Greetings from IESA - India's premier industry body focused on Semiconductor & Electronics System Design and Manufacturing. Today Electronics is playing a key enabler role in securing our country as well as establishing our dominance in space. Electronics systems nearly constitute 40 percent of defence equipment used in modern day warfare.

India's ambitious space program and modernization program of defence are going to create ~USD 193 bn Strategic Electronics opportunity in the next 12-14 years for our member companies.

The electronics system design community in India, one of the largest globally are working on cutting edge technologies which have direct impact on the strategic electronics need of our country, be it design of nano satellites, robots that can roam in moon & Mars or swarm robots for defence applications, AI enabled intelligent electronics systems for intrusion detection, software defined radios for building secured communication network, wearable devices for soldiers etc.

History shows that Government supported strategic electronics outsourcing has built the strong ESDM ecosystem & global MNCs in Electronics in countries like USA and Israel.

Today we are at the inflexion point where government with its strong focus on indigenization in Defence and Space and the matured ESDM industry can make India not only be self-sufficient in our need but also a global leader in Strategic Electronics to address the ~USD 542 bn opportunity by 2032.

I am very pleased that IESA and Roland Berger are releasing "Strategic Electronics Report 2019" coinciding with the Spacetronics & Deftronics event.
Aerospace and Defence today is at the cusp of a technological revolution – characterized by battlefield supremacy driven by electronics, data and material sciences.

Within the aforementioned trio, strategic electronics tends to have the single largest differentiated impact as a capability multiplier. Additionally, strategic electronics has the potential to redefine the competitiveness of India as an Aerospace and Defence manufacturing and export hub.

We at Roland Berger have had the privilege to work with some of the leading global A&D players and without doubt, most of them, do look at India as a promising place for developing their play for strategic electronics.

Over the last year, in partnership with IESA, we have commenced tracking India's readiness as a location for manufacture of strategic electronics. We are happy to enclose the outcomes from first such assessment in the form of "Strategic Electronics Report 2019" for your reading pleasure.

We would also be delighted to be of any assistance to Indian and foreign enterprises as they make their journey in local manufacturing of strategic electronics in India. We remain available for any comments, clarification and support you may need in your journey on the same.
This document shall be treated as confidential. It has been compiled for the exclusive, internal use by our client and is not complete without the underlying detail analyses and the oral presentation. It may not be passed on and/or may not be made available to third parties without prior written consent from Roland Berger.

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Global Strategic electronics market is expected to grow at a CAGR of 4% over next 12-15 years driven by technology, integration & Industry 4.0

Executive Summary (1/2)

Global market for strategic electronics

> Strategic electronics is the primary capability driver in modern warfare systems with value contribution being more than 40% across leading platforms

> The global market for strategic electronics is expected to be USD 256 bn in 2018 and estimated to grow at a CAGR of ~4% to reach ~USD 422 bn by 2032 with US occupying the largest market share

> It is expected to be driven by a set of factors including technology, integration, industrial aggregation and Industry 4.0

Demand assessment for India SE¹ market

> Growth in demand for electronics in Indian A&D is driven by modernization of weapon platforms, introduction of state-of-art weapons by the three armed forces, impact of indigenization and Make in India initiative

> The demand pool is highly dispersed emanating from more than 45 individual entities operating through more than 100 institutions. It is primarily led by Ministry of Defence, Ministry of Home Affairs & Civil Avionics

> Strategic electronics market size in India is expected to be ~USD 6 bn in 2019 and based on already classified plans and orders across various programs, it is estimated to grow at a CAGR of ~7% to reach ~USD 15 bn by 2032

> Civil avionics which has traditionally been untouched by Indian players is expected to generate demand worth USD 10 bn over the next 12 years (cumulatively)

Key implications

> Global players in strategic electronics market are focusing on innovation and technology based solutions thus increasing the platform efficiency and design

> There is a huge opportunity for strategic electronics players in India to capitalize on the demand created by MoD & MHA over the next 10-12 years

> However the value realization depends upon successful implementation of the proposed programs

¹) Strategic Electronics

Source: Roland Berger analysis
Private sector players in India's SE market have ample opportunity to fill the gap at tier 1 / tier 2 / tier 3 spaces in value chain

Executive Summary (2/2)

Key implications

> In order to become part of global supply chain for A&D, Strategic Electronics players in India need to invest in development of capabilities as well as capacities across platforms

