

Enabling Semiconductor Ecosystem- Factors for People capacity creation

Inauguration

1. Prof Rangan Banerjee/ Director - IIT D

Need to build smooth flow of skills in the talent pipeline to industry.

2. Prof RamGopal Rao

Presentation enclosed.

3. Dr. Ajit Manocha- SEMI/ISM

- SEMI-industry interface
- Talent a key pillar-initiative at SEMI (4T -Talent, Technology, Trade, Tax)
- Expanded Academia interface (ASA)
- Need for school->grad->postgrad->doctoral->industry pipeline to be setup as STEM in USA not favored

4. Dr. Ashwini K Aggaral

Expected Outcome Summary Enclosed.

Design

4. Dr Satya Gupta

Presentation enclosed. Key message: Build Indian Brands/ Develop fab-fillers to enable demand led fab success.

5. Muthu Chinaswamy/ SFAL

Presentation Enclosed.

6. Panel Highlights

Design Panel presentations enclosed.

Key enablers:

- Low cost EDA from mentor/Synopsis (Cadence not at / SFAL)
- Logicnotes/Elbrus Labs – offer a low cost EDA for academia
- MEITY program extends EDA for academia (however, not full featured)
- MRU , Dr Dutta confirms that it is not available to them
- SCL offers bridge for practical hands-on to VLSI students
- Devraj ESSCI- need for 50k technician training. Need for NOS /QP creation with industry expert creation. SEMI to offer its work to prevent rework – enable mainstream integration.
- Desired outcomes as listed earlier mentioned by group / specifically, Dr Dutta MRU:
 - 1) EDA availability
 - 2) Core hands-on
 - 3) Fab lab access
 - 4) Virtual labs/ multi-media content
 - 5) Open source content?
 - 6) Finishing schools/ 2nd ramp
 - 7) Case studies – prevent reinventing of wheels

- 8) National semi Design Hackathon
- 9) Skill based COE/ Independent access
- 10) Increased collaboration/links between industry, academia for right skill standards with alignment of skill pipelines
- 11) Growth in # of university and college faculty with Semi specialization
- 12) Development of strategic continuous learning programs with multiple on-ramp paths
- 13) Optimizing hourly usage of faculty resources for training/ optimizing existing lab/ faculty infra
- 14) 5. Development of content repositories/expansion of new multimedia teaching tools / resources
- 15) Availability of software design tools for students at low/ no –cost; growth in hands-on learning opportunities
- 16) Increased # of student projects tapping out/ startups
- 17) Optimized flow of skilled workforce pipeline to industry
- 18) Centralized dashboard on #s of skilled workforce in pipeline w/ match to industry needs
- 19) Prof Karmakar- PhD level not required. Need to balance needs carefully.
- 20) Dr Manocha – Huge shortage of talent predicted. India will lose talent to foreign shores unless it plans appropriately.

Pre-lunch Presentations:

Base

8. Dr Arindam Ghosh -Quantum Computing
 - invited by Dr Manocha to linkup with SEMI taskforce
 (Presentation enclosed.)

Device-Compound Semiconductors

9. Prof R Srinivasan (Vasu) IISc

GaN fab

10. Prof R Singh

Compound Semi R&D needs & Enablers

(Presentation being arranged)

PANEL:

Moonshot goals:

- Grow GEEC to commercial run rates
- Take position on GaN indigenous chip portfolio to capture:
 - Mobile Charger market
 - 5G base-station chipset / select wireless applications
- Grow niche Compound Semi products from indigenous R&D

Enablers:

- Startup incubation to pull talent into people pipeline
- Expand GEEC coverage to more engineering institutes.
- Open SCL as additional talent enabler
- Suraj – Build Scale, Enable Pull, Lower Cost!
- Dr Rawal – focus of strategic market opportunities.

