Wafering the Future

Insights from
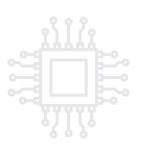
Semiconductor
Ecosystem Conference
SEC 2024

Index

Fruitful Deliberations Lead to Meaningful Collaborations

Deepak Karandikar

President,
Mahratta Chamber of
Commerce, Industries
and Agriculture (MCCIA)

Founded in 1934, the Mahratta Chamber of Commerce, Industries and Agriculture (MCCIA) has been a pillar of economic development in the region, boasting over 3,000 members. As one of the largest and most active Chambers of Commerce in India, our mission is to promote and protect the interests of industry and trade while supporting economic and industrial development in Maharashtra.

Hosting the maiden Semiconductor Ecosystem Conference (SEC2024) is a significant milestone for MCCIA. The semiconductor industry is a vital driver of technological innovation and economic growth, especially as we navigate rapid advancements in technology. The importance of a robust semiconductor ecosystem cannot be overstated; from powering smartphones to enabling advanced medical devices, semiconductors are at the core of modern technology.

The discussions at SEC2024 will pave the way for new strategies and initiatives that can drive growth and innovation in the semiconductor sector. I am confident that the deliberations will be both fruitful and inspiring, leading to meaningful collaborations. Let us work together to harness the power of semiconductors and drive the next wave of technological advancement and economic growth in our country.

Pune Unites for Semiconductor Manufacturing Excellence

Pune, a city that hosted Chhatrapati Shivaji Maharaj who established Swarajya, served as the seat of Peshwa Bajirao, and nurtured numerous freedom fighters contributing to India's independence struggle, continues to play a pivotal role in the nation's economic development. Renowned for its contributions to manufacturing and IT services, Pune ranks fifth in India for merchandise exports. Despite being only the ninth largest city by geography, Pune is among the top six cities in terms of tax contributions. The city also boasts the largest number of registered MSMEs and the highest contributing MSMEs on the Government e-Marketplace.
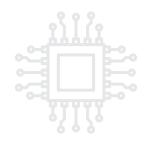
Pune's growth is fueled by its willingness to share lessons and learn from others. This collaborative spirit dates back to Lokmanya Tilak's era of community celebrations such as Ganeshotsav, which Pune still hosts magnificently, and cultural events like the Sawai Gandharva music festival. Today, Pune exemplifies this spirit by hosting conferences with esteemed speakers, including the MeitY Secretary.

The city has successfully established clusters for various industries. The food processor cluster supports 250 units, while the auto component cluster, active for over 20 years, assists around 600 companies. Recently, Pune has initiated an electronic manufacturing cluster in Bhosari, currently aiding approximately 100 companies. This project has received support from both the central and state governments, including the industries department, which is backing the MCCIA Electronic Cluster Foundation (MECF).

At the ongoing conference, representatives from the Maharashtra State government join us to discuss the development of a robust semiconductor manufacturing ecosystem, focusing on areas such as skilling and scaling. Pune's commitment to coming together and fostering growth is evident in its numerous successful initiatives and its continuous efforts to advance in the semiconductor sector.

Prashant Girbane

Director General, Mahratta Chamber of Commerce, Industries and Agriculture (MCCIA)
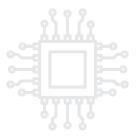
Maharashtra: A Hub for Compound Semiconductor Manufacturing

Sanjeev Keskar

Convenor, SEC2024

The Semiconductor Ecosystem Design Group (SEDG) in Pune, comprising around 20 passionate members, has been diligently working over the past two months to organise this inaugural conference. We extend our gratitude to Ajay Srivastava, Director, Software Technology Parks of India (STPI) for his involvement from the initial planning stages. This overview will cover global and Indian semiconductor industry trends, followed by strategic actions needed in Maharashtra.

According to a McKinsey report, the semiconductor industry was valued at $590 billion in 2023. Although there was a slight decline to $560 billion, the forecast predicts the industry will surpass $1 trillion by 2030. Typically, semiconductors contribute 25% to the electronics sector, indicating that the electronics industry will reach $4 trillion by 2030, marking a near 100% growth over the next six years.

India's electronics consumption, which was $120 billion in 2023, is expected to grow to $300 billion. The Indian semiconductor market, valued at $30 billion in 2023, is projected to reach nearly $100 billion in the next five years. With the government's focus on electronics and semiconductor manufacturing, India is poised for exponential growth in this sector.

Understanding the semiconductor value chain is crucial. It comprises 20% VLSI Chip Design, 20% wafer fabrication, 10% Assembly Testing Marking and Packing (ATMP) / Outsourced Semiconductor Assembly and Testing (OSAT), 10% component distribution, and an average profit margin of 40%. India excels in VLSI Chip Design, with top semiconductor companies operating captive design centers here. However, the majority of design services cater to foreign companies, and there are few Indian companies creating IP and technology domestically.

To leverage our talent and transform it into indigenous innovation, the group has decided to focus on developing chips in India, supported by the ISM policy, which provides a 50% incentive from MeitY and 25% from state governments. The semiconductor policy is progressing well, with

Tata announcing a wafer fab and Micron setting up an ATMP facility. There are nearly ten proposals awaiting ISM approval. We are confident that the semiconductor policy will catalyse significant fab and manufacturing activities in the next 3-4 years.
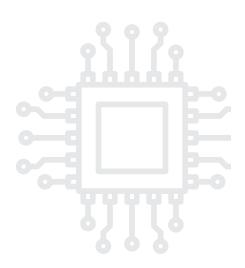
One critical area we need to address is the distribution segment. Currently, India imports most components from Hong Kong, Singapore, Taiwan, Japan, and Korea, leading to a 5-6% cost disability for Indian manufacturers due to freight, inventory carrying costs, and higher financing costs. Creating a robust component distribution hub in India could mitigate these costs.

