

Industry Perspective: An ESDM Report

2010 - 2011

Table of contents

- Aerospace & Defense Segment	05
- Automotive Segment	09
- Education Segment	13
- Industrial Segment	17
- Medical Electronics Segment	21
- Solar Segment	27
- Telecom Segment	31

FOREWORD

Semiconductor is at the heart of electronics. Semiconductor design, test, EDA, embedded systems - working with Electronic Systems Design companies - can play a vital role in impacting the performance, power, cost, reliability etc. of the electronic products. Over the years, ISA has built a strong semiconductor foundation which gives us the confidence to not only strengthen it further, but also leverage it as 'The Engine' that will propel the growth of electronics.

Electronic Systems Design and Manufacturing (ESDM) is a great opportunity ahead of us. This opportunity has led ISA to identify it as its core agenda.

Electronic Systems Design can become the strength of India. There are well over a thousand companies (local and multinational) across multiple cities and towns of India who excel in Electronic Systems Design innovation. Electronic product manufacturing is also a critical area for our growth ahead. ISA is committed to driving this agenda across multiple segments.

This book showcases the objectives and roadmap that each of these Segments have implemented or are in the process of doing so in the past few months. On behalf of ISA, we thank each of the Segment Conveners and their members for their high calibre participation and their contribution to our ESDM initiatives and to the various events.

Poornima Shenoy
President, ISA

Dr. Pradip K Dutta
Chairman, ISA

Defense

Defense

Convener



D A Mohan
CEO
DAC Int'l

Members

Mohan Ram A Executive Director-Naval Systems, BEL

Brig (Retd) P Ganesham Director (Retd.),
Bharat Dynamics Ltd.

U K Kalyana Ramudu Joint General Manager - Defense
Electronics, HED, Larsen & Toubro Limited

Randeep Sethi Vice President, Tripoint Global Asia Pvt. Ltd.
General Dynamics SATCOM Technologies Inc.

S Gyana Sundar General Manager, Tata PowerSED

Defense

Defense procurement is a high stakes game in any large economy. Most of the advanced nations of the world have a well developed military industrial base or have close military alliances (like the case of Japan and Korea with the United States). These nations spend huge amounts of money to keep their military industrial complex buzzing. The military industrial behemoths of advanced countries are always looking for opportunities to sell their wares to other parts of the world. Their Governments fully back them to the hilt to ensure that they win large lucrative contracts.

India and China have been economies struggling to grow their military capabilities. Both are large countries with huge populations. The last decade has seen dramatic shifts in the economic power towards India and China. While the advanced economies went into recession, India and China have continued to grow providing market opportunities for western economies. It is a natural corollary that large economic strength requires matching military capability for protection of economic interests and sustenance for economic growth. It follows that such strength should flow from internal capabilities in design and manufacturing of military systems.

Both India and China started out with somewhat similar capabilities in military technologies. However China has made great strides in developing its indigenous capabilities. While India is still dependent on foreign sources for about 70% of its defense requirements, China meets almost 85% of its requirements through internally developed capabilities.

Till around the year 2001, India reserved all indigenous development and manufacturing activity for defense products to the Government sector. Private sector could participate only as vendors to Government entities. The DRDO labs had primary responsibility for R&D and the DPSUs and Ordnance factories for manufacturing, delivery and maintenance support. Items that could not be supplied by these agencies were imported from foreign manufacturers. With the requirements of the defense sector rapidly growing, it was imperative that the country used all possible internal sources for meeting the requirements.

The DPP of 2006 was a major step towards bringing in transparency in defense procurement. This has undergone further amendments in subsequent years with the latest one issued in January 2011.

Defense procurement has been categorized as “Buy Global”, “Buy and Make” and “Make” with a subsequent introduction of “Buy and Make Indian” with offset clause (Minimum 30%) applicable for “Buy Global” category.

Introduction of above amendments have raised a lot of hope in the Indian private sector of substantial business accruing to them. Many firms have worked to tie up with foreign firms to get a share of the offset pie. Foreign firms have also shown keenness in tying up with Indian firms, both public and private, either as offset partners or as Joint ventures for development and manufacture.

The DPP brought in transparency but failed to accelerate the pace of procurement. Limiting the scope of this discussion to procurement of Defense Electronics items, the Ministry of Defense has announced major plans in the area of Electronic Systems - Tactical Communication Systems, Network for Spectrum, Army Strategic Communication Network (ASCON Phase IV), Battlefield Management system, Futuristic Infantry Soldier as a System (FINSAS), Army Wide Area Network (AWAN), Battlefield Surveillance System (BSS), Artillery Command and Control System (ACCCS), Combat Information and Decision support Systems (CIDSS), Air Defense Command and Control System (ADCNR), Electronic Warfare and Countermeasure systems, Tank communication (CNR) and Fire protection systems, Communication and Information Security, etc. Many of these networks will have SATCOM providing the required redundancy. These would be both static and mobile varieties. “SATCOM on the Move” systems would find wide application.

Actions on many of these projects are already in progress through the tender route. Some of them in the C4I and Electronic Warfare category have been allocated to Defense PSUs (DPSUs) on a single tender basis.

The total value of procurements excluding the single tender cases is expected to be in the range of ₹ 200,000 Crores (USD 40 Billion) spread over a 15 year time frame. The good news for Indian companies is that all of the above are in the “MAKE” category. Foreign firms are expected to be the technology providers to the Indian System Integrators.

The systems sighted above will use a number of communication devices and sensors. The dominant communication device of the

future is expected to be the “Software Defined Radio”. IP based Networking devices like Core and edge Routers, Switches etc are expected to play a major role. Opto electronic devices for day and night vision, different types of radars for surveillance, tracking, fire control etc will be required and would be procured through separate tendering. Radar is one area of primary importance where the country still relies on imports to considerable extent. DRDO has made important contributions but the requirements are too many for one agency to fulfill. Expertise in advanced phased array antenna systems, light weight Radars for use in inaccessible mountainous terrain, very long range surveillance Radars, Mobile Radars that can track on the move (for use on tracked wheel vehicles) are but a few examples where the country still depends on foreign technology.

Systems for Naval Network centric warfare are planned. Coastal surveillance systems based on Radars and Opto electronic sensors, to monitor the long coastline of the country, are being procured.

Missile systems are another area receiving a lot of attention from defense planners. Short Range Surface to Air Missiles (SRSAM), Medium Range Surface to Air Missiles (MRSAM), Anti Tank Missiles, Ship to Ship, Air to Air, Air to Ground are other missiles in various stages of procurement. AKASH and NAG are two missile systems for Surface to Air and anti Tank variety respectively, for which procurement orders have been placed on DPSUs. These are DRDO developed systems. AKASH has considerable private sector participation in production as well. Missile systems have considerable electronics for flight control, guidance and targeting. Seekers (both IR & RF) are an area where the country needs to develop sufficient indigenous capability.

UAVs of different types and sizes are being considered for induction in large numbers for surveillance and monitoring purposes. These carry payloads for day and night photography, and two way communication systems. Ground systems for UAVs form an important element. India has decided to go in for Aerostats for border surveillance and global RFI has been issued recently seeking information.

