SINGAPORE
SEMICONDUCTOR VOICE
Volume 14
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EMERGING STRONGER WITH INNOVATION AND COLLABORATION

Wasn't that in BLADE RUNNER?

Navigating the US Market

Biases that Maybe Tripping Up Your Decision-Making

SSIA
Singapore Semiconductor Industry Association

Emerging Stronger - Innovate, Connect and Collaborate

SEMICONDUCTOR BUSINESS CONNECT 2021

HYBRID EVENT

27-29 JULY 2021 (3 DAYS)

Organised by:

SSIA
Singapore Semiconductor Industry Association

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https://ssia.org.sg/semiconductors-business-connect-2021/

Foreword by Executive Director

We are almost at the halfway mark of 2021. While it may feel like nothing much has changed in the past months, we know that Singapore and the world have made great progress in vaccinating the population and the light at the end of this long and dark tunnel is becoming brighter by the day. The semiconductor industry remains a bright spot in our economy despite the pandemic. The sector is fortunate to have performed well when compared to other industries. Besides, our industry is set to continue its robust growth well into the next decade due to the digitalization trends, driven by technologies such as 5G/ 6G, AI, IoT and many more.

Despite this, we should not be complacent and must continue to strive to emerge stronger and better post-pandemic. We know that semiconductor manufacturing will grow tremendously over the next decade. Governments across many nations are investing heavily in big semiconductor companies to ensure they secure a significant share of this growth in the future. That said, other important factors to grow our industry are not only the heavy investment into large multinational companies, but also the strengthening and growth of the industry's local ecosystem on top of growing the talent pool for our industry.

With this in mind, SSIA will host the first Semiconductor Business Connect event on 27 to 29 July, aiming to grow the local semiconductor ecosystem by facilitating innovation, business matching and business collaboration. This is an important platform supported by government agencies and large MNCs to help drive our agenda to grow local companies to support our industry better. We believe in the famous quote attributed by Edward Everett Hale and Henry Ford "coming together is a beginning, staying together is progress, and working together is success". We have the entire ecosystem of the semiconductor and electronics industry here in Singapore. With strong support from the government, research institutions, institutes of higher learnings and supporting sectors, there is no reason we cannot grow our industry into a bigger global semiconductor hub.

We are also planning to bring back the Singapore Semiconductor Leadership Accelerator Programme (SSLA), after calls from companies to continue running this program after the last run in 2020. SSLA is an important leadership programme creating a pool of industry leaders who will lead this industry in the future. To date, we have more than 100 alumni of this programme.

SSIA will also be planning our inaugural SSIA Summit and Semiconductor Dinner at the end of September. Please stay tuned to our website for more information with regards to these events. You can also reach out to us at secretariat@ssia.org.sg if you would like to support our events in terms of sponsorship.

Thank you. Please stay safe and healthy!