We have analysed the top products consumed in India, identifying priority chips that need to be developed to cater to 80% of the market. With the Ministry of Electronics' Design Linked Incentive Scheme, our focus should be on developing these chips for both Indian and global markets.

From Maharashtra's perspective, there is a significant opportunity in compound semiconductor manufacturing. Unlike traditional silicon wafer fabs requiring billion-dollar investments, compound semiconductor projects, such as photonics, optocouplers, MOSFETs, and RF discrete semiconductors, can be established with $100 million investments, with 70% funding from the central and state governments. Maharashtra should prioritise compound semiconductor manufacturing.

Furthermore, establishing a VLSI Centre of Excellence (COE) in collaboration with STPI Pune will foster an entrepreneurial ecosystem for chip development. Additionally, setting up a component hub in Maharashtra and exploring the possibility of a silicon carbide fab, akin to the gallium nitride fab at IISc Bangalore, with support from MeitY and the state government, will significantly strengthen the region's semiconductor ecosystem.

These strategic initiatives will help Maharashtra emerge as a leader in the semiconductor manufacturing ecosystem.
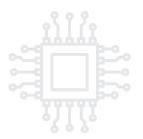
Maharashtra Leads the Way in Emerging Electronic Manufacturing Trends

Arvind Kumar

Director General, STPI

India is witnessing three significant technological trends. First, innovation is no longer confined to tier-1 cities; it is now emerging from tier-2 and tier-3 cities as well. Second, there is a substantial rise in the number of Deep-Tech startups. Third, the electronic manufacturing sector is experiencing remarkable growth. The MCCIA plays a pivotal role in supporting these developments across industry, startup ecosystems, and individual innovators.

In the realms of electronic manufacturing and Deep-Tech, the semiconductor industry is a critical input, encompassing fab design and innovation. The SEC2024 is being held at an opportune time to address these areas of growth.

The Software Technology Parks of India (STPI) has a significant presence in Maharashtra, with centers in Pune, Nashik, Mumbai, Nagpur, and other cities. These centers offer comprehensive services for software technology certifications and host two entrepreneurship centers that provide extensive support to startups, including mentoring, funding, and global connections.

Maharashtra is also home to two Centers of Excellence (COE), including one in Pune at Bhosari. Additional Centers for Entrepreneurship are in the pipeline for the state. Notably, an approved project for an Electronic Manufacturing Cluster (EMC) in Ranjangaon near Pune, with an investment of around Rs. 492 crore, is also underway. STPI-registered units in Maharashtra have significantly contributed to the state's software exports, totaling Rs. 1.74 lakh crore, which represents 20% of the country's total software exports of Rs. 9 lakh crore. With MCCIA's interventions, this enthusiasm and growth are expected to escalate further.

MCCIA and STPI Signs MoU for Centre of Excellence on Semiconductors

A Memorandum of Understanding (MoU) was signed between MCCIA and STPI for establishing a Centre of Excellence on Semiconductors. The MoU was signed by Ajay Shrivastava, Director of STPI Maharashtra & Goa and Prashant Girbane, DG of MCCIA. The signing ceremony was witnessed by S Krishnan IAS, Secretary, MeitY and Deepak Karandikar, President of MCCIA.

Transforming Pune into the Silicon Valley of the East

India is making significant strides in digital governance, including the e-passport project, which aims to provide e-passports with embedded chips to around 110 million passport holders. This will generate a substantial demand for semiconductors in the Indian market. While we possess exceptional talent in chip design, establishing a robust manufacturing ecosystem is crucial. MCCIA's efforts to create this ecosystem are commendable and well-directed.

The advent of cloud networks, data centers, and the mobile industry underscores the importance of semiconductors. These sectors require a sophisticated and complex manufacturing ecosystem, and it is imperative that we collaborate to advance in these domains.
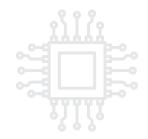
The implementation of FASTag, starting with RFID chips in 2018-19 and becoming mandatory for all vehicles, exemplifies how technology can be a powerful enabler. With 100 million FASTags issued and daily collections of Rs. 200 crores, the annual revenue from FASTag toll collection exceeds Rs. 60,000 crores. This highlights the transformative potential of technology.

Pune is a logical choice for developing this ecosystem due to its excellent human capital, financial resources, technological infrastructure, and governance. The signing of an MoU between STPI and MCCIA marks a significant step forward, establishing an institutional framework to drive progress. Additionally, MeitY's upcoming data center in Chikhali further emphasises Pune's priority status.

Pune, often referred to as the Oxford of the East, has a rich legacy, abundant talent, and strong design capabilities. The SEC2024 provides an ideal platform to connect and collaborate, positioning Pune to become the Silicon Valley of the East.

Sanket Bhondve, IAS,
Joint Secretary, Ministry of Electronics and Information Technology (MeitY)

State Government Committed to Infrastructure Growth and Policies

Pradeep Chandren, IAS

Additional Development Commissioner, Department of Industries, Government of Maharashtra

The forthcoming electronic policy, currently in the draft stage, is being refined through stakeholder consultations and benchmarking with other states. During the previous policy period, Maharashtra targeted an investment of Rs. 3 billion and the creation of 1,00,000 jobs, approving projects worth Rs. 5,000 crore, primarily in Pune.

