



# Challenges and Solutions in bridging the gap of Skilled Human Resource (HR) in Electronics System Design and Manufacturing (ESDM) sector



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## Workshop Report

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*Follow up  
action*

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## 1. Background

The demand for electronics hardware in the country is projected to increase from USD 45 billion in 2009 to USD 400 billion by 2020. Most of this demand is presently being met through imports. This has serious economic and strategic implications for the country. The Government has identified growth of electronics hardware manufacturing sector as a thrust area and has drafted a national policy on Electronics to create a globally competitive ESDM industry to meet the country's need and serve the international market.

As per the draft National Policy on Electronics – 2011, one of the key strategies to boost the electronics manufacturing industry is to work closely with the private sector, universities and other institutions of learning so as to design programs to ensure that adequate trained and skilled manpower is available to the industry.

The industry-led Task Force has estimated that the Electronics Systems Design and Manufacturing (ESDM) industry can potentially employ close to 27.8 million by 2020 as compared to the current 4.4 million. The MAIT report(2008) and the NSDC study on HR requirement and Skills-Gap in Electronics Hardware sector dealt with competency mapping and skills-gap analysis for some verticals of the industry from a broader perspective. These reports have set up a framework and need for a thorough and more granular assessment of demand-supply gap for skilled human resource in ESDM sector.

Therefore, a one-day workshop was organized by Department of Information Technology (DIT) and National Institute of Electronics & Information Technology (NIELIT) on 2<sup>nd</sup> March 2012 in New Delhi. The workshop was attended by large number of experts and delegates comprising of Senior Govt. Functionaries, Industry leaders from Electronics and Hardware Manufacturing, Industry Associations, Training Providers and Academia. The objective of the workshop was to work out a mechanism to establish a forum for collectively providing need

assessment of Human Resource Development in ESDM Sector. Understanding the need of the industry is needed to provide a foundation for developing government schemes and interventions that would facilitate capacity-building in colleges/ITIs, Polytechnics and other government and private vocational training institutions so as to enhance the availability of skilled manpower.

## 2. Agenda of the Workshop

The workshop was organised in panel-discussion mode. The workshop was inaugurated by Sh. N. Ravi Shanker, Addl. Secretary, Govt. of India & Executive Director, NIELIT. There were four panels consisting of distinguished individuals from the ESDM industry, academia, and public & private sector training providers. Each panellist was given 7-8 minutes for presentation on the topic. There was a question & answer session at the end of each of the sessions.

### **Session 1: Projections of Skill sets and manpower requirement**

Panelists:

- Dr. J. V. Ramamurthy, HCL Infosystems Ltd.
- Mr. Basab Banerjee, NSDC
- Mr. Rajiv Mahajan, Tejas Networks
- Mr. Amrit Manwani, CMD, Sahasra Electronics Pvt. Ltd.
- Dr. C. P. Ravikumar, Texas Instruments
- Dr. S. Ahmad, Ex-Director, CEERI, Pilani

### **Session 2: Training requirements and development modules**

Panelists:

- Prof. N. J. Rao, IIT Bangalore
- Dr. B. K. Murthy, Senior Director, DEITY

- Mr. Sabyasachi Patra., ED, MAIT
- Mr. R. L. Singh, Director, DGE&T
- Prof. Prabhat Ranjan, DAIT, Gandhinagar
- Dr. Ankush Mittal, Director, Graphic Era University
- Mr. Rajesh Lalwani, Wind River

**Session 3 : Financial aspects including post training employment/entrepreneurial empowerment, tax and other incentives to encourage PPP mode investments**

Panelists:

- Prof. Sudhir Jain, HOD, Department of Business Studies, IIT Delhi
- Mr. J. Sreekanth, CEO, SEER Akadami
- Mr. Ravinder Goyal, Chairman, IACM
- Dr. Debashish Dutta, Senior Director, DEITY
- Mr. Rajeev Jain, ISA
- Mr. M. D. Agrawal, President CSI
- Mr. Sanjay Shivnani, President & CEO, Career Launcher

**Session 4 : Industry – Institute Interaction models for training, apprenticeship, placement (for e. g. Taiwan, Germany, UK, Belgium models)**

Panelists:

- Prof. S. K. Sinha, IISC Bangalore
- Mr. Ashwini Aggarwal, Applied Materials

- Mr. J. Sreekanth, CEO, SEER Akadami
- Mr. Avinash Bharwani, Vice president, JetKing
- Dr. B. Chandrasekhar, IL&FS

### 3. Key Discussion Points

Each of the session witnessed informative presentations and insightful discussions among panellists and the audience. Following are the key points which emerged out during deliberations. Many of these points were reiterated by various speakers and thus created an atmosphere of consensus among the participants.