Semiconductor Packaging

Moonshots & Enablers:

- Raja-TATA rolling out ATMP – start with conventional and planning to expand to Advanced packaging
- SAHARSA- need for skills in Indian context
- AKA – need for India Advanced Packaging COE – start with Design , leverage Singapore APDC for POC development. \

Prof. Rao Tummala

1. Packaging is the single most important strategic value to India as India debates what to invest in. India should invest more in packaging than in devices. The end goal is integrated packages or systems with devices, components and interconnections. Invest more in SOP(System.-On -Package) than in SOC
2. With this high value add and high investments in packaging India can be a global player by 2030 and a global leader 10 years later provided GOI funds packaging as much if not higher than devices. I don't believe India will be a global leader in devices but it can be in new packaging. With these increased GOI investments in packaging, the industry will leverage and add 5-10X more in the coming decade or two. Thus packaging industry will prosper in India. I don't see huge device investments by the industry other than matching GOI funding.
3. As Moore's La-based devices slowdown in performance, packaging becomes more valuable than ever before. The only way to overcome the shortcomings of current Moore's Law-based devices is to count on packaging even to make chips, and packaging is necessary to make systems. Packaging thus covers both chips and systems-- chips to systems.
4. The holy grail in advanced packaging is < 1-micron lithography on a large panel substrate with 1-micron pitch assembly in 5 years. The industry is at 9-micron pitch but on the wafer in 2022
5. The other holy grail is 3D for HPC applications. In spite of 20 years of focus on TSVs and 3D, there is no logic and memory stack today. This is the other holy grail
6. Prof Tummala recommended three COEs at three IITs to start with and each IIT collaborating with others to seek the missing faculty expertise.
 - Automotive
 - HPC/ AI-ML-Cloud
 - Communications – 5G-6G-mm wave -radar chip/ SIP
7. Georgia Tech Packaging Center model for simultaneous leading-edge R&D, education of a large number of interdisciplinary students, and involvement of the large number of global companies funding the center and contributing to R&D can be. Applied at IITs and IISc
8. Prof. Tummala proposed to bring a team of 20 packaging experts from the US, EU, Singapore, India, etc. to teach week-long courses in packaging at IITD, IITB, IITM, IISc and others.. He also proposed that each IIT set up hands-on educational facilities. to accompany the week-long courses. For this to happen, experts need to be funded for travel and honorarium.

1. IME success story (govt catalysed, industry enabled)
2. AKA – need to look at special subsidy to train industry experts in industry and in academia to enable the first projects. To be reviewed by ESSCI/MEITY. For ex. If Tata/Saharsa require 100 people in first batch – let us send 120 people to COEs abroad for skilling and bringing the skill back to India

Display & Flexible

Prasad

1. Need for technology partner to set up First Display LCD fab. Road
2. Map for Indigenous display Technology development to reach Moonshot goal.
3. Govt support and Local Eco system development for Display Fab needs.
4. With Pharma industry in India, there is huge scope for Display
5. Materials development and supply-chain development focus required from Govt.

Dr SS Iyer

NC FlexE presentation
(separately attached)

Dr Sudheer Kumar (in absentia)

- Deploy a Production level tool to enable <2.5 micron electrolytic capacitor film + encapsulation to make India self-sufficient in indigenous electrolytic capacitor supply-chain. Encapsulation functionality can kickstart additional applications including appropriate mobile display making with IIT Chen / Grantwood CSS OLED panel technology.

Dr Rajeswaran/IIT M/ Grantwood

- Enable commercial display fab - Manufacturing led R&D not vice-versa. Need to ensure risks are balanced by starting with proven tech and grooming emerging tech.
- Innovative work on 'vacuum printing OLED panels' – IIT Chen CSS technology could be a new paradigm in enabling low-cost, manufacturing-at-customer site mobile display panels.
- Evolving an alternate path to OLED manufacturing using concept of 'vacuum printing'- however, India needs to start with Mfg first, and then evolve Mfg led R&D. No scope for experimenting with a green field technology in a commercial world with ROI expectation.

Vimal Malhotra, Avanstarte/Vedanta

Need for home-grown people base. Requirement in large numbers.

CMOS Fab

Industry Engagement- India tech roadmap

Prob definition

NOS Standards

Integrated training

Prof Udayan G/ Presentation available on request for restricted distribution in Govt only.

Content for industry

Dr.Manocha presented the SEMI talent initiatives, the ASA opportunity, review of cross-fertilizing the skill standards, content.

Presentation available on request for restricted distribution in Government only.

As Minuted By:

Dr.Ashwini Aggarwal, Applied Materials
& Dr Rajendra Singh, IIT Delhi
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