Incentives such as stamp duty and interest subsidies, power subsidies, and GST reimbursements are expected to continue in the new policy. Electronics will remain under the Essential Services Management Act, ensuring uninterrupted operations.

Maharashtra hosts the largest number of registered MSMEs in India, around 4.5 million, with a significant concentration in Pune and the Mumbai Metropolitan Region. Notably, 20% of these MSMEs are women-owned, the highest proportion in the country. Unlike other states, Maharashtra lacks a dedicated MSME policy, but one is currently being developed to address financing issues and provide resilience against global disruptions like COVID-19.

The new MSME policy will include expanded insurance coverage beyond the first shipment. The policies for the Electronic Systems Design and Manufacturing (ESDM) and MSME sectors, delayed by the election code of conduct, are expected to be released soon, potentially before the state elections.

Maharashtra boasts strong macroeconomic indicators, ranking second in exports and consistently leading in FDI, which constitutes one-third of India's total. The state contributes 14% to India's GDP and has a proactive policy environment with numerous incentives. Significant infrastructure projects, such as the new airport in Navi Mumbai and the Vadhvan Port, are underway,
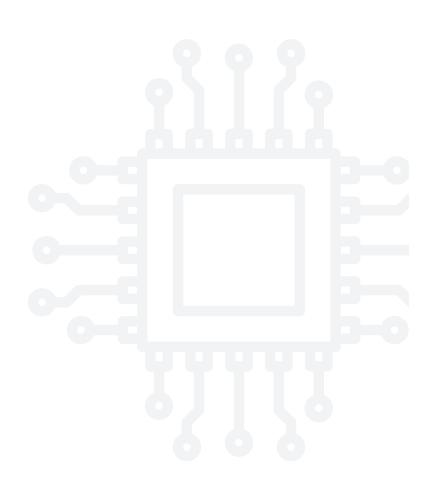
expected to boost Maharashtra's freight capacity to over 40% of India's total.

Maharashtra's high per capita income, large number of internet users, and substantial share in mobile handset manufacturing underscore its robust demand side. On the supply side, the state has a skilled workforce, ranked first in employable talent, and scores high in ease-of-doing-business metrics.

The Maharashtra Industry, Trade, and Investment Facilitation Act, 2023, further enhances ease-of-doing-business by ensuring timely approvals and permissions through an empowered committee.

With these policy-driven initiatives, infrastructure investments, and the state government's commitment, Maharashtra is poised to significantly advance its ESDM sector, fostering substantial growth and development.
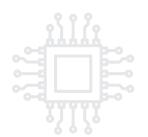
Pune's Crucial Role in Developing India's Electronics Component Ecosystem

S. Krishnan, IAS
Secretary, MeitY

The successful operation of the electronic component park managed by MCCIA demonstrates the key elements needed for a thriving initiative. The MCCIA cluster facility is well-governed, fully utilised, and provides precisely the required services for industry, truly benefiting all its members.

Semiconductors are a vital sector targeted for significant growth in India. Maharashtra, as a leading industrial state, must play a pivotal role in this critical sector. For years, there has been a push to establish a semiconductor fab in India. A decade ago, we missed an opportunity when a major US company was on the verge of setting up an ATMP plant, but the deal fell through due to a gap in expected government grants. However, policies have since evolved, and now the Indian government is prepared to invest significantly, with $10 billion already committed and more likely in the future.

India's dependency on foreign semiconductors became evident during the pandemic when car manufacturers couldn't ship vehicles due to chip shortages. Semiconductors are essential for a wide range of electronics, and having domestic manufacturing capacity is crucial for resilience and competitive advantage.

India offers one of the world's most generous incentive packages, covering 50% of the capital cost for semiconductor plants, with state governments contributing an additional 20-25%. The Government of India committed Rs. 76,000 crores for the India Semiconductor Mission in its first phase, with Rs. 70,000 crores already allocated to various programs.

Despite this progress, developing a complete ecosystem remains crucial. Large fabs and ATMP plants need a supporting ecosystem of suppliers for materials, gases, and other requirements, including high precision manufacturing and cleanroom services. The next phase of the Semiconductor

Mission will address these needs, focusing on compound semiconductors, display fabs, MEMS, and sensor-related semiconductor equipment, which require smaller investments and can be established nationwide.
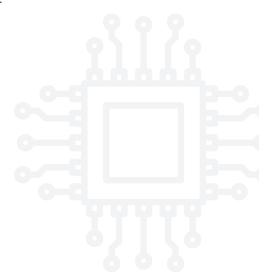
India has a significant advantage in semiconductor design, with many design centres and startups in cities like Bangalore and Hyderabad. However, these often get acquired by multinational companies. The goal is to develop Indian-designed semiconductor chips and products that can compete globally.

The semiconductor industry in India is a long-term journey requiring 10 to 15 years of sustained effort. Established centres like Pune, with their industrial culture and commitment, will be crucial in this journey. Collaborations with entities like STPI, C-DAC, and the Government of Maharashtra will be essential in building the human resources needed for the semiconductor industry.

Deepening the electronics ecosystem in Pune is vital. While electronics manufacturing and exports are increasing, most components are still imported, with India mainly handling final assembly. To remain competitive, India must develop its electronics component ecosystem to increase value addition. Established clusters like Pune will play a significant role in this effort.