#### 3.1 Inaugural Session

- Dr. Ajay Kumar, Joint Secretary, DEITY the importance of self-reliance in electronics Hardware manufacturing and informed about the initiatives taken by Govt. of India. He also highlighted the skilled manpower requirement of 28 million by 2020 to achieve the size of 400 Bn by the ESDM industry. He stressed that this cannot be done by the government alone and therefore participation of all the stakeholders like NIELIT, CDAC, DGET and private players is significant. He also emphasized the problem of unavailability of manpower for upcoming technological areas like solar photovoltaic, LCD and LED technology, fab etc. The academic/ training sector should know the exact industry requirement and expressed that the deliberations of the workshop will make road map for planning HR development in ESDM Sector.
- Shri J.V. Ramamurthy, President and Chief Operating Officer, HCL Infosystems Ltd. hailed the policy initiatives taken by the government for the ESDM sector in last four to five years. He highlighted the growing purchasing power as the greatest enabler for the growth of electronics market in India. Shri Ramamurthy pointed out the trend of requisite skills moving towards

higher end - semiskilled to skilled and skilled to high end. He told the gathering that only 31 % of the engineering graduates produced in the country are employable and along with the other stakeholders, Industry also has the responsibility of making engineers employable. Citing various international examples, he proposed Research & Development to happen in PPP mode in the country so as to achieve sustainable growth in the sector. He stressed upon the need of close interaction between Industry, Academia and Training Providers.

- Dr. Debashish Dutta, Senior Director, DEITY reiterated the need for involving private and semi government partners for designing and implementing skill development programmes for the ESDM industry. He highlighted the significance of a robust mechanism to make people employable at a large scale.
- Shri N Ravi Shanker, AS, Govt. of India and ED, NIELIT, brought the attention of the forum towards the pervasiveness of electronics in daily lives of common Indians. He told the group that ESDM is bound to increase and India will achieve quantum leaps in emerging areas like nanotechnology. He mentioned the National Skill Development initiative under which 500 million people are to be trained and highlighted the significant role of NIELIT in skills development domain for the electronics Industry. He urged the participants to make full use of established infrastructure like National Knowledge Network to develop collaborative research programmes. He proposed that units like IIIT and ITIR can focus on one of the ESDM verticals and attain more depth in that domain.

### 3.2 Session 1 - Projections of Skill sets and manpower requirement

- Manufacturing based strength is essential for a sustainable economy.
- Industry must play a proactive role in projection of skills sets required and in devising mechanisms to develop competent human resource for the industry.

- The focus should be on fulfilling skill need all across the spectrum - ITIs, diploma holders, B Tech. etc.
- Collaboration among all stakeholders is essential to create quality human resource with required skill sets.
- NSDC and MAIT study have set up a good framework to build upon and understand the skill need of the industry. Joint effort from the Government, Industry and Academia is needed to supplement the skills gap projected by these reports.
- DGET is in the process of setting up a Labour Market Information System (LMIS) in partnership with NSDC which will supposedly act as a centralised database for accessing skills set requirement by the industry.
- Quality assurance and standards for assessment of knowledge parameters must be created.
- Domain specific skill development council is going to be created.
- Employers of each Industry Sector with Government & Academia should form a Sector Skill Council (SSC)
- Occupational Standards for each job role and Labour Market Information (LMI) must be laid down.
- Education and Training Providers align curriculum, pedagogy to Occupation Standards, and industry requirement as per LMI
- Accrediting curriculum, industry internship, assessment and certification may be facilitated.
- The training infrastructure is fairly good in formal sector but quality curriculum and training infrastructure need to be created in non-formal sector. Virtualization and innovation may be one solution.
- Curriculum development should not be a one-time effort but a continuous interaction between industry and trainers is needed.
- Training the Trainer programmes are required to have quality Trainers.
- It has been observed that there is a dearth of manpower in one area and abundance in other. Therefore, a proper skills gap assessment is needed to correct this imbalance.