Demand assessment for India SE

> The total opportunity across electronics in programs via Ministry of Defence is estimated to be ~USD 68 bn with ~38% demand from naval electronics

> The total opportunity in programs via Ministry of Home Affairs is ~USD 58 bn with ~45% of the demand from Information, Surveillance, Networks & Forensics

> Detailed assessment of ~320 private sector key suppliers in A&D space and capabilities across DPSUs leads to the following observations:

– In case of electronics, India is nearly as competitive as other low cost countries

– India continues to be significantly more attractive in terms of final delivered cost vis-à-vis developed countries/regions

– Overall India's competitiveness on electronics is bettered only by competitive on engineering and development (services)

– Considering the entire value chain for SE manufacturing, public sector leads the private sector across segments; however in some segments private sector capability and capacity is catching up

> India's competitiveness is uneven across segments, and whilst there are clear areas where India is a natural sourcing destination, there are also segments where OEMs will have to do significant mining to grow local champions

Source: Roland Berger analysis
A. Strategic Electronics market outlook
A&D industry is seeing a major transformation vis-à-vis electronics: value contribution of electronics >40% across most leading platforms

Electronics and consequently delivered capability are real differentiators

<table>
<thead>
<tr>
<th></th>
<th>Armored personnel carrier</th>
<th>4+ Gen fighter aircraft</th>
<th>New-gen naval destroyer</th>
<th>AIP Submarine</th>
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<tbody>
<tr>
<td>Across mobility, mission systems, protection and munitions</td>
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<tr>
<td>Across avionics, Actuation, Structures, Munitions and Engines</td>
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<td>Across platform electronics, platform management, structures, munitions and protection</td>
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<tr>
<td>Source: Roland Berger analysis</td>
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</tbody>
</table>
Why is electronics worth focusing on in the A&D industry?

Electronics is also today the primary capability driver for the entire battle value chain from situational awareness to delivery.
Strategic Electronics industry is benefitting a lot from civil electronics businesses and vice versa

STRATEGIC ELECTRONICS MANUFACTURING

Percolation of Aerospace & Defence product testing standards into civil electronics manuf. requirements
A lot of specific technologies are originating in strategic electronics space and going into civil electronics

There exists significant synergies between the Civil electronics and Aerospace & Defence electronics space

CIVIL MANUFACTURING

Increased usage of COTS components to drive down costs
Increased percolation of civilian supply chain methodologies into A&D

Source: Roland Berger analysis
Defence electronics market is expected to grow at a CAGR of 4% to reach USD 422 bn by 2032 (annually)

Global defence electronics market - Overview

Global defence electronics market by value [2018 – 2032, USD bn]

<table>
<thead>
<tr>
<th>Year</th>
<th>Value (USD bn)</th>
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<tbody>
<tr>
<td>2018</td>
<td>256</td>
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<tr>
<td>2023</td>
<td>304</td>
</tr>
<tr>
<td>2032</td>
<td>422</td>
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</tbody>
</table>

> Global threats from terrorism, migration, resource protection and organized crime are expected to drive the demand
> Military segment is expected to dominate the market followed by growth in public services

Distribution by geography [2018]

- United States: 43%
- Asia-Pacific: 23%
- Europe: 24%
- Middle East: 4%
- India: 4%
- Rest of the world: 3-4%

> The US is currently the largest player in defence electronics market with major players being Northrop Grumman, Lockheed Martin, Raytheon, Harris, and BAE Systems
> Asia-Pacific is also expected to grow with China taking the lead

Source: Industry reports, Press articles, Roland Berger
Consolidation, supply chain integration and industry 4.0 led disruptions are key trends influencing strategic electronics

1. Growth in communication technology has resulted in demand for networked battlefield
2. The trend is to reduce size, weight, power consumption & cost increasing the flexibility of platform design and utilization
3. ~400 deals have been executed in this space in 2018 reinforcing key to building technology scale and scope
4. Strategic electronics primes are increasingly investing in vertical integration in order to control technology bricks

Key trends:

- Impact of Industry 4.0
- Artificial Intelligence & Machine Learning
- Interconnectivity & mobility
- Size, weight, Power & cost (SWaP-C)
- Supply chain integration
- Autonomous systems
- Augmented Reality/Virtual Reality