Engineering R&D is another expanding area. Pune is already a significant centre for global capability centres and engineering R&D. Indian companies need to expand their R&D footprint and investments. Promoting engineering R&D will create better job opportunities for Indian youth and contribute to making electronics the largest manufacturing sector in India.

By focusing on these areas, India can position itself as a major player in the global electronics and semiconductor industry, aligning with the vision of a 'Viksit Bharat' (Developed India) as envisaged by Prime Minister Narendra Modi.

Keynote 1

Driving Innovation in the Semiconductor Ecosystem

Hitesh Garg

Vice President and
India Country Manager,
NXP Semiconductors

The drivers of innovation in the semiconductor ecosystem have remained consistent over the past five to seven years, though the intensity and momentum within various segments have evolved. A prime example is the substantial impact of AI, demonstrated by companies like Nvidia. AI, from the cloud to the secure edge, is a key driver pushing the semiconductor industry towards a projected value of $1.2 trillion by 2030.

We have observed three distinct waves in the market:
- 2000-2010: Laptops, desktops, and mobiles.
- 2010-2020: Smartphones.
- 2020-2030: AI, cloud, and smart connected devices.
  By 2030, these smart connected devices are expected to exceed 75 billion units, spanning industrial, healthcare, smart home, and automotive segments.

Key Growth Drivers:
- Autonomy: Advancements in autonomous vehicles, progressing through levels 3, 4, and 5.
- Electrification: A significant shift towards electric vehicles, with over 20-30% electrification in India's two-wheeler market.
- Connectivity: Ensuring seamless connectivity for vehicles and devices.

The technologies driving these innovations fall into four key verticals:
- Sensing Technologies: Essential for environmental perception.
- Thinking Technologies: High-end computing capabilities for information processing.
- Connectivity Technologies: Solutions for internal and external connectivity.
- Actuation Technologies: Enabling devices to perform actions based on processed information.

Security is paramount, particularly for connected devices, and scalable system solutions are crucial. In the automotive industry, software complexity will far exceed that of mobile phones.

The automotive sector, particularly in Pune, is undergoing significant architectural transitions. Companies are exploring various architectures, such as domain-based, zonal, and consolidated computing, to meet future needs. These transitions require reliable sensing technologies, end-to-end computing solutions, and robust connectivity.

Integrating software solutions is essential to minimise integration challenges. The complexity of software in future vehicles will surpass that of mobile phones, making it critical to build platforms that integrate connectivity, compute, sensing, and actuation technologies.

To achieve a software-driven ecosystem in automotive and industrial applications, we must focus on architectural transitions, superior sensors, trust provisioning for AI and machine learning and comprehensive software toolboxes for integration. No single entity can achieve these advancements alone; we must work together to navigate these challenges and capitalise on the opportunities ahead.

Building a Successful Fabless Semiconductor Ecosystem

Sandeep Kumar

CEO,
L&T Semiconductor
Technologies

Building a robust fabless ecosystem requires a clear understanding of market dynamics. There's often confusion between the overall electronics market and the semiconductor segment. For example, while India's electronics market is valued at $300 billion, only about $60 billion pertains to semiconductors. A significant portion of this consists of components like PCBs and passives, which are predominantly imported from countries like China.

Semiconductors, often referred to as chips, are high-volume products. Despite their complexity, they are sold at lower prices, making mass production—into the millions or hundreds of millions—essential for achieving cost-effectiveness and competitiveness. To succeed globally, our chips must be of superior quality, surpassing those from established companies like NXP. However, serving only the domestic market is insufficient due to volume constraints; targeting international markets is crucial for achieving the necessary scale.

India has made strides with around 10 to 15 startups in the semiconductor sector, primarily focusing on intellectual property (IP). However, to achieve significant growth, we need hundreds more. With 20% of the world's IC design engineers based in India and major semiconductor companies having substantial design centers here, talent is not an issue.

The challenge lies in translating our design talent into product design and customer interaction skills. Many decisions for systems manufactured in India are made abroad. To change this, we need to focus on niche markets where we can design and manufacture locally. Competing with giants in processors and memory chips may be impractical, but areas like power analog and RF offer promising opportunities. Technologies such as silicon germanium RF, gallium nitride, and silicon carbide are in high demand and lack market dominance, presenting significant opportunities.
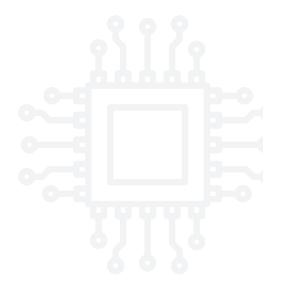
Our design talent is world-class, but we need to develop product design

capabilities and enhance global customer interactions. Understanding and defining product roadmaps through direct customer engagement is crucial.

To build a competitive and robust fabless ecosystem, it is vital to focus on niche opportunities, develop comprehensive product design capabilities, and engage with global customers. These efforts form the foundation of the strategies we are implementing at L&T Semiconductor, aiming to leverage our design talent and target specific technologies to create a thriving ecosystem.