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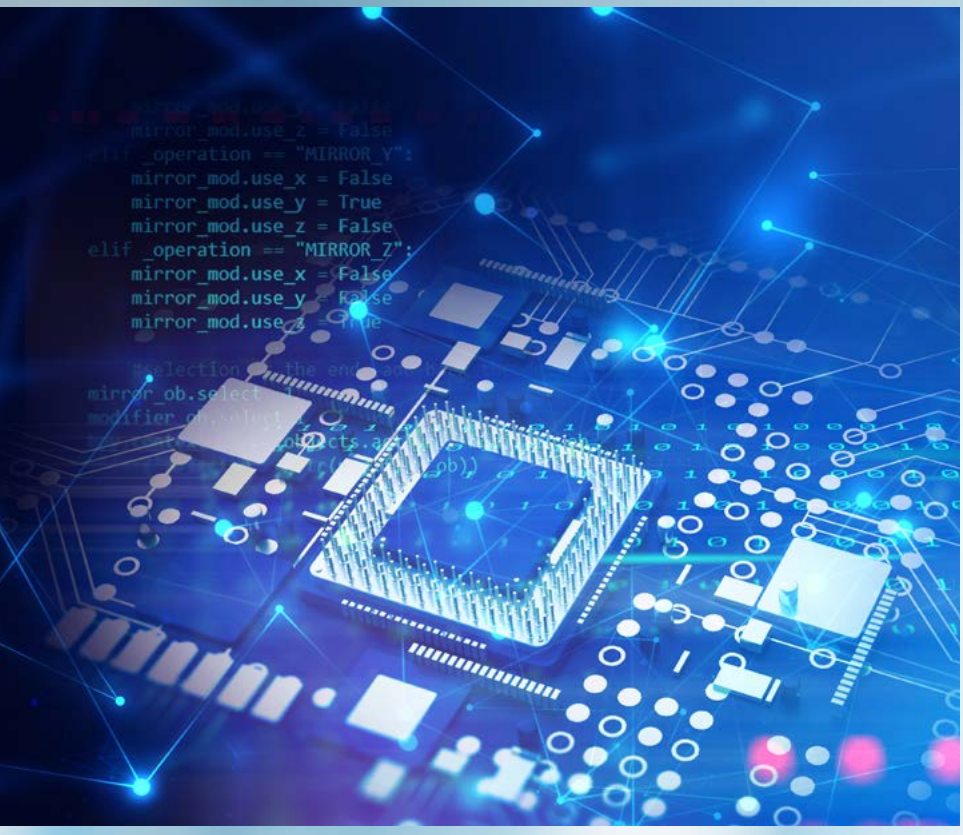
INDUSTRY

PEOPLE



AUTOMATION SUPPLIERS DAY is now known as

Semiconductor Business Connect 2021

HYBRID EVENT

The pandemic and ongoing trade tensions have a mixed impact on the semiconductor industry. While the sector is facing uncertainties such as the global chips shortage and supply chain disruption, it is set to continue its robust growth well into the next decade due to the surging demand for chips and emerging technologies.

As Brene Brown would put it, "vulnerability is the birthplace of innovation, creativity and change".

The semiconductor industry should embrace the change as opportunity not only for companies, but also countries to thrive in the technological space in the future. The Semiconductor Business Connect, previously known as the Automation Supplier Day, is an inaugural event aimed at growing the local semiconductor ecosystem by facilitating innovation through business collaboration. Themed **Emerging Stronger – Innovate, Connect and Collaborate**, the 3-day event held on 27-29 July 2021 will include keynote presentations and webinars presenting emerging technologies that companies can harness to grow their business, and most importantly, networking sessions connecting manufacturers and suppliers.

The Semiconductor Business Connect will be a milestone to grow the vibrancy of the Singapore's semiconductor industry. Join us to shape the bright future for the industry.

Please contact Daphne at **daphne@ssia.org.sg** for companies' participation or scan the QR code for event details.

SSIA HR Roundtable – Emerging Stronger for a New Normal

Over 40 HR Heads of the industry and partners joined the SSIA HR Roundtable with the theme 'Emerging Stronger for a New Normal' on 15 April 2021. Topics discussed included the latest hiring trends and initiatives supporting the company workforce facing the shifting mode of work. SSIA would like to thank Sharon Lim and Jessy Yau from Singapore Polytechnic, Hema from Uni Connect Pte Ltd and Winston Wong from Nanyang Technological University for their presentations and insights. It was an engaging session for participants where they shared their recent challenges in hiring.

Ang Wee Seng

Sharon Lim

Jessy Yau

Hema Annamalai

Winston Wong

HR Pulse Survey

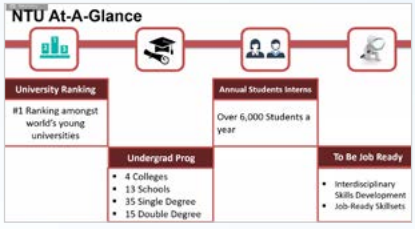
During the meeting, SSIA Executive Director Ang Wee Seng shared the results of an HR Roundtable pulse survey conducted in April 2021, which aimed to understand the current hiring and HR practices impacted by the pandemic.