Source: Industry reports, Press articles, Roland Berger
Interconnected networks are driving design and revolutionizing platform electronics to serve as nodes in a larger operational cloud

Key trends in Strategic Electronics (1/8)

1. Inter-connectivity & mobility

Overview

> Development of communication technology has enabled networked battlefield
> Increasing demand of connectivity via electronic devices for remote control, monitoring, communication and operational management
> Centralized battlefield management with complete information transparency and sensor multiplication through seamless communication using cloud services

Benefits

> Secure and reliable connectivity
> Remote visual data usage will have wider applications in defence operations
> Strong enabler for autonomous systems
> Development and expansion of in-demand capabilities

Examples

1. Partnership between Thales and Microsoft for development of a common defence cloud solution for armed forces enabling them to keep sensitive data inside their own infrastructures

2. NanoPAK i7 Small Form Factor computer – It is used in operation of an unmanned aerial vehicle which provides networking capabilities on Army tactical vehicles and also hosts network services software used by other systems on the network

Source: Industry reports, Press articles, Roland Berger
There is a strong focus on smaller/lighter form factors with a view towards making more efficient platform electronics

Key trends in Strategic Electronics (2/8)

2 SWaP-C (Size, weight, power and cost)

Overview

> The demand for miniaturization of electronic components has grown multifold lately
> Advancement in nanotechnology and microelectromechanical systems (MEMS) have increased M&M\(^1\) applications in defence
> Several RF functions like radar, electronic warfare and datalink communications through shared active electronically scanned array (AESA) technology are emerging

Benefits

> Miniaturization helps in savings in terms of space, weight and power consumption allowing for expansion flexibility
> Multi function systems helping in weight reduction leading to higher payload capacity
> Reduced logistics and supply costs

Examples

1. The Institute for Soldier Nanotechnologies at MIT is dedicatedly developing nanotechnology to improve the survivability of soldiers. One of their accomplishments is development of a hydrogel-based wound dressing that could be equipped with a variety of sensors, lights and drug delivery tools

2. Products like micro mirrors are used in steering laser beams, micro sensors & satellite communications at speeds in excess of 100 GHz

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1) Miniaturization and multifunctionality

Source: Industry reports, Press articles, Roland Berger
Industrial consolidation is leading to creation of much larger A&D entities with wider array of services offered

Key trends in Strategic Electronics (3/8)

**Growing consolidation**

**Overview**
- There were ~400 deals announced in A&D sector in 2018 with electronics accounting for 41% of deal share followed by 18% contribution from software and security systems
- Financial sponsors are extremely active on account of attractive lending environment and well positioned assets

**Benefits**
- Expansion of product line
- Access to wide clientele
- Cost synergies via implementation of initiatives in supply chain and lean productivity
- Access to brand name and global recognition
- Development and expansion of in-demand capabilities

**Examples**

1. April 2019 - Acquisition of night vision business of Harris Corp. by Elbit Systems Ltd. for USD 350 m

2. June 2019 - Acquisition of Riptide autonomous solutions, provider of unmanned underwater vehicle technology (UUV) by BAE Systems

Source: Industry reports, Press articles, Roland Berger
Electronics primes are increasingly investing in vertical integration for ensuring control of technology bricks

Key trends in Strategic Electronics (4/8)

4 Supply chain integration

Overview

> Integrated supply chain is of high importance because defence is a sector where design know-how and product quality are of prime importance
> With an increase in customization demand of defence products, supply chain integration becomes imperative
> Tierised entities with specific technology bricks are being increasingly integrated by electronics primes to ensure greater control

Benefits

> Higher pricing power and flexibility
> Technology control/ buying patent rights
> Access to information at all stages from defining requirements, designing contracts to operation and performance management
> Useful in catering to customized product demand

Examples

1. Lockheed Martin has announced tie-ups with three Indian startups - Terero Mobility, Sastra Robotics, and NoPo Nano-technologies which will integrate into its global supply chain

2. Thales acquired Gemalto, a major player in cybersecurity products for more than USD 5 bn in Apr 2019 thus giving it access to critical decision chain in digital world from data generation to real-time decision support

Source: Industry reports, Press articles, Roland Berger
Industry 4.0 led methodologies are defining the future of aerospace manufacturing causing significant disruption to existing value chain.