Panelists:

Hitesh Garg

Vice President and Country Manager,
NXP Semiconductors

Sundeep Gupta

Managing Director,
Alphawave Semiconductors

Niranjan Pol

India Electronic and Semiconductor
Association (IESA), Maharashtra Chapter

Manoj Soman

Analog-RF-Mixed Signal-DSP
Semiconductor Chip Designer and Advisor

The panel discussed that to build a robust fabless semiconductor ecosystem in India, focusing on niche opportunities, enhancing product design capabilities and engaging globally are crucial. Collaboration between industry and academia is needed to produce industry-ready graduates and drive local innovation. Pune's rich talent pool and industrial culture position it well for significant contributions. Targeting specific technologies and leveraging design talent can help India become a major player in the global semiconductor industry.

Moderator:

Sandeep Kumar

CEO, L&T Semiconductor Technologies

Manoj Soman
Analog-RF-Mixed Signal-DSP
Semiconductor Chip
Designer and Advisor

Sundeep Gupta
Managing Director,
Alphawave Semiconductors

Hitesh Garg
Vice President and
Country Manager,
NXP Semiconductors

Sandeep Kumar
CEO, L&T Semiconductor
Technologies

On Challenges and Opportunities in the Fabless Semiconductor Ecosystem

Manoj highlighted the critical challenges of lack of industry collaboration and skilled resources. Despite engaging with academia for over a decade, the alignment between academic training and industry needs remains insufficient. He stressed the need for practical, project-based learning integrated into university curricula to produce industry-ready graduates.

Sundeep emphasised the availability of financial resources once there is trust in deliverables. However, the primary challenge is in finding the right talent and fostering collaboration. Alphawave has developed several intellectual properties (IPs) and focuses on advanced technologies like 2-nanometer and 3-nanometer nodes. Yet, more efforts are needed in skill development and industry-academic partnerships.

Hitesh pointed out the disparity between design and consumption of chips in India. While 40% of NXP's chips are designed in India, only 15% are consumed locally, and less than 2.5% are sold within the country. He highlighted the need for local system innovation and market visibility to bridge this gap. NXP's experience in creating cost-effective innovations like the first hearing aid in India demonstrates the potential for growth if supported consistently.

Sandeep stressed the importance of enabling startups and addressing the talent gap. Despite designing a significant portion of chips, India's global market visibility is limited due to the lack of local system innovation. Graduates often lack practical skills relevant to semiconductor design, becoming productive only after years in the industry. He emphasised the need for comprehensive VLSI curricula across more universities and colleges.
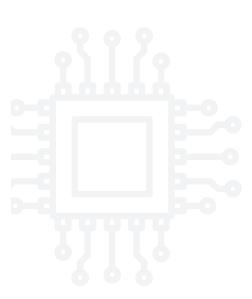
Niranjan discussed efforts by institutions like IIT Bombay to bridge the gap between academic learning and industry needs through comprehensive design courses. He emphasised the importance of developing product design capabilities and engaging with global customers. Niranjan also highlighted promising developments, such as CDAC's HPC chip project, and stressed the need for indigenous system-level companies in Pune and Bangalore.

Niranjan Pol
India Electronic and Semiconductor Association (IESA), Maharashtra Chapter

On Impact of Brain Drain on the Semiconductor Ecosystem

Sundeep Gupta and **Manoj Soman** both addressed the issue of brain drain, where trained individuals leave for higher-paying jobs in multinational corporations or IT service companies. This migration depletes the talent pool for local startups and core technology companies. They called for creating an encouraging environment with financial incentives and career growth opportunities to retain talent within India.

Keynote 1

Developing a Self–Sufficient Semiconductor Manufacturing Sector in India

We have been talking about reaching $100 billion in electronics consumption by 2030. Yet, as of today, we do not manufacture a single commercial wafer in India. This has been a point of concern for many of us. However, it seems like the dream is finally coming true. With Tata's proposed fab in Gujarat, we might see the first wafer coming out of India by 2026-27. This is great news for all of us.

In addition, we have announcements for three OSAT (Outsourced Semiconductor Assembly and Test) facilities, with another five or six in the pipeline. This means we are looking at around 10-12 OSATs and two fabs in the coming years. It is a significant development for our country.

We have always excelled in design, contributing to about 30% of the world's high-end VLSI design activities. Our universities and colleges have produced top-notch talent. When TCS started in 2004, there were only 40 physical test engineers in the country. Today, we have more than 6,000, thanks to the efforts of many companies and institutions.

However, we still lack expertise in assembly and packaging. While we have many talented individuals abroad, we need to bring them back and develop these skills domestically. This conference is crucial for addressing these gaps. We need to focus on skilling in design, fab, and OSAT areas. Institutions like IESA and MCCIA can collaborate to develop these skills.

Another critical aspect is the supply chain. We need efficient logistics, customs support, and reliable access to power, water, chemicals, and gases. The chips we produce must move quickly and efficiently. We have been working with the government on supply chain issues, and we must continue to do so to ensure everything is in place before our fabs and OSATs become operational.
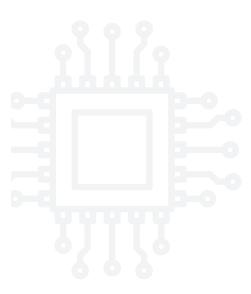
Dr. V. Veerappan
Chairman,
India Electronic
and Semiconductor
Association (IESA)

There are also regulatory challenges, especially with importing chemicals. We need to address these issues to create a conducive environment for semiconductor manufacturing. This conference is timely, and it is an excellent platform to discuss and solve these problems.

I hope to see more announcements and developments in Maharashtra regarding the semiconductor sector.