- SME sector is the biggest recruiter of manpower in electronics and thus must be involved in skills demand projections and competency mapping.
- There has to be a special skills development focus in areas like Electronic Packaging, Embedded systems and Quality Testing.
- There should be independent certification agency, which work exclusively in skill testing and certification.
- Look at Indian needs like Telemedicine, Security, Education, LED lighting, Solar cooking, Transportation etc. and make special efforts for building manpower in these areas.
- Industry training and apprenticeship is to be encouraged and Manufacturers associations should take lead to provide such a link.

### 3.3 Session 2 – Training requirements and development modules

- Qualitative utilization of the current capacity must be done before creating more infrastructures.
- Undergraduate programmes in Electronics Systems Engineering should be introduced and encouraged
- DEITY should create a separate group for Electronics Packaging to promote human resource development and research in this area.
- Introduce Courses on Design & Fabrication, Integration & System Engineering, Quality Assurance/Control, Industrial Design etc. Get courses developed in Electromagnetic Compatibility, Design for Reliability, Electronic Packaging, Industrial Design of Electronic Equipment, Design for Manufacturability, Electronics Systems Engineering etc.
- It is the assessment drives learning and the quality of assessment should be improved to address higher cognitive levels.
- All engineering programs should be designed and conducted to meet, in letter and spirit, the Program Outcomes as defined by National Board of Accreditation or preferably those of Washington Accord.

- National agencies that conduct competitive examination like GATE and UPSC, should be requested to reconsider the subjects in electronics in view of the major technology changes that have taken place in this area
- Texas Instruments, Wind River, Intel and HCL have good training models to follow and devise more such training programs for the ESDM industry.
- Majority of the present work force in manufacturing sector is workers category and less educated.
- More women are employed in manufacturing as they are fine in finger work and having grater patience.
- Bridge the gap between Academic institutions and Industry finishing schools.
- Encourage and embed entrepreneurial skills.
- High employability turnover is a big concern for the industry and this issue is needed to be tackled along with the skill development for sustainable results.
- Training Providers face a dearth of competent faculty and thus a special focus is needed in this direction.
- Faculty/Trainers for skills development courses need to have a practical understanding of the technology along with the theoretical knowledge.
- Current Apprenticeship Scheme must be looked into and efforts must be made to revise it for better.
- Private training providers should come forward for the partnership with DGET in managing upcoming 1500 new ITIs and 5000 new centers in the PPP mode.
- There is a need to bring in more flexibility in the training systems specifically in the government agencies.
- It is high time that the concept of engineering finishing schools is concretized as the majority of the fresh engineering graduates in the country are not job ready.
- DIT may play a role in fast-tracking the mechanism for procurement of infrastructure for training & development.
- It is important to adapt the training modules with the NVEQF Framework.

- Due to a suitable environment and nature of the work, Electronics industry has a huge potential to employ females and thus maintain gender-equity in the employment scenario of the country.
- Training Programs need to focus upon the individual's aspiration and aptitude, balance technical and management career growth, maintain flexible in schedule and provide easy access to physical laboratories.
- The programs need to be flexible in interdisciplinary courses (breadth) and should provide quick access to advanced courses (depth).
- Innovative training models by private training providers like SEER Akademi, Jetking etc. may be adopted.

### 3.4 Session 3 – Financial aspects including post training employment/entrepreneurial empowerment, tax and other incentives to encourage PPP mode investments.

- Skilling has a social overtone. People from disadvantaged regions like J&K, North-East should be given appropriate focus even though this may not be financially very attractive to do. Government must play a proactive role in promoting such efforts.
- There are many more electronic segments that can be taught using the same facility like ATM repair, Elevator repair, Vending machine repair, etc that will increase the potential of the sector many folds.
- Need of a sustainable financing model based on self-finance and Fee Subsidy.
- Deregulation of academic funding and fee control regime may be explored.
- Industry must participate in funding of the training infrastructure keeping into consideration that Industry invests a lot in remedial training of B Techs. Industry must invest time and not just money for the training efforts.
- Industry is not involved in next generation product definition or capability definition. Hence, little funding flow from the industry for research.