Key trends in Strategic Electronics (5/8)

5 Impact of Industry 4.0

Overview

> Industry 4.0 has led to introduction of new technologies, new methods & materials, new business models & new profit pools
> New technologies/disruption and platform capabilities are needed in context of key platform attributes (Mobility, Firepower, Survivability and Battlefield Transparency/Networked platform)

Benefits

> Increase in efficiency, quality and flexibility across stages of value chain
> Improvement in production capabilities
> Rapid design and transition capabilities

Examples

1 Military Sealift Command Pilot Programme: US Navy has partnered with GE to improve two dry cargo T-AKE class ships' mission readiness. GE will develop a digital twin which will enable high speed data sampling for analyzing electrical signature of critical marine equipment & provide predictive analytics.

2 Lockheed Martin has deployed interactive 3D technology by NGRAIN in order to streamline its manufacturing process of F-35 jets. This has resulted in optimization of maintenance time, data accuracy and improved efficiency.
Unmanned systems are expected to lead the future warfare necessitating developments in autonomous systems and sensors

Key trends in Strategic Electronics (6/8)

6 Autonomous/ unmanned systems & platforms

Overview

> Autonomous and semi autonomous systems are being developed leading to substantial investments in sensor electronics
> Investments in commercial autonomous vehicle technology has hastened the development of sensors and electronics and narrowed the technology gap between commercial and strategic electronics
> Optronics, Lidar and Radar technology form the backbone of autonomous system design

Benefits

> Paradigm shift in military tactics necessitated by next gen warfare
> Safer military operations
> Greater flexibility
> Unlimited life
> Wider military application in reconnaissance, surveillance and sensing

Examples

1. Russia is planning to introduce a nuclear-powered autonomous air platform which can fly indefinitely with unlimited range by 2025

2. 'Project Overlord' by US Navy aims to deliver 10 large unmanned surface ships by 2020. China and Russia are also developing such systems

Source: Industry reports, Press articles, Roland Berger
AR & VR applications in defence are transforming traditional business ways, enabling real-time simulation of complex situations & eliminating errors

Key trends in Strategic Electronics (7/8)

### Augmented Reality / Virtual Reality

#### Overview
- AR/VR enable generation of computer-generated visuals within a simulated environment
- Growth in partnership amongst IT and defence industry has led to better situational awareness on the battlefield
- Concept modelling and design simulation are two key areas where AR is helping to 'de-complexify' sophisticated technologies and also to explore design flaws from 3D perspective

#### Benefits
- Enables understanding of complex system architectures thereby bridging the educational gap
- Decline in maintenance lead time with faster detection of anomalies & curation provision
- Facilitates remote servicing / on-the-move repairs and at the same time, helps in practicing repair of complex systems

#### Examples
1. Use of Upskill Skylight AR by Boeing: The firm uses AR glasses by Skylight to guide technicians in wiring applications. This has resulted in reduction of production time by 25% and eliminated errors

2. VR led military trainings: Virtual Reality is increasingly used to simulate a situation, surroundings and conditions for practical purposes

Source: Industry reports, Press articles, Roland Berger
Demand for firms adopting AI solutions in their value chain is expected to rise for its ability to learn statistically & adapt contextually

Key trends in Strategic Electronics (8/8)

8 Artificial Intelligence & Machine Learning

Overview

> Artificial intelligence application in defence is leading to intelligent automation
> It can facilitate strategic, operational and tactical level of planning across functions, be it entering hazardous zones or combat applications or para dropping
> It will help in developing safer systems, evolving from concept-proof to operation-proof
> AI solutions can also facilitate setting up of self-configuring networks which could detect bugs in software & perform corrective actions

Benefits

> Improvement in operations efficiency
> More can be achieved with lesser resources
> Human limitation can be improved with self creation of algorithms
> Force multiplier coupled with superior intelligence

Examples

1 The US military has partnered with Raytheon to develop AI based predictive maintenance tool which will tell if multi-mode radar needs repair and maintenance or needs replacement. This will not only lead to savings in time & money but also facilitate servicing requirements as and when needed

Raytheon

2 BAE Systems has developed adaptive radars and is working with US Defense Advanced Research Projects Agency (DARPA) to enable airborne electronics warfare systems to counter new, unknown and adaptive radars in real time

BAE SYSTEMS
Growth in the demand for electronics in Indian A&D sector is driven by three factors

