courses

Establishment of appropriate channels for placements

- Though a majority of recruitment takes place through campus recruitment, job portals and consultancies, there is demand across many small manufacturing firms
- A better tracking tool for skill requirements can help students choose desired courses

Recommendation 3: Online portal assisting job search in the electronics sector

- There should be a common central database for updates on vacancies across electronic firms, including all job roles firms in each cluster

Recommendations for Stakeholders

Strengthening the link between sector and training institutes: There is a need to establish centres of excellence in this sector

- Existing training institutes lack courses on superior machine operation. These institutes can strengthen their collaboration with the sector to introduce these courses
- Lack of semiconductor design and research facilities for every segment of the semiconductor sector
- A large requirement on the job training to understand the operations and basics of technology is currently being done to make the people “employable”
- Significant demand in consumer electronics, smart phones and set-top boxes drive demand for management courses, such as one for marketing and sales. These courses are considered priority in this technology-dominated sector
- There is demand for managerial courses on programme management and product management; hence, courses to teach such courses should also be included, as these skills can demand premium
- Basic knowledge on computer and English is mandatory, so courses on imparting soft skills should be offered

Recommendation 4: Specialised training for high technology machine operations

- ITIs located in major hubs must be upgraded with latest technology and converted into centres of excellence offering courses in operating high-end machinery and equipment and machine operations. This is possible only with sector collaborations

Recommendation 5: Establishing of centres of excellence for research and design

- Strategic electronic, industrial electronics and medical electronics require knowledge on semiconductor research and design. Hence, new courses should be introduced by establishing CoEs in all these areas
- System integration, a key emerging skill, and niche skills would be required across the semiconductor design, VLSI and chip design processes

Regular update of course content and training standards: The sector is growing significantly and international standards should be maintained

- Infrastructure and machinery in ITIs and ITCs offering courses in soldering, picking and placing, and processing operations are not in line with the latest technology. With increased automation and changing technology, there is a requirement of constant upgrading of skills among operators, fitters, electricians and also technologists
- The latest technology and machinery as per industry requirements exist only in a few research institutes; hence, participation from several private players should be sought

Recommendation 6: Private sector participation for infrastructure provision to industrial training institutes

- A large number of public-private partnership programmes should be initiated wherein funds are provided to private players interested in establishing institutes
- This could be further extended to another model wherein training institutes with poor financial capacity, which cannot procure latest technology, can purchase second-hand machines from private players or lease them

Recommendations for Stakeholders

Improved collaborations for internationalisation: Collaboration among the government, sector and training institutes should improve to develop superior products

- There is a need for collaborative research with global R&D electronic institutes. This could be further extended to programmes in advanced electronic technology and quality control
- Students trained in ITIs and other vocational training institutes lack awareness on global trends; hence, there is a need for constant guidance through workshops
- Introducing standard manufacturing processes in the curricula, such as Lean and Agile, is likely to help trainees to get placed easily in multinational electronics manufacturing plants
- Including basic management principles in engineering and technical curricula would improve their knowledge on the overall principles and practices
- The government can incentivize players that facilitate this by providing tax breaks
- Up-skilling trainers and skilled workers is of paramount importance in this sector

Recommendation 7: Matching international standards and quality control

- With many global firms establishing manufacturing plants in India, there is an increasing need for quality testing and product certification processes
- For exports, international quality control standards should be adhered to, so that the manufacturing quality of India is in line with international standards.
- There is likely to be a demand for supervisors and quality control managers in various consumer goods

Recommendation 8: Designing course content in line with global trends

- Major MNCs in electronics research and design in the manufacturing segment follow international standards for export markets; hence, tapping into this opportunity would provide large skilled workmanship

Recommendation 9: Introduction of management principles in curriculum

- The severe lack of understanding on management principles at the middle-management level should be addressed

Assessment and certification: improvement in training quality, content and infrastructure, and certification of trainers is required

- There is lack of quality trainers and there exists a huge demand for niche skilled trainers
- There is a need to expand the existing list of courses offered by industrial training institutes in line with the demand from the electronics sector
- The sector also needs to lead from the front to include practical training, which can be conducted on manufacturing plants
- The government can incentivize sector players by giving them tax breaks for adopting such practices

Recommendation 10: Certify and assess trainers

- Courses should be reviewed periodically with the help of industry experts
- Improved methods of teaching by leveraging technology as an aid
- Strong collaboration between sector players and skill councils to improve the quality of trainers and training facilities



सत्यमेव जयते

GOVERNMENT OF INDIA
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