The above gives a glimpse of the defense scenario to provide a flavor of the business and is not exhaustive. Overall, it provides an excellent business opportunity for the companies who are willing to take the risky plunge. Private players are unfamiliar with the style of defense business where one has to invest and wait for long periods of time for business to result delays in decision making lead to technology and cost changes resulting in complexity in budgetary planning, cost over runs, etc. The Indian

defense players who anticipated large offset orders are a worried lot because of recent dilution of offset provisions to include non defense areas also. Foreign players are heavily lobbying for increasing the FDI limit to over 51%. The Indian players are wary and would like to limit the FDI to a maximum of 49%. The policy makers seem to be caught between these conflicting demands.

The Ministry of Defense could do the following:

- Have a funding mechanism for pure Indian entities both in the Public and Private sectors for development of defense technologies, products and systems. Proper provisions for accountability would have to be built in.
- Enhance the FDI limit in defense manufacturing to 49% in general and to 51% in exceptional cases of strategic importance.
- Introduce a system of valuing offsets where a direct offset has the maximum weightage followed by indirect and civilian offsets.
- Liberalize defense exports and create a mechanism of government support (Non financial) for companies bidding for foreign contracts similar to what is extended by foreign governments to their companies when they bid in India. Leverage the growing economic power to open foreign markets.
- Develop hubs of military industrial complexes where large number of companies can operate synergistically. Preferred locations are Bangalore and Hyderabad for defense electronics and aerospace systems, Pune and Chennai for Vehicular systems, Ports in Kerala, Karnataka, Maharashtra and Andhra Pradesh for Naval systems, and North and East Indian locations for all types of ordnance.
- Reduce cycle time of supply by changing the role of “Inspection” agencies like the DGQA to an advisory one and empower the companies to be their own inspectors. Impose heavy penalties for non compliance to specifications.
- Reduce cycle time of procurement by reducing the stages of decision making and empowering the MoD for an increased financial limit.

The armed forces need to be modernized quickly in view of the dangerous geo political situation due to regional instabilities, the rapidly growing might of our potential adversaries and India's ambitions to play a greater role in the world. Policies play a very important role in making these decisions.

Automotive

Automotive

Convener



Ganesh Guruswamy
Vice President & Country Manager
Freescale Semiconductor (I) Pvt. Ltd

Members

Aravind S Bharadwaj CEO, Automotive Infotonics

Late **Tarak Balaji** Director, Delphi

Vivek Tyagi Country Sales Manager,
Freescale Semiconductor

Sandip Sarkar EGM - Electrical Controls & Software,
General Motors

Anup Sable Senior VP - Automotive & Engineering,
KPIT Cummins Infosystems

Nischal Muchakani Senior Business
Development Manager, NXP Semiconductors

M Ganesh General Manager, Pricol

Raghav Gulur Renault

C S Venkatraman General Manager -
Electrical & Electronics, Tata Motors

Dr. Jabez Dinager VP - Advanced Engineering, TVS Motors

Dinesh Shyamsundar Head - R&D, Varroc Engineering

Safe, green & connected - Future of the automobile

In the recent years, India has become a major auto hub. More and more auto giants are seeing the potential of the Indian auto industry. India's rising status in the global auto market can also be gauged by the fact that the country now accounts for 5% of the global auto production, much higher than 1.4% at the beginning of the last decade, as per a report released by SIAM. Also, the country is now amongst the top 10 highest auto producing nations, standing at the seventh position in 2010. In 2009, India emerged as the fourth largest exporter of automobiles. As the auto sector continues to evolve with increased electronic content, a lot of stress is being made to make the vehicles much Safer, Greener and Connected. This led to ever increasing automotive electronics content. For example, 80 MCUs or more in a High-end car to about 25- 35 MCUs of which about half are 8-bit units in an average car. A lot of research is being done in this domain and it has opened up the doors for the embedded design companies as they emerge as reliable partners to the automakers. As per the latest ISA F&S report the Total Market (TM) for Indian Semiconductor Automotive Electronics Market is expected to be USD 300.9 million and Total Available Market (TAM) is expected to be USD 159.3 million by 2012.

Not so long ago consumers chose their vehicle based on its looks, speed, mileage and so on but safety which is an important factor was often neglected. This perhaps has to do with lack of stringent laws in our country where, as per International Road Foundation (IRF), over a lakh people get killed each year in highway accidents. The US government for example does crash tests on all cars and posts the results and ratings to help consumers make a wise decision on the safety features. However, thanks to the availability of information, the consumer attitude is fast changing, and Safety along with other features is becoming a priority. However, a lot is still desired.

Today vehicle manufactures can enhance safety features that were impossible perhaps a decade ago because of advancement in embedded design technologies. Many of these advanced technologies can detect and compensate for driving errors such as distraction and drowsiness. The changing mindset has opened up a lot of brand new possibilities in a relatively new field in automotive domain which is called Advanced Driver Assistance

Systems or ADAS. This domain along with the traditional safety and chassis are together creating new markets for semiconductor organizations.

ADAS encapsulate several technologies like lane departure warning, adaptive cruise control, blind spot detection, airbags, electronic power steering, active braking systems, night vision, adaptive cruise control and collision warning systems based on camera and radar, active front lighting and driver alertness. Some of these technologies have been there for quite some time. However, technologies based on various camera and radar systems are still evolving rapidly and deployment for these systems in next generation cars is rapidly increasing. Such safe and intelligent vehicle will soon become part of our lives.

The other element that will be most critical in the coming years is the focus on cleaner and greener technologies which is fuelled by the rising energy cost and stringent environmental regulation around the world. In vehicular segment, electrification of the Powertrain is creating new demand for high voltage power semiconductor. All marketing studies foresee steady growth for Hybrid vehicles, with Japan leading and followed by North America and Europe.

The car manufacturers are devising methodologies for electrification of the car that reduces weight by replacing hydraulics, mechanics, new in-vehicle networking techniques that means fewer wires, lighter wiring harness and greater integration of features. Further, efforts are being made to move towards more efficient engine control technology such as hybrid engines and optimizing conditions by alerting the driver of potential problems.

In India turning green will benefit our future generation since vehicle emission is responsible for 70% of India's air pollution.

Another trend that will capture the imagination is Connectivity/ Infotainment. With increasing demand of consumer electronics, the need to stay connected on the drive is the next big thing. The trend is catching up in West and may soon pickup in other regions.

Even the two wheeler segment is not left behind. The Indian

two-wheeler industry has matured over the last two decades and India has emerged as the second largest producer of two-wheelers in the world. As per the latest report released by ISA, the production volume of two-wheeler in 2010 has grown to 11.5 million units from 9.6 million units in 2009. The segment is generating lot of competition and subsequently lot of money is being spent on R&D. Today, the consumers have an option for motorcycles, motor scooters, all-terrain vehicles (ATVs), electric bicycles and e-scooters and other two-or multi-wheel vehicles. The rising demand for going green has made electric models

the top most choice for consumers as well as many major two-wheeler manufacturers. The concept of airbag jackets are sure to become reality since safety needs to be paramount in two-wheeler segment as the risk of being killed in an accident is 20 times higher than when traveling in a passenger car,

The automotive industry is ever evolving and today it is developing new and exciting technology at an ever-increasing pace. In the near future, we will see a lot of advance applications which will be driven by a new generation of consumers.