Key factors influencing growth

- Impact of indigenization and Make in India initiative
- Modernization of weapon platforms
- Introduction of state-of-art weapons by the three armed forces

Source: Industry reports, Press articles, Roland Berger
## India demand pools for Strategic Electronics

The demand pool is highly dispersed emanating from > 45 individual entities operating through > 100 institutions

### Majority of the demand arise from the bodies under MoD and MHA

<table>
<thead>
<tr>
<th>Ministry of Defence [1.5 m active, 1.2 m retired personnel]</th>
<th>Ministry of Home Affairs [1.1 m active personnel]</th>
<th>Intelligence [Under Ministry of Home Affairs]</th>
<th>Civil aviation</th>
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<tbody>
<tr>
<td>&gt; Indian Army</td>
<td>&gt; Assam Rifles</td>
<td>&gt; Intelligence Bureau</td>
<td>&gt; Civil aviation aircrafts</td>
</tr>
<tr>
<td>&gt; Indian Navy</td>
<td>&gt; Special Frontier Force</td>
<td>&gt; Research &amp; Analysis Wing</td>
<td>– Narrow body</td>
</tr>
<tr>
<td>&gt; Indian Airforce</td>
<td>&gt; Border Security Force</td>
<td>&gt; National Technical Research Organization</td>
<td>– Wide body</td>
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<tr>
<td>&gt; Indian Coast Guard</td>
<td>&gt; Central Industrial Security Force</td>
<td>&gt; Aviation Research Centre</td>
<td>– Turboprops</td>
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<td>&gt; JSF</td>
<td>&gt; Central Reserve Police Force</td>
<td>&gt; National Disaster Management Authority</td>
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<td></td>
<td>&gt; Indo-Tibetan Border Police</td>
<td>&gt; Narcotics Control Bureau</td>
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<td>&gt; National Security Guard</td>
<td>&gt; Census Survey &amp; Statistics</td>
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<td>&gt; Sashastra Seema Bal</td>
<td>&gt; Defence Image Processing &amp; Analysis Centre</td>
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<td>&gt; National Disaster Response Force</td>
<td>&gt; Central Forensics Science Laboratory</td>
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<td>&gt; Civil Defense&lt;sup&gt;1)&lt;/sup&gt;</td>
<td>&gt; Modernization of Police Forces</td>
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<td></td>
<td>&gt; Home Guard&lt;sup&gt;2)&lt;/sup&gt;</td>
<td>&gt; National Investigation Agency</td>
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<td></td>
<td>&gt; Special Protection Group</td>
<td>&gt; Defense Intelligence Agency</td>
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> Demand arises from 49 DRDO Labs, 8 DPSUs, 6 PSUs, Space manufacturing ecosystem driven by ISRO and 39 Ordnance Factories

> 45 individual entities (Central forces, Paramilitaries and State police forces) operating through

> >100 institutions (ministries – Defence & Homeland Security, DRDO labs, PSUs, Defence PSUs)

> Demands are raised at a singular level, leading to no demand aggregation

> No coordination in planning of requirements from each of the agencies leading to similar products being bought from different manufacturers

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1) Civil Defense force is responsible for protecting the public and restore vital services in case of immediate emergency conditions like an attack from an outside enemy

2) The home guard is a voluntary paramilitary force that acts as an auxiliary to the Indian Police force

Source: Roland Berger
The total market opportunity for strategic electronics in India is expected to range from USD 135 to 137 bn till 2032 (cumulatively).

Strategic electronics market size in India (cumulative over next 12 years)

- **Ministry of Defence** [1.5 m active, 1.2 m retired personnel]
  - The total opportunity across electronics in programs via Ministry of Defence is ~USD 68 bn
  - Based on already classified plans and orders, demand for strategic electronics is distributed as under:
    - Land-systems: ~USD 18 bn
    - Naval electronics: ~USD 26 bn
    - Airborne electronics: ~USD 13 bn
    - Network electronics: ~USD 11 bn

- **Ministry of Home Affairs** [1.1 m active personnel]
  - The total opportunity in programs via Ministry of Home Affairs is ~USD 40 bn
  - The demand arising from Ministry of Home Affairs (except Intelligence Systems) is expected to decrease at ~CAGR 4% till 2025 and stabilize beyond that
  - Uri attacks has resulted in a reprioritization of critical infra protection (a large part of which is electronics based security)