- Mobilization of larger magnitude of financial resources; creation of a Skill Development Fund
- Performance linked funding (and subsequent funding) support from Government for training institutes.
- Develop competition for resource allocation; move from supply driven to demand driven model.
- Stimulate investment by private sector through tax incentives and financial support (grant and loans at concessional rates).
- Provision of tax incentives like availability of tax deductions on:-
  - investments made in own / 3rd party training institute
  - expenses on training allowed to be deducted from income statement
  - contribution to Skill Development Fund
- Availability of matching funding support from Government funding support should be stable and sustainable.
- Most of the Patents are not commercialised in India and hence of not of any use.
- Placement incentive may be provided to to private sector.
- Service tax to be exempted for training.
- Relaxation on Income tax on income generated through education & training.
- Training should be demand driven and not supply based.
- Industry should come forward to accept challenges in HRD.
- Funding should be provided for innovative Education.
- The fee control regime needs to go – we are sacrificing quality for access and equity
- Create better financial aid mechanisms to fund talent
- Colleges must compete for good students, good professors and funded research
- The migration to bottom up faculty/ alumni governance must happen for quality.

- Enable more PPP programs –self financed or subsidized
- Even Tier II US univs have better labs than our premier institutes.
- Create Labs to teach and share them – use scholarships to keep top talent in electronics
- Encourage the private sector to participate in development of Labs as it needs money. Govt. funding is another option for Lab.
- ITRI, IMEC style consortia need to be developed.
- Private sector investment is to be encouraged and Govt. funding should come as scholarships/soft loans
- Fast track mechanism/relaxation in procurement of specialized components.
- Innovative flexible and interdisciplinary programmes.
- Adopt TAIWAN model or IMAC Belgium Model.
- Provide soft loans for Training provider.
- Skill development funds of Singapore and Malaysia to be followed.
- Profit Making IT Majors in India, companies shall be asked to make definite percentage of their Profit as an investment in R & D especially for ESDM sector.

**3.5 Session 4 – Industry – Institute Interaction models for training, apprenticeship and placement**

- The gap between the skill set acquired by graduating engineers and the expectations of the industry, particularly in the electronics related branches, has been widening over the years. The reason is the mismatch in the “time constants” of the two systems - academia and university. Even with the best of intentions and efforts, changes in the curriculum get reflected in the skills of graduating engineers after a minimum delay of four years, during which industry would have moved beyond what was the state-of-art at the time the changes were initiated. The current university systems of a centralized common examination for hundreds of institutions, this time lag is impossible to obliterate.

- Engineering education in India does not necessitate any one to “do engineering” to qualify as “practicing engineers”. This is in sharp contrast to professions such as medical, where a graduating doctor is allowed to practice only after a mandatory internship in recognised hospitals.
- Include a mandatory one year internship at industry for all graduating engineers before they are deemed to be “practicing engineers”. During the period of internship, the raw graduate would get focussed exposure to the state-of-the-art in the industry of his/her choice and be ready to perform from day one of the regular employment. This will need systemic change and all the stake holders – Government, Universities, colleges and Industry - shall have to contribute to make this happen. If the industry is really serious about improving the skill of our engineering graduates, they must co-operate actively in creating a systems for the above objective.
- A proper career plan must be designed with industry help and communicated to the potential trainees so that he can make an informative decision.
- Exploratory research is needed in the long run for India to compete in the global markets.
- More PhDs are needed in both industry and academia.
- Industries to actively consider recruitment of PhDs and offer better packages to PhDs in both academia and industry.
- Industries can lend brand value to academic research programs through association. Industry employees should be encouraged to take up part-time PhD programs
- Use telecommunication technologies to create a pool of qualified mentors willing to supervise PhD remotely.
- Work with a few branded institutions which are willing to offer PhD degrees supervised by remote supervisors. This can be the next step for SMDP Program.

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- Final year project/apprentice programmes are to be made compulsory for industry exposure.
  - Make the system of Internship a must for Degree programmes.
  - Similar to Green Revolution, we need leadership to be developed in ESDM.
  - Frame work on partnership is required to be build.
  - Since ESDM require involvement of committed agencies and some of professional bodies like Computer Society of India, All India Engineers Associations have vast network for imparting training and competency development, having good connect with engineering and polytechnic colleges. Their infrastructure and network of experienced academic members shall be explored for providing training and competency development.
  - Professional agencies in Singapore/ Australia are helping government for running of short term certification programs on the subject, similar model can be explored.
  - Considering gaps and shortage of time and to leap frog, incubation centres shall be explored to develop indigenous affordable and low cost solutions.
  - Nano-manufacturing will be a key determinant of ESDM enablement in the medium term. HR capacity as well as a smart R&D Engineering program for IP creation may be built in this sector– a process where industry and innovation feed each other in a self-sustaining cycle.
  - Creating a private sector/ even foreign MNC participation in smart R&D E programs to create IP and innovation
  - India fab will require a different scale of training/ supporting R&D setup.
  - A centre of Excellence on advance nano – AMAT can look at participating in as a PPP partner – scaling the IIT Bombay initiative to a different level or Centre of Nano.