Education

Education

Convener



Dr. Praveen Vishakantaiah
President
Intel India Technology (I) Pvt. Ltd.

Members

Dr. Ishwardutt Parulkar Chief Architect & Director,
Cisco Systems Inc.

Srikanth Iyer Director & COO, Edurite Technologies

Anup Dutta Senior VP - ERS, HCL Technologies

Valmeeka Nathan Global Head &
VP - Product lifecycles & Engineering Solutions,
Infosys Technologies

Vijay Talwar Head - Strategy &
Business Development, Macmillan

Amy Purushotham VP & Head -
Corporate Strategy, Samsung

C D Anant Chief Technologist - Technology,
Telecom & PE Services, Wipro Technologies

Indian education industry

Education has always played a crucial role in enabling innovation and bringing about economic development in all the developed economies. The Organization for Economic Co-operation and Development (OECD) economies of the USA, Europe and Japan has fine educational institutions which have significantly contributed to the advancement of these economies. India is on the cusp of rapid growth resulting from liberalization of the Indian economy and its linkup with the global markets. The main concerns now are of maintaining the momentum, promoting inclusive growth, and improving the human development index. In this context, investing in education would be essential for the development of human capital, which is critical to sustain growth in a disruption-driven economy. To respond to unforeseen changes in such an economy, its workforce has to be more agile and adaptive, and substantial investment in education can achieve this.

India is one of the largest education markets having more than 26,000 colleges attached to about 500 universities and university-level institutions, comprised of:

- 243 State public universities
- 53 State private universities
- 40 Central universities
- 130 Deemed universities
- 33 Institutes of national importance

The total number of students enrolled in the formal system (universities and colleges) is estimated at 136.42 lakhs.

The institutions of higher education are regulated by two statutory bodies – the University Grants Commission (UGC) and the All India Council of Technical Education (AICTE). These bodies set up norms for facilities and infrastructure, grant permissions to establish educational institutes, provide accreditations, monitor their quality through periodic inspections and decide on the curriculum and syllabi of various degree programs.

As per the 2007- 2008 statistics, there were 7,85,950 primary schools, 3,20,354 middle schools, 1,71,862 high schools (including pre-university) and 19,000 degree colleges. About 10

million students were enrolled in higher education, and about half-a-million teachers were employed in this sector. The current numbers would certainly be much higher because this sector has been experiencing rapid growth.

Technical and management education plays a vital role in creating skill sets needed in the knowledge economy. This sector covers courses in engineering, technology, management, architecture, town planning, pharmacy, applied arts & crafts, hotel management and catering technology. There are 65 centrally funded institutions imparting excellent education in technology professions and management. The distribution of these institutions is as follows:

- Indian Institute of Technology (IITs): 15
- Indian Institute of Management (IIMs): 7
- Indian Institute of Science (IISc): 1
- Indian Institute of Science Education and Research (IISER): 5
- National Institute of Technology (NITs): 20
- Indian Institute of Information Technology (IIITs): 4

While this level of investment appears large, it is not considered adequate to cope with the growth challenges facing the Indian economy.

According to the World Bank, some of the key challenges faced by the education sector in India include **universalization of good quality basic education, reaching out to some eight million children not yet enrolled, and ensuring retention of all the students till they complete their elementary education. Some other related issues include expansion of secondary education, upgrading curriculum and teaching practices, and reforming vocational education and training. These issues can be addressed by introducing reforms in the governance structure of higher education, decentralization and major investments in faculty development.**¹

One persistent issue that is reported by the local media is that of gradual degradation in the quality of educational content and its delivery. From a regulatory requirement, formal education has been considered a “not-for-profit” sector; therefore it has

not attracted the large-scale private investment that is needed to build the capacity that the growth momentum demands. This sector will need major investments (public or private) to increase its existing college seats and faculty members to cater for the newer disciplines that are getting introduced owing to the advancements in technology. In this context, the ability of the traditional brick and mortar model of education to scale and meet these challenges is doubtful. This poses an opportunity for technology-enabled learning and teaching to play a key role in overcoming the problems of access, scale and quality of education. The incorporation of ICT solutions in education would lead to improvements in teaching effectiveness and provision of cost-effective education solutions to the masses to help mitigate the risk of India's "demographic dividend" from becoming a "demographic nightmare".

Considering the rapid growth in the education sector and the potential business opportunities for technology solutions, the ISA Education task force has identified three areas of focus for the year 2011:

- a) **ESDM ecosystem development for education:** This would include exploring opportunities to develop technology solutions which will create opportunities for design houses, OEMs and ODMs to develop products for the education market, facilitating creation of education parks, and to increase industry focus on solutions for the vocational training segment.
- b) **Education policy influence:** Identifying policies relevant to the education sector and the Electronics System Design & Manufacturing industry in India and providing recommendations on policies such as Digital Rights management and

content protection. The team intends to work on recommending incentives for educational institutions that make purchases of electronic tools and systems and solutions and also formulate an ISA recommended framework for digital learning.

- c) **Business models for digital education:** Foster ecosystem for enabling multiple players to participate and monetize from the business opportunity offered by the education sector in India.

The ISA education segments assessed needs in the higher education market through engagements with academia and education service providers. A preliminary market scan has also been completed to understand gaps and challenges in solutions currently on offer in the market. The ISA education segment member companies have also explored and put forth solutions from within their companies which are relevant to the proposed reference framework, and are in the process of putting together a beta implementation of the solution based on a reference framework. The team is also actively involved in understanding policies relevant to the education and ESDM industry and plans on making recommendations at the appropriate forums.

References:

www.education.nic.in/

<http://www.worldbank.org.in/WBSITE/EXTERNAL/COUNTRIES/SOUTHASIAEXT/INDIAEXTN>

¹ (<http://www.worldbank.org.in/WBSITE/EXTERNAL/COUNTRIES/SOUTHASIAEXT/INDIAEXTN>)

Industrial

Industrial

Convener



Arun Jain
Director - Sales and Marketing
Texas Instruments India

Members

- Leader: **Bhupendra Bhate** Head Industrial Products, L&T
Switchgear, Metering, Relays :
Includes all type of metering - Energy Meters, Gas and
Water meters, Smart Grids etc.
- Leader: **Satyan Vijayvergiya** Senior VP,
Genus Power Infrastructure
Members: **Venkat Rajaraman** CEO, Solarsis;
Ramsamy Director, Lineage Power
Inverter / UPS / Power Supplies:
Industrial Automation: includes Control Panels, PLC, Drive,
Alarms, Security and Surveillance etc.
- Leader: **Dr. M V Ramana Rao** MD & CEO, MIC Electronics
Member: **A V Ravi** General Manager, Nichia
Lighting
- Leader: **Ardhendu Pathak** Director, GE India Center
Pumps, Fans and Motors
- Leader: **C M Menon** Country Sales Manager, ADI
Eco-system development

Industrial Segment

Indian semiconductor industry is on an unprecedented high today. According to industry reports, domestic consumption of electronics reached \$45 billion in 2009 and is expected to reach \$125 billion in 2014 and \$400 billion in 2020. Domestic production of electronics has grown at 16% annually over 2004–2009 to reach revenues of \$20 billion. A significant portion of domestic production is consumed in the Indian market and only a small part of it is exported. Export of electronics stood at \$4.4 billion for 2009, representing 21% of domestic production. Exports have grown at 19.5% annually for the 2004–2009 period.