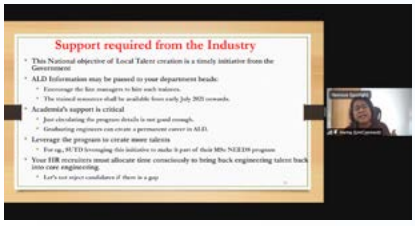
The survey looked at 4 broad categories – hiring, remunerations, Covid-19 measures and workforce management. The results showed that the challenge in 2020 was mainly hiring operators, engineers and technicians. It was cited that there was a lack of local skilled talents, or their vacancies were in niche areas of the industry. Job redesign may be the way to go post-COVID-19; however, the results showed that not many companies were considering redesigning jobs except for the engineering functions. Moving forward, companies are looking to hire technical staff - engineers, managers and technicians.

The detailed report will be shared with companies who participated in the survey. Companies who are keen to know more about the details or interested in joining the next round of SSIA HR Roundtable, please write to **secretariat@ssia.org.sg**.

Topics discussed at the SSIA HR Roundtable

TOPICS	PRESENTED BY
Overview of Industry Workforce Update and HR Pulse Survey	**Ang Wee Seng**, Executive Director, SSIA
Skills for Skills - Learning Skills To Help You Upskill	**Sharon Lim**, Senior Executive, Curriculum Quality and Innovation **Jessy Yau**, Deputy Director, Outreach & Development, Singapore Polytechnic
Training on Analog IC Layout Design	**Hema Annamalai**, Founder, Uni Connect Pte Ltd
Meeting Talent Pipeline Needs with Internship and Work-Study Degree Programme	**Winston Wong**, Deputy Director, Nanyang Technological University





Presentations at the meeting

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What are the Benefits of SSIA membership?

- Business networking opportunities
- Knowledge sharing platform with government agencies
- Extensive market outreach and branding opportunities
- Leadership and master class trainings
- Priority access to industry benchmark data and directories
- Priority in customised talent outreach programmes

To connect with us
visit https://ssia.org.sg

For more information about membership
visit https://ssia.org.sg/join-us/

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TP

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Our purpose is people

VEOLIA

SSIA

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IHCI
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Industry 4.0 Human Capital Initiative (IHCI) Enabler Programme

A unique eight-week hands-on programme to help Singapore manufacturers prepare for successful Industry 4.0 transformation

An Initiative by

Supported by

Anchor Partners

Strategic Partners

Made Possible with

Benefits of the programme

- Work with experienced Industry 4.0 and human capital experts
- Trial Industry 4.0 solutions in a low-risk setting
- Receive a full SIRI assessment and tailored transformation roadmap
- Diagnose and identify priority areas for at least 10% improvement in productivity
- Design critical human capital interventions to support and sustain transformation
- Join the IHCI Enabler Alumni Network

How much does it cost?

On a Per Company Basis & Excluding GST

	SME	Non-SME
4th Cohort (May 2021) *Subsidised fee*	S$ 6,325	S$ 18,975
5th Cohort (Aug 2021) *Subsidised fee*	S$ 6,325	S$ 18,975
Potential subsidised fee after SFEC and RISE (For each Cohort)	**S$ 132.50**	**S$ 8,975**

Want to find out more?

To learn more about the IHCI Enabler Programme, visit our website at: **https://ihci.sbf.org.sg**

To apply for the programme directly, or be notified of any upcoming Information Sharing Sessions, contact us at: **IHCI@sbf.org.sg**

Several years ago, I was invited to help a semiconductor organisation facilitate a quality transformation program. The mission - to eliminate preventable, human-error induced incidents that were impacting shipment and client retention. The data was clear – a 1% improvement would add millions to the bottom line. The program was equally straightforward – get everyone to submit their incident prevention ideas on how we could eliminate such excursions. Surely everyone could see how it made sense to participate.

When the heads of departments and section managers walked into the workshop, the air was thick with pessimism. The rumblings were clear – "they won't even follow SOPs, how to get them to give ideas?"

The change team had meticulously prepared a PowerPoint presentation laden with data and graphs. The deck was hardly required.

After the senior VP's welcome, a quietly-spoken engineer, well-respected by everyone in the room stood up to address his seniors. He shared how he had been the engineer assigned to analyse and produce the report on the most recent "high profile" incident. It had taken him and a colleague three months of 16-hour days to get to the root of the issue. That incident had coincided with the arrival of his first-born. He shared how he'd trudge home every night to see his wife and newborn in bed, and how he'd rise and leave before they did.