#### 4. Key Recommendations:

- Industry must play a proactive role in projection of skills sets required and in devising mechanisms to develop competent human resource for the industry.
- Collaboration among all stakeholders is essential to create quality human resource with required skill sets and a frame work on partnership is required to be made.
- Quality assurance and standards for assessment of knowledge parameters must be created.
- There should be independent certification agency, which work exclusively in skill testing and certification.
- Occupational Standards for each job role and Labour Market Information (LMI) must be laid down.
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- Accrediting curriculum, industry internship, assessment and certification may be facilitated.
- Training the Trainer programmes are required to have quality Trainers.
- Industry training and apprenticeship is to be encouraged and Manufacturers associations should take lead to provide such a link.
- DEITY should create a separate group for Electronics Packaging.
- All engineering programs should be designed and conducted to meet, in letter and spirit, the Program Outcomes as defined by National Board of Accreditation or preferably those of Washington Accord
- Industries such as Texas Instruments, Intel and HCL have good training models to follow and devise more such training programs for the ESDM industry.
- Encourage & embed entrepreneurial skills.
- It is important to adapt the training modules with the NVEQF Framework.
- The programs need to be flexible in interdisciplinary courses (breadth) and should provide quick access to advanced courses (depth).
- A sustainable financing model based on self-finance and Fee Subsidy may be built.



- Deregulation of academic funding and fee control regime may be explored.
- Industry must participate in funding of the training infrastructure keeping into consideration that Industry invests a lot in remedial training of B Techs. Industry must invest time and not just money for the training efforts.
- Stimulate investment by private sector through tax incentives and financial support (grant and loans at concessional rates).
- Provision of tax incentives for R&D and Skill development by Industry like availability of tax deductions on:-
  - investments made in own / 3rd party training institute
  - expenses on training allowed to be deducted from income statement
  - contribution to Skill Development Fund
- Availability of matching funding support from Government funding support should be stable and sustainable.
- Placement incentive may be provided to private sector.
- Service tax to be exempted for training.
- Funding should be provided for innovative Education.
- Create Labs to teach and share them – use scholarships to keep top talent in electronics
- Encourage the private sector to participate in development of Labs as it needs money. Govt. funding is another option for Lab.
- Private sector investment is to be encouraged and Govt. funding should come as scholarships/soft loans
- Fast track mechanism/relaxation in procurement of specialized components.
- Adopt TAIWAN model or IMAC Belgium Model for boosting the training in ESDM Sector.
- Profit Making IT Majors in India, companies shall be asked to make definite percentage of their Profit (1% company achieves) as an investment in R & D especially for ESDM sector.
- Similar to Green Revolution, we need leadership to be developed in ESDM.

## 5. Way Forward – Creation of ESDM Competencies Development Committee

The need for a continuous dialogue on strategizing for human resource development in the ESDM industry emerged out of the workshop. It was proposed that a working group/ committee created to work out detailed scheme. The representatives may be from:

1. Various ESDM Industry verticals/ Industry Associations
2. Academia/ Public Training Providers/ Private Training Providers
3. Skills Domain Specialists – Policy Advisory, National and International Skills Development Models etc.
4. Government Representatives – DIT/ MoLE/HRD

The working group/ committee can submit its report within two months. Working group/ committee may be mandated with following Terms of References:

- a. Identification of competency development programmes in ESDM along with competencies required based on interaction/ feedback of Industry, NSDC, Training providers and other Agencies.
- b. Suggesting framework and Collaboration Model between Industry, Training Providers, Academia, Government and other Stakeholders.
- c. Suggesting agencies for Curriculum development, testing & certification, Quality/ standard creation etc.
- d. Suggesting Financial Models covering post training employment/ entrepreneurial empowerment, tax and other incentives to encourage PPP mode investments.

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