The demand for industrial electronics in the Indian market is on a steady high and we see a corresponding increase in investments in this market. Needless to say, the electronics content in industrial applications is also growing. The demand for energy efficiency, productivity gains through electronic enabled systems and “quality and reliability” are emerging as the key drivers in this market.

The industrial market in India is widespread in terms of end equipments. Some of the key segments are:

Lighting - We have more than 400 million Incandescent light points in India which are highly energy inefficient. Nearly 20% of energy consumption is in lighting segment. Hence, it is a key area to focus for energy savings. The lighting market is, however, moving fast towards light emitting diodes (LEDs) technology. According to Frost & Sullivan’s Indian LED Lighting Market study, LED is displacing many conventional technologies such as incandescent, high intensity discharge (HID), and fluorescent lighting. Lower energy consumption, less maintenance cost and ‘green’ features contribute to its high acceptance.

The Indian government is encouraging more and more usage of LED lighting solutions especially for rural markets. There is, however, a need for regulatory framework in terms of references and benchmarks before laying down any targets on energy efficiency. There is an urgent need for component level certification in lighting products.

The government should also spend resources on consumer awareness in addition to rebates or concessions to make new technology more affordable among masses. Benefits accruing to

solar programs should also be extended to LED lighting industry. To propagate energy efficiency, companies going through energy efficiency audits successfully (through a star rating system) should be extended tax benefits.

Inverter, UPS and Power Supplies - The uncertainty over uninterrupted and clean power supply has fueled the demand for power back-up devices. While commercial establishments opt for industrial power back-up systems, it is the residential and SOHO segments that have been driving the demand for inverters. The inverters market has a manufacturing index of almost 89 percent, indicating the high level of indigenous manufacturing activity. This, in turn, presents a great opportunity for semiconductor players to offer solutions to OEMs.

Inverter market in India has multiple opportunities particularly on high frequency inverters. The companies are focusing on off grid systems development, grid connect and India specific roof top systems. Indian authorities are working towards regulatory framework for efficient Inverters through star rating systems. A significant amount of time and effort is being also spent on tax reforms and uniformity across all the states. Currently sales tax varies from 4% to 12% across different states.

Industrial Automation - With India’s industrial production continuing to expand at a dynamic rate, the challenge of meeting quality standards has become a priority. Because of its fragmentation, low volumes and conservative customer base, industrial automation is relatively slow to change. In the broad automation markets, there are pockets of technology and market growth that deserve special review. Many manufacturing sectors in India are registering double digit growth rates. As the economy becomes more accessible to global market players, Indian manufacturers are realizing they must modernize their production plants and processes in order to stay competitive. This applies to every facet of industrial automation. As a result there has been a dramatic increase in the demand for modern production technology and high-performance systems.

Metering, Switchgear and Relays - Every house, small factory, business establishment, shops, offices etc. needs at least one energy meter to register power consumption. This

results in a huge business opportunity for both OEMs and semiconductor players. The protection relay business in India is worth ₹ 2000 crores which can create a global opportunity for Indian manufacturers. Electronic ELCB and Arc Protection product market is a large opportunity and much remains to be accomplished here.

Metering plays a big role in energy efficiency and hence we need policies that can be directed to have metering systems fit into smart grid, larger public infrastructure, etc. We also need to integrate multiple utilities (electricity, gas and water) to ensure interoperable systems are developed and deployed in the country.

Motors & Compressors - This is another area where there is a huge opportunity for electronic control to help improve efficiency and save energy. Motor control is at the core of many industrial automation and motion/servo drive control applications. The growing use of electric motors and automation has resulted in the greater demand for energy efficient electric motors. The more energy consuming large sized industrial motors and increasing usage of small motors in portable devices has given a renewed push to the demand for the energy-efficient motors. Ever rising energy prices and demand for innovative energy products will push the demand for energy efficient motors. The Indian government is supporting energy saving products through favorable policies and incentives.

Way forward

There are a few challenges that stand in the way in the Industrial market as a whole. Lack of Regulation, across all the above segments, is leading to spurious imports. Another challenge is the affordability factor. The end equipments incur a significant initial cost which impacts the end consumer. While growing

‘green’ consciousness are making consumers today sensitive about energy saving products, there is also a need to make them more affordable. This is where initiatives such as ESDM (Electronic Systems Design and Manufacturing) driven by ISA becomes very important.

There is an immediate attention needed towards efforts to increase manufacturing efficiency across all the above segments. Engineering focused on innovation and thrust on energy efficiency is key. Standardization is another immediate need where we have to introduce the highest level of quality in Indian products. We also need to focus on identifying platforms that encourage electronics for inclusive growth.

The steadily increasing pace of technology evolution has offered India an opportunity to be globally competitive. Much stress needs to go to the small and medium enterprises (SME) that drive the growth in this industry

It will be imperative to identify unique Indian needs. Both the manufacturing and design industry have to create a ‘designed for India, manufactured in India’ product strategy which can also open doors for export to large markets in developing economies with needs and demographics akin to India.

Both the industry and government need to look at this opportunity with a sense of urgency as it can transform the face of the nation and propel the industry players to another high growth trajectory, generate employment and augment India’s branding as a technology powerhouse.

Just like any other industry, it is essential to have the right policies and regulatory environment to drive sustainable growth across the segment and create full-fledged electronic systems and a design and manufacturing ecosystem in India.

Medical Electronics

Medical Electronics

Convener



Vivek Sharma
Regional Vice President GC &SA-India Operations
Director, India Design Centers
STMicroelectronics

Members

Dr. Anand Anandkumar MD, Cellworks

Poornima Mohanachandran Executive VP,
i2i Telesolutions

Bhanuprakash Cherukuri Senior VP -
Strategy & Head, Infotech Enterprises

Mahesh Sanzgiri Head EmSyS (Operations), L&T

Sridhar Perepa GM & Head - Multi Market Industry,
MindTree Ltd.

K Krishnamoorthy MD India, Natsem (I) Designs

P Jayalakshmi Director, NXP Semiconductors

Vivek G Pawar CEO, Sankalp Semiconductors

Deepak Bhardwaj Director- Corporate Relations,
Texas Instruments

C G Sriram General Manager- Engg., Trivitron

Manimaran Rajakannu GM - Medical Devices Practice,
Wipro Technologies

Advisors

Dr. Devi Shetty Cardiac Surgeon & Founder, Narayana Hrudayalaya

Dr. V Raja Managing Director, G E Healthcare India

Dr. GSK Velu Managing Director, Trivitron

Current status and potential for medical electronics in India

Objectives

- Outlook of healthcare delivery in India
 - To assess the market, the challenges & opportunity in healthcare delivery in India
- Understanding the overall dynamics of the medical electronics industry in India
 - Current status and future prospects
- Regulatory issues facing the medical electronics industry
 - Policy initiatives and incentives
- Relevant drivers for the medical electronics industry in India
- To assess opportunity in the semiconductor space, with the growth of the medical electronics industry