Keynote 2

Building a Semiconductor Ecosystem Requires a Pan-India and Global Perspective

I am not a semiconductor specialist. However, given the discussions around IC design and upstream aspects in the previous sessions, I aim to provide an overview of Tata Projects and the broader Tata Group's involvement in this sector. Tata Group's diverse operations include a wide range of industries, and it is essential to understand our role within this vast ecosystem. Tata Projects is an infrastructure design and construction company, and I will focus on our experiences in engineering and constructing semiconductor facilities.

Our expertise in engineering and construction covers the complexities involved in building semiconductor facilities. Contrary to the belief that there is abundant talent, we face a significant talent shortage in this domain. I will share insights from our perspective on this issue.

Tata Group, with its $150 billion operations across 30 companies, operates in various sectors, including infrastructure. Tata Projects, specifically, builds infrastructure projects, and while we have clients within the Tata Group, a significant portion of our business comes from external clients across India and globally.

When constructing a semiconductor facility, we handle extensive civil, structural, mechanical, and electrical packages, along with utility systems. The complexities are immense, involving numerous gases, chemicals, and a fast-track schedule. Our diverse experience in projects like energy transition, oil and gas, nuclear, and urban infrastructure, including the Pune Metro, equips us to handle semiconductor projects effectively.

Building a semiconductor ecosystem is not limited to one city or sector. It requires a pan-India and global perspective. Each stakeholder has a role to play in converting challenges into opportunities, and it is essential to take bold steps and move beyond comfort zones.

Rajiv Menon
President and COO,
Tata Projects

In our semiconductor projects, we employ advanced technologies like 4D BIM for project monitoring, hybrid modular construction for speed, and sustainability measures like ZLD and LEED Gold standards. Our project with Micron Technology in Sanand, a 1.5 million square feet assembly and testing facility, exemplifies this approach.

Understanding the semiconductor ecosystem involves addressing transitions in energy, supply chain resilience, and digital platforms. The Indian government's incentive schemes and approved projects, including those by Micron and Tata Electronics, underscore the opportunities in this sector.

Building a semiconductor facility in India comes with unique challenges compared to places like Taiwan or Singapore. It is crucial to learn from each project and build the necessary ecosystem to support these initiatives.

Integration in EPC is key to success, and the role of people and their safety is paramount. Given the shortage of semiconductor-specific experience in India, we are mapping global talent and upskilling local resources through strategic initiatives.

The semiconductor ecosystem presents significant opportunities despite its complexities. It requires a collaborative effort, focusing on people, partnerships, and innovative approaches to overcome challenges and achieve success.

Mahratta Chamber of Commerce, Industries and Agriculture, Pune

Panelists:

Raghu Panicker
CEO, Kaynes SemiCon

Ashok Chandak
President, IESA

Hareesh Chandrasekar
CEO, AGNIT Semiconductors

Moderator:
Rajiv Menon
President and COO, Tata Projects

The panel highlighted the multifaceted challenges and opportunities in developing a semiconductor ecosystem in India. Collaborative efforts, strategic government support, and a focus on niche technologies and MSME participation are essential for building a robust and self-sustaining semiconductor manufacturing sector.

Raghu Panicker
CEO, Kaynes SemiCon

Raghu elaborated on the challenges of establishing OSAT facilities in India, including the lack of capacity, trained manpower, and raw materials. He discussed Kaynes Semicon's journey from EMS to semiconductor manufacturing

and the critical role of government support in overcoming these challenges. He highlighted the importance of localising the supply chain and fostering local demand to ensure the sustainability of semiconductor manufacturing initiatives.

Ashok outlined the difficulties in setting up semiconductor fabs in India, citing substantial capital investment and skill shortages as major obstacles. He pointed to the recent interest from Tata and other projects awaiting approval as positive signs. Mr. Chandak stressed the need for a supportive ecosystem for MSMEs and highlighted the focus on mid-range semiconductor technologies that would remain relevant over the next decade.

Ashok Chandak
President, IESA

Hareesh emphasised the opportunities for MSMEs in niche semiconductor technologies like Gallium Nitride (GaN). He shared AGNIT Semiconductors' success in developing indigenous GaN manufacturing technology with government support. He highlighted the potential for MSMEs to address supply chain gaps and contribute to the semiconductor ecosystem by focusing on niche markets and technologies.

Hareesh Chandrasekar
CEO, AGNIT Semiconductors

Rajiv emphasised the need for a pan-India and global perspective in building a semiconductor ecosystem. He shared insights from Tata Projects' experiences in engineering and constructing semiconductor facilities, addressing the talent shortage, the complexities of EPC aspects, and the importance of integrating advanced technologies and sustainability measures in projects. He stressed the necessity of bold steps and collaboration among stakeholders to convert challenges into opportunities.

Rajiv Menon
President and COO,
Tata Projects

Expert View:

Dr. V. Veerappan, Chairman, IESA discussed the ambitious target of reaching $100 billion in electronics consumption by 2030 and the gap in domestic wafer manufacturing. He noted the promising development of Tata's proposed fab in Gujarat, expected to produce the first wafer by 2026-27. Dr. Veerappan highlighted the announcements for multiple OSAT facilities, signifying progress in India's semiconductor manufacturing sector.
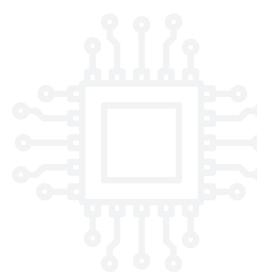
Dr. V. Veerappan
Chairman IESA

Key Discussion Points:

- The high complexity, substantial capital investment, and shortage of advanced technology and skills.
- Significant potential for MSMEs in niche technologies like GaN and mid-range semiconductor nodes.
- Importance of creating a supportive ecosystem and addressing supply chain gaps.
- The critical role of prototype fabs in testing and proving new technologies before large-scale production.
- Existing facilities in India and recommendations for expanding prototype fabs to bolster the ecosystem.
- Supportive government policies like PLI, DLI, SPECS, and EMCs.
- Projected market growth for semiconductors and electronics in India, contributing significantly to the GDP.