- **Intelligence** [Under Ministry of Home Affairs]
  - The total opportunity in electronics for Intelligence sector is ~USD 18 bn
  - Information, Surveillance, Networks & Forensics constitute ~45% of the total demand from Ministry by Home Affairs
  - This is driven by implementation of tech-based solutions in security networks

- **Civil aviation**
  - The total opportunity in electronics for civil aviation programs is ~USD 10 bn
  - Assuming India needs to buy 700-800 aircrafts in the next 10-12 years, avionics market size is expected to be ~USD 10 bn
  - This demand is driven by domestic industrial growth, growth of LCCs (Low Cost Carriers), increase in customer segment of middle class flyers and increased policy support in the form of removal of FDI limits in key aviation sub-sectors

Source: Roland Berger Analysis
B. Strategic Electronics capability assessment
Strategic Electronics Readiness Index considers ~320 private sector key suppliers in A&D space and capabilities across DPSUs

Consideration set – Nature of companies

~320 Companies under consideration

~270 Standalone companies

~20 Large Group Enterprises

~25 Govt. owned Enterprises / DPSUs

1) Defence Public Sector Undertakings

Source: Roland Berger
The identified ~320 key suppliers were then categorized basis the product segments that they addressed

No. of companies in various segments

- **Surveillance**: 28
- **Electronic Warfare**: 25
- **COMS**: 18
- **Optics & Optronics**: 18
- **Fuzes & related devices**: 5
- **Platforms**: 4
- **Power supplies**: 12
- **Design services**: 7
- **Test chambers**: 10
- **Shelters**: 6
- **Mechanical hardware**: 38
- **Software**: 16
- **Materials (Alloys & composites)**: 33
- **Control & command**: 15
- **Fabric**: 8
- **Electro-mechanical**: 8
- **Display systems**: 7
- **Safety & related equip.**: 7
- **Cables, harness & connectors**: 7
- **Non-metallic material**: 16
- **Missiles**: 2
- **Other**: 32

Source: DRDO, BEL, HAL, Roland Berger
India's competitiveness as a destination for sourcing vis-à-vis other low cost countries and developed markets is strong in electronics.

India Competitiveness vs. low cost countries and developed markets (like Europe)

<table>
<thead>
<tr>
<th>Category</th>
<th>Assessment</th>
<th>Comments</th>
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<tr>
<td>Composites</td>
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<td>&gt; In case of electronics, India is nearly as competitive as other low cost countries</td>
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<td>Electronics</td>
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<td>&gt; India continues to be significantly more attractive in terms of final delivered cost vis-à-vis developed countries/regions</td>
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<td>Electricals</td>
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<td>&gt; Overall India's competitiveness on electronics is bettered only by being competitive on engineering and development (services)</td>
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<td>Metallics</td>
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<td>Engineering &amp; services</td>
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Source: Primary interviews, Roland Berger

Competitiveness vs Low cost countries
Competitiveness vs Europe
Strategic electronics space across platforms is dominated by the government owned entities; ample opportunity for private players

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<thead>
<tr>
<th></th>
<th>Pub. Sector</th>
<th>Pvt. Sector</th>
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<tbody>
<tr>
<td>Design, engineering &amp; IT incl. Training</td>
<td>Capability</td>
<td>Capacity</td>
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<td>Tier 3 components</td>
<td>Capability</td>
<td>Capacity</td>
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<td>Tier 2 components</td>
<td>Capability</td>
<td>Capacity</td>
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<tr>
<td>Tier 1 sub-systems</td>
<td>Capability</td>
<td>Capacity</td>
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<td>Final assembly and System Integration</td>
<td>Capability</td>
<td>Capacity</td>
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<tr>
<td>Post sale – lifecycle support</td>
<td>Capability</td>
<td>Capacity</td>
</tr>
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Land systems – platform electronics

Land systems – Communication networks

Airborne avionics

Marine platform electronics

Munitions electronics

Low | High

Source: Company websites, industry reports, Press articles, Roland Berger
The private sector has some areas of competence gap – this reflects in the ability to address sourcing needs of OEMs

Sourcing from India – Relevant sub-segment competence

<table>
<thead>
<tr>
<th>Electronic/Electrical</th>
<th>Assessment</th>
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<tr>
<td>Data Links</td>
<td>Low</td>
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<td>GIUs</td>
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<td>Test Beds/ATE</td>
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<td>Electro-optic Assemblies</td>
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<td>Detailed Design</td>
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<td>Certificate and support document</td>
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<td>Configuration &amp; change mgmt.</td>
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<td>Software &amp; hardware design</td>
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Source: Expert interviews, Roland Berger Research
To conclude, we observe that the evolving industry structure has led to avenues for private sector to start emerging as meaningful Tier 1/Tier 2 players.