Scope

Indian healthcare delivery

- Overview of the Indian healthcare delivery
- Healthcare indices - Comparison of Indian health indices with global indices
- Investments in healthcare delivery
- Challenges & opportunities in healthcare delivery
- Role and influence of insurance companies in the medical equipment industry
- Growth of healthcare system in India

Medical equipment industry

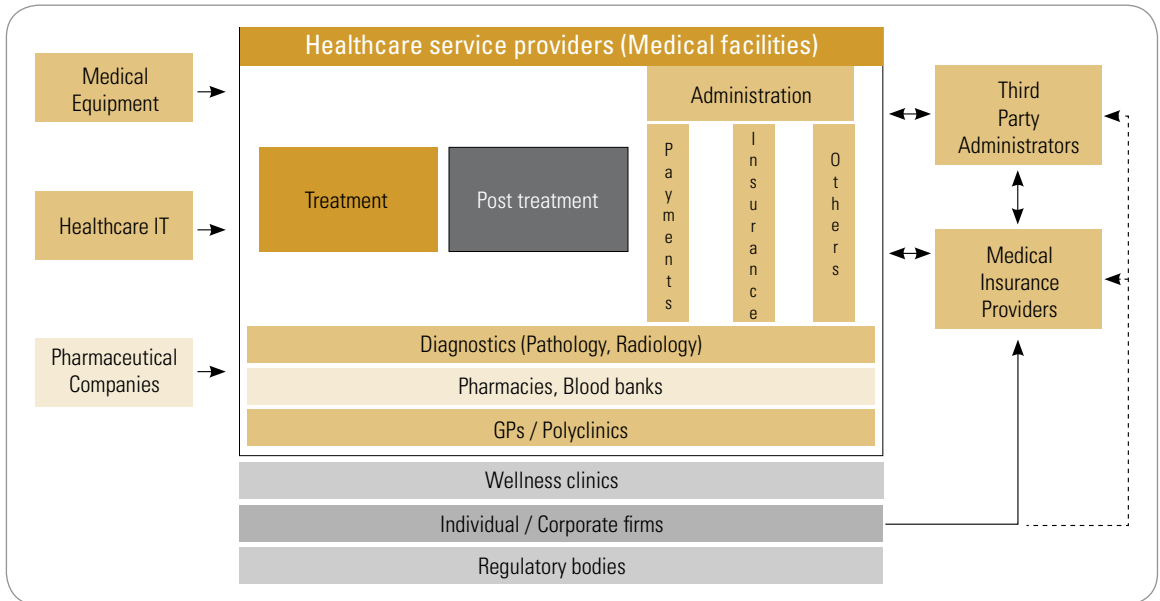
- Overview of the medical equipment industry
- Trends in medical equipment manufacturing
- Regulations & policies governing the medical equipment industry
- Future outlook of the medical equipment industry
 - Innovations and low cost product development

Medical electronics industry

- Estimated size of the medical electronics industry
- Sourcing & usage of semiconductors
 - Reasons for a specific type of sourcing
- Trends in semiconductor sourcing that could impact the industry

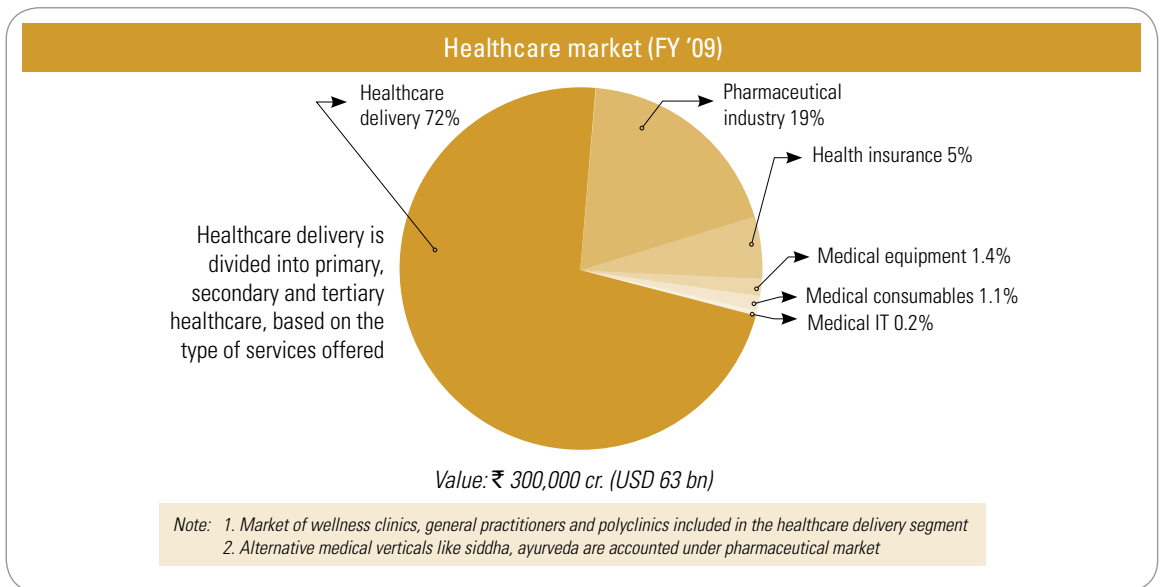
Overall dynamics of medical equipment industry and the opportunities it holds for semiconductor manufacturers

Structure of the Indian healthcare delivery system



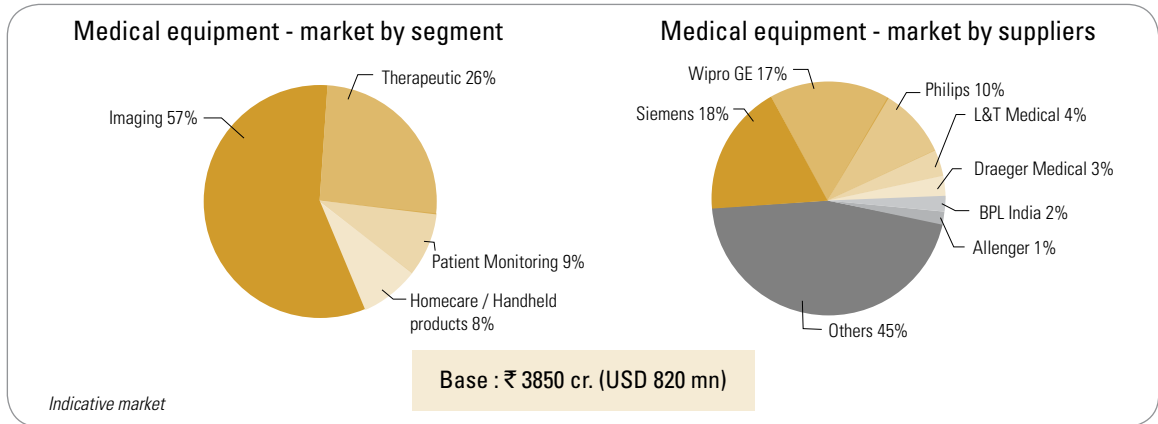
Source: ISA-Feedback 2010

Healthcare delivery (hospitals) accounts for close to 70% of the healthcare market