Audience Interaction:

Question on Building a Robust Semiconductor Manufacturing Ecosystem

Rajiv Menon acknowledged the critical role of prototype fabs in India's semiconductor sector and discussed ongoing efforts to expand these facilities. He emphasised the need for integrated semiconductor research parks to foster innovation and development. Vikram highlighted opportunities for non-semiconductor MSMEs in the sector, such as supplying materials and equipment. He encouraged these businesses to participate in industry exhibitions to better understand the ecosystem requirements and potential collaborations.

Session 3:
Skilling and Scaling

Panel Discussion

Panelists:

Navin Bishnoi
AVP and Country Manager,
Marvell India Pvt. Ltd.

Dr. Arvind Shaligram
CEO, Science and Technology Park,
Savitribai Phune Pune University

Samir Patel
SemiX Semiconductor Technologies, IIT Bombay

Karthik Sankaran
CEO, Deshpande Startups

The panel highlighted the importance of innovative approaches, continuous learning, and industry-academia partnerships in skilling and scaling the semiconductor ecosystem. Addressing these challenges and leveraging collaborative efforts can drive the semiconductor industry forward and create impactful solutions for India and the world.
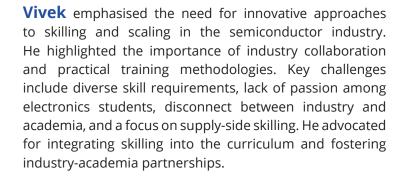
Moderator:
Vivek Pawar,
Founder, Sankalp Semiconductor Pvt. Ltd.

Vivek emphasised the need for innovative approaches to skilling and scaling in the semiconductor industry. He highlighted the importance of industry collaboration and practical training methodologies. Key challenges include diverse skill requirements, lack of passion among electronics students, disconnect between industry and academia, and a focus on supply-side skilling. He advocated for integrating skilling into the curriculum and fostering industry-academia partnerships.

Vivek Pawar
Founder, Sankalp
Semiconductor Pvt. Ltd.

Navin underscored India's role as a driving force in the semiconductor industry, stressing the importance of continuous learning and upskilling. He highlighted the need for multidisciplinary skills in the semiconductor value chain and called for hands-on, industry-relevant education. He emphasised the role of policymakers in ensuring up-to-date infrastructure and engaging students from an early age.

Navin Bishnoi
AVP and Country Manager,
Marvell India Pvt. Ltd.

Arvind discussed the comprehensive skilling required across all stages of semiconductor manufacturing. He stressed the need for precise parameter adjustments in fabrication processes and familiarity with industry-standard tools. He highlighted the importance of academia-industry partnerships and the potential for focusing on niche technologies like flexible organic semiconductors.

Dr. Arvind Shaligram
CEO, Science and
Technology Park,
Savitribai Phune Pune University

Samir highlighted the critical role of education in skilling and scaling the semiconductor industry. He emphasised the need for targeted training programs and hands-on experiences. He discussed SEMIX's interdisciplinary research and practical applications, aiming to address local needs and create relevant solutions. He called for scalable training programs leveraging virtual technology to drive transformation.

Samir Patel
SemiX Semiconductor
Technologies, IIT Bombay

Karthik Sankaran
CEO, Deshpande Startups

Karthik shared his experience in product development at Analog Devices and emphasised the importance of hands-on faculty for effective training. He advocated for a curriculum with integrated labs, industry adoption of colleges, and technology-enabled skilling initiatives. He highlighted the need for substantial training infrastructure and equipment for OSAT, ATMP, and fabs.

Key Discussion Points
- Diverse skill requirements and lack of passion among electronics students.
- Disconnect between industry and academia, and a focus on supply-side skilling.
- Need for hands-on, industry-relevant education and continuous upskilling.
- Industry-academia partnerships and practical training methodologies.
- Focus on niche technologies and comprehensive skilling across all stages of semiconductor manufacturing.
- Scalable training programs leveraging virtual technology and substantial training infrastructure.

Audience Interaction:

Question on Gross Enrolment Ratio (GER)
Arvind Shaligram discussed efforts to increase GER through outreach programs, flexible learning options, and vocational training.

Question on Accessibility of Skilling in Semiconductor Design
Vivek Pawar proposed simplifying the learning process by starting design education with Python to make it more accessible to students from diverse academic backgrounds.

Question on Motivating Faculty for Hands-On Skills
Navin Bishnoi recommended offering internships and industry exposure to faculty members to bridge the gap between academia and industry. He suggested incentives like recognition, research funding, and collaboration opportunities.

Maharashtra's Semiconductor Ecosystem: A New Chapter in Industrial Growth

Maharashtra is set to make significant strides in the semiconductor manufacturing sector, marking a new chapter in its industrial growth. Following extensive discussions with the state government, RRP Electronics Ltd. has received in-principle approval for subsidies to establish a comprehensive end-to-end semiconductor plant in the state.