Indian A&D electronics manufacturing: Evolving industry dynamics

- Historical presence of Defence Public Sector Undertakings (DPSUs) across the value chain
- DPSUs created capacity through the value chain, sometimes even until the component manufacturing level
- Exit of DPSUs from Tier 1/Tier 2 and Congregation of DPSUs at OEM levels
- Opening up of Tier 1/Tier 2/Tier 3 spaces for homegrown Indian mfg. groups to step in and fill the gap

Source: Roland Berger analysis
C. Our recommendations
Devising a strategic roadmap, a consortium led approach and introducing standardization are some of our key recommendations

1. **Consortium led approach**
   - It is imperative to note that representation of industry stakeholders in defence value chain is limited.
   - This presents a need to look at an industry body led consortium approach to handle large indigenization opportunity.

2. **Leverage holistic opportunity**
   - The solutions and processes designed must look at the holistic opportunity from chips to systems to solutions to achieve truly secured, IP controlled solutions for India leveraging the large system and chip design capabilities.

3. **Standardization**
   - Manufacturers cannot develop global standard products because of absence of institutional compliance standards within MeitY for electronic products.
   - Standardization will support indigenized design and avoid vulnerability.

Source: Roland Berger analysis

**Our recommendations**

4. **Strategic roadmap**
   - Absence of a National Security Doctrine and absence of long term defence planning make it difficult for private players to participate in defence value chain.

5. **Testing infrastructure**
   - Establishment of Electropreneur park and various testing facilities in Defence production clusters are extremely welcoming initiatives by the government.

6. **Developing local talent pool**
   - MeitY is providing grant-in-aids to institutes like IITs, IISc, central universities and various R&D organizations to conduct research in thrust areas.
   - However, a closer relationship between academia and industry is needed to improve domestic capabilities.
D. About Roland Berger
Roland Berger is one of the top 5 global strategy consultancy firms & the only one of European origin; working with the best of the A&D industry globally

Roland Berger Strategy Consultants – Key facts

Founded in **1967** in Germany by Roland Berger

- 51 offices in 35 countries, with around 2,400 employees
- Nearly 220 Partners currently serving over 1,000 international clients

Broad spectrum of services based on **3 solid pillars:** Knowledge | Technology | Capital

The only strategy consultancy of European origin playing in the top league of international consulting companies

1) This includes indicative list of clients where disclosure is possible

Source: Roland Berger
E. About IESA
IESA is the premier industry body working towards development of Indian Electronics System Design & Manufacturing ecosystem

India Electronics & Semiconductor Association (IESA) – Key facts

About IESA

India Electronics and Semiconductor Association (IESA) is committed to the development of the Indian Electronics System Design and Manufacturing (ESDM) ecosystem by bringing all stakeholders on a common platform.

Vision

The IESA’s vision is to bring stakeholders from the Indian industry, government and academia on a common platform to work towards making the Indian ESDM sector globally competent.

Members

The member base of IESA represent a spectrum of Large Global Corporations to Large, SME and Start-ups from Domestic Technology companies in Intelligent Electronics space, including Academic Institutions and Venture Capital firms.

Objectives of IESA

The primary objective of IESA is to act as a catalyst for the growth of the ESDM industry in India.

- Create global awareness for the Indian semiconductor and electronic systems industry outside of the generic ‘IT’ umbrella.
- Create a win-win interaction among semiconductor and electronics product and services companies, government, academia, venture capitalists and industry bodies.
- Create an enabling ecosystem that catalyzes industry growth and leadership.
- Enhance operational efficiency.
- Foster active collaboration between industry and universities to further expand the available world-class semiconductor talent pool.
- Identify investment opportunities.
- Drive technology vision for the semiconductor and electronic systems industry.
- Promote trade and industry.

Source: IESA
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