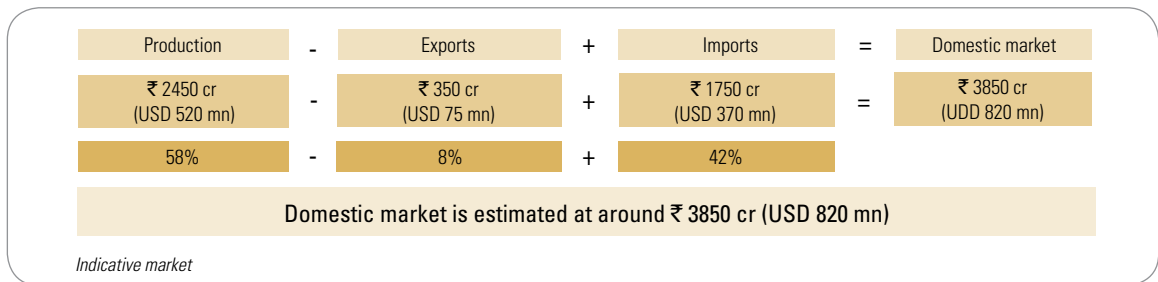
Source: ISA-Feedback 2010

Medical equipment market (FY'09)



Source: ISA-Feedback 2010

Medical equipment: Estimation of total market



Source: ISA-Feedback 2010

Semiconductor usage

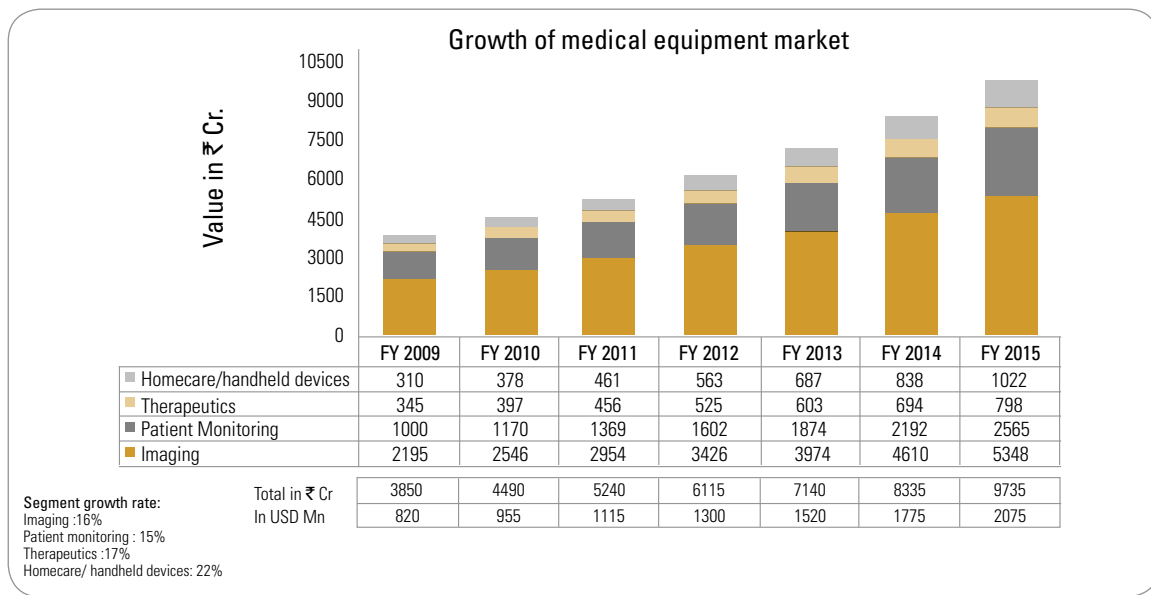
Usage of semiconductor is critical from power supply to the display in medical equipment

- Semiconductors are an integral part of most medical equipment, starting from high end imaging to small handheld devices
- The role of a semiconductor supplier becomes more critical as the medical equipment devices move towards portable and smaller medical devices

Product / segment	Widely used semiconductor components
Medical imaging	Microcontroller, microprocessor, amplifiers, data converters, Digital Signal Processors (DSP), Application Specific Standard Products (ASSP) and Application Specific Integrated Circuits (ASIC)
Patient monitoring systems	Microcontroller, sensors, zigbee modules, ASIC, rectifiers, amplifiers, controllers, EEPROM
Digital hearing aids	Microcontroller, EEPROM, linear accelerometers, comparators, amplifiers, audio processor ICs and other ASIC
Infusion pumps	Microcontroller, regulators, transistors, rectifiers, comparators, amplifiers, sensors

Source: ISA-Feedback 2010

Medical equipment market is estimated to grow at a CAGR of 17% over the next five years



Source: ISA-Feedback 2010

Steps to be taken by ISA

- Promote policies and initiatives to encourage domestic manufacture of medical equipment
- Promote export based medical equipment market
- Support and influence government to discourage import of medical equipment
- Support and sponsor research and development of medical equipment which will suit the Indian healthcare environment, in terms of accessibility, affordability and ease of usage
- Work towards a holistic approach to promote domestic sourcing of electronic components across various industrial segments

Source: ISA-Feedback 2010

Solar

Solar

Convener



Dr. Madhusudan V Atre
President & Managing Director
Applied Material (I) Pvt. Ltd.

Members

Prof. J Vasi Deputy Director & Professor of
Electrical Engineering, IIT-B

Rajiv Jain Associate Director - Government Affairs, ISA

Dr. Gangadhar Rao COO, Lanco Solar

Dr. Sudheer Kumar General Manager Solar, Moser Baer

Venkat Rajaraman CEO, Solarsis

K Subramanya CEO, Tata BP Solar

Solar Energy

Charter

Renewable Energy is a growing sector in India, driven by energy deficit, security, outreach, as well as by need for less dependency on conventional (fossil) fuel. Clean energy is also a factor of importance.

Solar energy, in particular, has attracted a lot of interest recently, especially driven by the Jawaharlal Nehru National Solar Mission (JNNSM). This covers the full chain – polysilicon, wafers, cells, modules, thin-film panels, Balance-of-Systems (BoS), utilities, grid connectivity, etc.

Much of the solar sector is intimately tied to the electronics and semiconductor industry:

- manufacture of polysilicon and the associated wafering deals with capital intensive technology;
- cell manufacturing user process-steps/chemicals/equipments/etc which are very similar to semiconductor chip manufacturing;
- modules manufacturing and BoS deals with a lot of sophisticated electronics, power management, monitoring and tracking;
- utilities for power generation/transmission deal with a lot of hardware and software for grid connectivity, minimization of energy losses, smart grids; etc.

Technology plays a very critical role in the solar industry, and covers many aspects:

- Silicon wafer based vis-à-vis Thin Films (TF);
- TF have many variants like amorphous-Silicon (a-Si), Cadmium Telluride (CdTe), Copper Indium Gallium diSelenide (CIGS), or-organic solar films, flexible solar films, etc.

The ISA's Solar Energy Segment has been constituted to address many of the important aspects of the solar industry:

- The Vision is to "Help growth of solar industry in India to attain the JNNSM goals".

- The Mission is to "Focus on the Ecosystem, Market, Technology and R&D, Standards, Finance, and Government-Interface aspects of the solar industry – to identify the key challenges, solutions, and recommendations".