The company's upcoming OSAT (Outsourced Semiconductor Assembly and Test) facility, scheduled to commence operations by September 16th, represents a pivotal development. Substantial investments have already been made to ensure the successful setup of this facility, which will play a crucial role in advancing Maharashtra's semiconductor capabilities.

The supportive government policies and attractive subsidies have been instrumental in driving this progress. Further discussions are underway for additional subsidies to establish a semiconductor fabrication plant. The government has earmarked 20 acres of land in Talegaon for a larger facility that will encompass both OSAT and fab operations. Collaborations with HMT Microelectronics and negotiations with two major industry giants are in progress, signaling promising future developments.

Aligning with broader discussions on technology and subsidies, the project has seen a significant investment of several hundred crores. This venture is not only a testament to the robust industrial policies but also a beacon of the collaborative efforts required to build a strong semiconductor manufacturing ecosystem.

However, one of the major challenges remains securing skilled manpower. The company's leadership is actively addressing this issue, aiming to create numerous employment opportunities and foster a skilled workforce within the state.
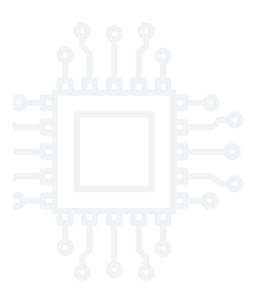
Rajendra Chodankar
Chairman,
RRP Electronics Ltd.

While there has been considerable attention on semiconductor developments in other regions, Maharashtra is poised to make its mark with this state-of-the-art facility. The project, officially launched on March 23rd, has garnered support from notable figures such as Dr. Anil Kakodkar and key investor Sachin Tendulkar. Their involvement underscores the importance and potential impact of this initiative.

Maharashtra's foray into semiconductor manufacturing represents a significant expansion from traditional sectors, such as border protection and surveillance systems. With the OSAT facility's operations set to begin shortly, the state is on the brink of becoming a major player in India's semiconductor ecosystem, contributing to the country's technological and economic advancement.

Forging the Future of Maharashtra's Semiconductor Ecosystem

I would like to share a bit about the Semiconductor Ecosystem Development Group (SEDG). Around this time last year, in 2023, a few of us were exchanging messages on the MEFC and MCCI WhatsApp groups. It was during these exchanges that Abhay and I captured the idea of starting something more constructive and qualitative focused on the semiconductor industry. We realised that WhatsApp could not serve as a business platform, so we decided to act.

We approached Director General of MCCIA Prashant Girbane with the idea of creating a dedicated working group aimed at developing the semiconductor ecosystem. This initiative was intended to support ecosystem development not just in Pune and Maharashtra, but also in other parts of the country.

After forming the SEDG WhatsApp group, we moved forward by organising about 8 to 10 lectures from many eminent personalities in the semiconductor field. Dr. Arvind Shaligram, CEO, Science and Technology Park, Savitribai Phule Pune University and Dr. H. S. Jatana, Group Head, Design and Process, Semiconductor Library, Mohali were among the key speakers. We also collaborated with SemiX Semiconductor Technologies from IIT Bombay to explore synergies and shared visions.

We dreamed of hosting a conference like this, where we could bring together many experts and attendees who are keen to contribute to the semiconductor initiative as part of India's broader electronics development. This session, or rather this conference, is just one instance of our ongoing efforts. We have many action plans and strategies lined up for both the short term and the long term. We envision active participation from all of you, and while it may not be feasible for everyone to be involved, we encourage as many of you as possible to join us in this endeavor.

One crucial realisation from a manufacturing perspective is the necessity of indigenous fabrication equipment. The high manufacturing costs can be significantly reduced by utilising locally produced equipment. From an RF background, I've noticed through interactions with various academic institutes that there's a critical need to bridge the gap between industry requirements

Mr. Ajit Chigteri

Group Head, Semiconductor Ecosystem Development Group (SEDG)

and academic capabilities.

We believe that Pune, with its rich legacy in the automobile industry, already has an ecosystem for building special-purpose machines, including expertise in metrology, material science, and precision machining. These are the same skill sets that Taiwan and China leveraged before establishing their semiconductor industries. Many think that the semiconductor industry is exclusive to big players, but it involves contributions from everyone in the ecosystem. Our goal at SEDG is to unite engineering experts from various fields to repurpose their skills, turning India into a semiconductor hub.

We have been grappling with the semiconductor ecosystem for over two decades. However, a significant opportunity has emerged due to geopolitical factors and government initiatives. We must seize this opportunity fully and work collectively to strengthen the semiconductor ecosystem.

Training of trainers in semiconductor technologies is another crucial aspect. While colleges have tools like Cadence and Synopsys, many faculty members lack the expertise to use them effectively, which ultimately affects students. We need to implement quick interventions in this area.

Lastly, there is a need for India-based VC funding specifically targeted towards the semiconductor industry. For Indian semiconductor companies to thrive, we need dedicated funding sources, which are currently lacking. Exploring this possibility is essential for our progress.

Views by SEDG Members

The SEDG team members emphasised various aspects crucial to the semiconductor ecosystem's growth. Indigenous fabrication equipment can significantly reduce costs. Bridging the

gap between industry requirements and academic capabilities is vital. Pune's existing expertise in special-purpose machines can be repurposed for semiconductor manufacturing. The geopolitical climate and government initiatives present a significant opportunity that must be seized. Training faculty in semiconductor technologies and the need for India-based VC funding are critical for long-term success.