Four focus areas:

1. **Government:** Primary Owners - Rajiv Jain and Dr. Madhu Atre
2. **Ecosystem & market:** Primary Owners - Venkat Rajaraman and K Subrahmanya
3. **Technology/Standards:** Primary Owners – Prof. J. Vasi and Dr. Madhu Atre
4. **Finance:** Primary Owners – Dr. Gangadhar Rao and Dr. Sudheer Kumar

The segment will aim to bring out white papers in relevant areas of technology, conduct workshops, explore and recommend various financing models, drive for standards, interface closely with government ministries and agencies, etc.

Members

The segment is a body constituted of industry experts in various aspects of the solar industry:

1. Venkat Rajaraman – CEO, Solarsis
2. Dr. Sudheer Kumar – General Manager, Solar, Moser Baer
3. Rajiv Jain – Government Affairs Head, ISA
4. Prof. J Vasi – Professor, IIT-B
5. K. Subrahmanya – CEO, Tata BP Solar
6. Dr. Gangadhar Rao – COO, Lanco Solar
7. Dr. Madhu Atre (Convener), President & Managing Director, Applied Materials India

Achievements so far

A. Recommendations to MNRE

Submitted various recommendations to the Ministry of New & Renewable Energy (MNRE) to promote and strengthen the domestic solar PV manufacturing industry and ecosystem:

1. Manufacturing clusters
2. Semiconductor Policy – ISA has recommended extending, revamping and enhancing the scope of SIPS program to focus on:
3. Financial incentives to promote domestic manufacturing in terms of taxes for SEZs

B. White Paper on “India’s JNNSM: Status on PV Inverters and Recommendations for Encouraging Domestic Industry” by Venkatesh Rajaraman and Rajiv Jain

Executive Summary: In the world of photovoltaics, inverters are the gateway through which the energy of the sun is delivered into a usable format. Solar Inverter market is estimated to grow to more than \$5 billion in 2013 and to about \$8 billion in 2014, according to IMS Research.

If the entire PV inverter demands for JNNSM requirement of 20,000MW through 2022 for grid-connected systems were to be met through imports, then this will have a huge impact on the foreign exchange. On a conservative estimate, an estimated foreign exchange of ₹ 15,000 crores (about US \$ 3 billion) can be saved if the PV inverters can be manufactured in India.

Having a local manufacturing and support for service/maintenance will help in realization of the objectives and the targets for capacity addition under the Mission immensely. The strong domestic manufacturing base can also help in the exports of the PV inverters, especially, to African markets and other countries with similar characteristics of power shortages, akin to Indian scenario.

The detailed white paper can be downloaded by ISA website for further reading.

C. White Paper on “PV Monitoring Systems for On-Grid PV Applications” by Venkat Rajaraman

Executive Summary: One major issue in the Solar PV System is unaccounted power losses in a typical PV installation. These losses can range anywhere from 15% to 50%. Reduction in these losses would be a key enabler in achieving the grid parity faster. Variability in the outputs for different installations is also an issue. Same capacity plants in similar geographical locations have shown up to 20% variation in the power outputs.

The keys issues here are lack of diagnostics and monitoring infrastructure and total dependency on the quality and knowledge of technicians who install the system. With large number of PV manufacturers entering this market, the biggest challenge faced by the industry is to standardize the communication protocol so that all the different components from different manufacturers can talk in the same language. There is a clear need to standardize the data communication systems that are used by solar components. This is required to drive down the cost for over all integration and to make installations more robust and monitor friendly.

Recommendations include the need to review the existing standards and come up with specific standards for PV monitoring systems for all the grid-connected SPV projects in India, include PV monitoring system standards in the PV system specifications and make it mandatory for develop to adhere to the standards for all the grid-connected SPV projects in FY2011 and beyond, etc .

The detailed whitepaper can be downloaded from the ISA website.

D. “Achieving India’s Solar Mission Goals” Global Solar Technology (South East Asia) Volume 12, Oct 2010, page 22, http://www.globalsolartechnology.com/documents/gst_sea_1.3.pdf, by Dr. Gangadhar Rao and Dr. Madhu Atre

Executive Summary: This report studies what is needed for the JNNSM goals to be met. Highlights are the a) present scenario in India, b) salient features of the JNNSM and its implications, c) manufacturing ecosystem requirements, d) applications/product requirements, e) conclusions and recommendations.

Telecom

Telecom

Convener



Sanjay Nayak
Chief Executive Officer & Managing Director
Tejas Networks Ltd.

Co-convener

Anirudh Mathuria Director - Device R & D
Nokia India

Members

Rajiv Kapur Managing Director, Broadcom

Vipin Tyagi Director, C-DOT

Sudhakar Paliseti Senior Director of Engg.,
Cortina Systems

Ruchir Godura CEO & Founder, Maverick Wireless

Samartha Raghava Nagabhushanam President & CEO,
MindTree Ltd.

Sanjeev Keskar MD Sales India, PMC-Sierra

A Gururaj Senior VP, Reliance Communications

Sujai Karampuri CEO & Founder, Sloka Telecom

Praveen Prathivadi Director, Business Service,
Texas Instruments

Neeraj Varma Country Manager - Sales (India, Australia &
New Zealand), Xilinx Inc.

Advisor

Hemant Kanakia President, Kanakia Ventures

Indian telecom sector

Telecommunication is about connecting people. In a vast and diverse country like India, telecom plays a vital role in helping government and businesses to reach out to masses residing in faraway places, effectively implementing their policies and providing inclusive growth. Telecom is not just a technology but it is an enabler, a multiplier of opportunities and a platform over which many important initiatives can be built in a growing country like India. According to The Telecom Regulatory Authority of India (TRAI) an effective National Broadband network would greatly facilitate inclusive growth of the country by including the large rural population in governance and in the decision making process, thus extending to the rural areas better education, health and banking facilities. Telecom services are a significant contributor to India's GDP. As per the study, there is a 1.2% increase in GDP for every 10% rise in teledensity.

Current scenario

Indian telecom industry has been growing at a stupendous rate of 44.66% over the last 5 years connecting close to 846 Million people by Mar'11. We expect this growth to continue as we have reached the tele-density of only 70%. Number of connection are planned to cross 1 billion by 2014.

While our perception of impact of growth of telecom on a country's economy may vary, one cannot deny the fact that telecom is a critical infrastructure sector having significant impact on other sectors like education, healthcare and manufacturing. For example it is estimated that 36% of Semiconductor TAM will be the telecom sector. Last year alone Indian service providers imported telecom equipment worth ₹ 461 billion. Given the future growth of this sector, this number will continue to grow. In fact, telecom import may be the second largest in value term after after the Oil & Gas sector. While telecom growth is very important to the overall growth of India, it is also important that we develop the capability to produce India designed and manufactured telecom equipments, eventually those that are also built using Indian components. To achieve this we need to create a vibrant ecosystem and build product companies across the telecom value chain from ICs, Components, and Devices to Infrastructure.

Opportunities

The growth potential of the Indian telecommunications market is well recognized. Massive growth in the number of subscribers- projected to grow from 742 million to about 1 billion in next 3 years- would require networks to be upgraded, new technologies to be inducted and new services to be offered. This would create huge demand for switching, transmission and subscriber equipment. It is estimated that for 3G alone the investment would be of the order of US\$ 15 billion. Demand for the network elements would translate into requirement for components, test and auxiliary equipment. The overall requirement is expected to be of the order of US \$100 billion.

Technology trends

Telecom sector has seen several innovations in last few years which have helped better connectivity at lower cost. Emerging countries like India have greatly benefitted by leapfrogging to the new technology. Following are some of such trends which have the potential to bring disruptive changes in this sector:-

1. Data explosion post 3G: Intense traffic pressure

The average bandwidth consumed by a mobile broadband device (e.g., USB dongle, smart-phone) is expected to grow by 10-15 times in the next few years. For example Cisco in their report feels that 1/3rd of mobile traffic would be from video.

With the majority of Indian telecom networks built for a predominant voice component of traffic, operators will continue to adopt innovative solutions that extend the life of their existing network assets such as microwave radios, optical transmission equipments and reuse of fiber on the ground to support data, VAS and content services.

2. Active infrastructure sharing among operators

The cost of rolling out a ground based tower is \$60,000 and it takes 45 days per Ovum estimates. Next-generation network deployments are extremely demanding for operators in terms of capex and opex. We will see active sharing between the operators of such infrastructures. Novel business models are catching on where some telecom operators are building networks exclusively

for wholesale purposes. Sophisticated capabilities like service virtualization, hierarchical QoS, connection-oriented Ethernet and self-provisioning customer portals are enabling this trend.

3. Dynamic pricing models and intelligent traffic management

Challenge for operators is how to reach profitability and yet continue to address pricing needs of bottom of the social pyramid. With the introduction of 3G, value based pricing may be applied at the affluent segment while dynamic pricing will be employed at the price sensitive class.

4. Innovative Value-Added Services (mobile commerce, mobile ads, social media)

The VAS market is driven by services like caller ring back tones, SMS, GPRS, applications and games. With mobile phones becoming a gateway to internet access, mobile social media applications for facebook, linkedin and twitter will continue to proliferate amongst the urban mid to high end segment.

Mobile marketing in the form of ads will continue to grow. In May 2010, AdMob reported that it had served over 2 billion mobile ads in India, 2nd only to the United States, which had 8 billion served.

Mobile commerce penetration will be slow overall but faster than the past in 2011.

5. Converged telecom networks (one network for mobile, enterprise and residential applications)

Traditionally, telecom networks were built and operated in silos with separate overlays created for transporting mobile services, fixed-line voice and leased line traffic. The growth in packet traffic on 3G networks is however straining this deployment model and operators are looking at opportunities to synergistically combine these disparate networks to maximize network utilization. Large integrated operators and telecom incumbents are building unified aggregation networks based on Carrier Ethernet to support all forms of telecom services. In a few cases, Carriers are planning to offload mobile broadband traffic to their fixed-line networks at enterprise locations and in central business districts by using femtocells and Wi-Fi hot spots. Similarly, evolving FTTx (Fiber-to-Home/Curb/Basement) architectures will reuse fiber infrastructure being laid for high-bandwidth residential access to also backhaul mobile broadband traffic.

6. Advanced business ethernet services (multipoint, multicast, operator ethernet exchanges)

Enterprises are enthusiastically embracing resilient Ethernet services to manage their connectivity costs and realize flexible bandwidth scalability from 10 Mbps to up to 10Gbps in suitable increments. The Indian market estimated to be around \$140 million in 2011, and is set to grow by a CAGR of 40% with Ethernet Private Lines and multipoint Ethernet LAN services seeing similar growth patterns. India's demand will be fuelled by global corporations setting up base, with a requirement for telecom connectivity within India and overseas. For instance, in the IT sector, during FY10, over 40 MNCs had set up/expanded centers in India per a NASSCOM report. This trend is poised to continue.

7. Telecom-media alliances

With the rapid decline in voice revenues, due to hyper-competition and an explosion of over-the-top (OTT) data services, telecom operators seek to diversify their service portfolio and offer high-margin services. With 3G services being rolled out, the end user pull for rich media content such as online games, video on demand, TV channels (live broadcasts), e-learning and the supply-side push for content such as mobile advertising will increase rapidly. There is a fundamental change in the telecom operator paradigm with the network as an "intelligent" revenue enabler and not just a "transport" infrastructure.

8. Focus on rural telecom markets

Investment in ubiquitous, high-capacity and affordable telecom infrastructure is of strategic importance to India. India continues to lag behind on several broadband indicators due to deficiencies in network connectivity at the district, tehsil and rural levels. Multiple Government initiatives such as Rural Broadband, National Knowledge Network and Universal Service Obligation (USO) are expected to close this gap by building high-capacity information highways with nationwide coverage. The network will be future-proofed to support a full basket of applications such as telemedicine, e-education and e-governance especially relevant to bridging the urban-rural divide.

It is worthwhile to note that growth rate of wireless subscriber in rural areas is higher than the urban areas. Urban subscribers grew at the rate of 2.45% on monthly basis where as rural subscribers grew at 2.75% during the same period.

9. Optical fiber usage

Optical fiber will play a prominent role in all high-speed telecom networks and is being extended closer to the customer premises. Fiber is the preferred access medium for data traffic as it can carry terabits of bandwidth per fiber strand, with low ongoing costs and a long asset life. Also, with the increase in commercial deployment by operators, the cost of fiber rollout is fast approaching the cost of other wired technologies. Though evolving mobile technologies such as HSPA, LTE and Mobile WiMAX are capable of delivering high-speed broadband access on a wireless medium, the “backhaul” from the cell towers to the switching centers continues to be a bottleneck. Optical fiber is fast replacing microwave as the physical medium of choice in this part of the mobile operator’s network.

10. Green telecom

The global telecom industry generates up to 183 million tonnes of CO2 per annum, roughly 1% of global emissions as per a Deloitte report. Ovum estimates that roughly 2-3% of operator opex goes to electricity costs, which would be around \$6 billion annually in APAC. While growth in data traffic is expected to continue at 40% per annum, improvements in router energy efficiencies are not keeping pace. In the wire-line networks especially, routers represent the biggest challenge. Japan Advanced Industrial and Science Institute forecasts, that by 2015, routers will consume 9% of Japan’s electricity and by 2020, 50%. Operators are

deploying multi-functional equipments called Packet Optical Transport Platforms (POTP) that integrate traditional stand-alone network elements into a single device to realize significant power savings. Advanced features such as optical bypass of transit IP traffic, video multicasting, sub-wavelength grooming and lambda switching are incorporated to realize energy efficient networks.

Summary

ISA have made specific recommendation to increase the participation of Indian companies in Telecom sector. We see government playing a key role in providing the market access, creating a market pull and investing in education sector. It is very important that we in India not only use innovations in telecom segment to fuel our economy and provide inclusive growth but also encourage innovation, convert our ‘intellect’ into actual ‘property’ by providing incentives to retain intellectual rights and finally designing & building Indian products. It is worth to note that IP creation gives revenues that are at the least 10 times more than the ‘creation costs’.

India Semiconductor Association

Head office:

UNI Building, Millers Tank Bund Road, Bangalore - 560 052 India
Phone: +91 80 4147 3250 Facsimile: +91 80 4122 1866

New Delhi office:

DBS Business Centre, First Floor World Trade Tower
Barakhamba Lane, Connaught Place, New Delhi - 110 001 India

Email: research@isaonline.org

www.isaonline.org