He recounted how he'd gotten to "know" his colleague so well that when he walked into a room, he could tell he'd been there simply through the familiar odour in the air. He'd missed his child's wet nappies, first chuckle and bath time. It was time he would never get back again. Looking into the eyes of his colleagues, he made a simple, heartfelt appeal "Please support this program. It MUST work. I don't want anyone to go through what I did".

You could have heard a pin drop. That story had lasted but 5 minutes. It was from the heart. And it moved hearts. And importantly, that translated into urgent action. 18 months later, one of the foundries reported a key milestone - zero incidents over a 365-day period.

Free Online Session in June 2021

They say a picture tells a thousand words, and a story, a thousand pictures. Story-telling is a master aptitude of leaders and influencers. Which would help you be a more effective change leader – mastering PowerPoint or the art of story-telling? Join me in the free online session 'Story-telling Skills to Capture Hearts and Minds' on 11 June 2021 to get insights into why story-telling is such a powerful tool, and how you can incorporate it into your business and technical presentations to make them memorable.

ABOUT THE AUTHOR

Dominic Siow
CEO/Co-founder, EQ Strategist and Amazon Best-Selling Author

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Upcoming Electronics & Industry Relevant Courses

Building a Smart Urban Farm (1 day)

Co-organized by SSIA & SP

5 June/ 19 June 2021

The objective of the course is to introduce participants on how a smart urban farm can create a sustainable and affordable food source and they will learn how technology can make farming effortless and increase yields. Basic farming knowledge, techniques and maintenance processes will be discussed. Participants will also learn hydroponics farming and enjoy hands-on session during the course.

Who should attend?

Agriculture farm manager, farm worker, farm owner, people interested in building their own urban smart farm

Wafer Fabrication in Semiconductor Industry (3 days)

Co-organized by SSIA & SP

7-9 June 2021

Interactive 3-day course with classroom sessions and practical laboratory work that provides participants with the relevant knowledge and skills of the Wafer Fabrication process in the semiconductor manufacturing industry. The courses are conducted in person.

Who should attend?

Those who have recently joined the semiconductor industry or engineering technical or personnel under the Eletronics Skills framework

Introduction to Industrial FMEA

Co-organized by SSIA & SP

1 June 2021

The objective of this course is to equip participants with the knowledge of Failure Mode and Effects Analysis (FMEA), a step-by-step approach for identifying all possible failures in a design, a manufacturing process, an equipment, or even a service. Participants will also have the opportunity to work on real-life case studies where they will learn how to create a proper risk assessment, prioritise the different critical levels of risk, and trigger necessary mitigation actions.

Who should attend?

Technician, Associate Engineer / Assistant Engineer, Equipment Engineer, Maintenance Engineer

Data Analytics for Electronics Industry

Co-organized by SSIA & SP

7 June 2021

The objective of this course is to equip participants with knowledge of fundamentals of data analytics. Participants will also be able to apply these analysis tools to their data when designing and developing their future intelligent systems for the electronics & semiconductor industries. There would be hands-on session with the data analysis tools such as data wrangling, visualisations, regression models and prediction. Participants can apply the knowledge and skills to help improve their operational tasks and increase work productivity.

Who should attend?

All engineering technical or personnel

IoT for Electronics Industry

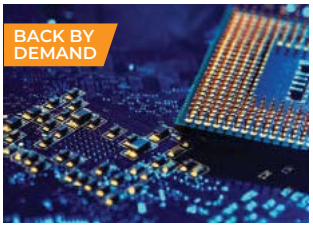
Co-organized by SSIA & SP

17 June 2021

One day classroom/practical session to equip participants with knowledge of the Internet of Things (IoT), IoT applications and its eco-systems used in the semiconductor/electronics manufacturing industry. There is a hand-on session for particaipants to apply their knowledge.

Who should attend?

All engineering technical or personnel



Semiconductor Processes

12-13 Jul/8-9 Nov 2021

This 2-day online course enables the learners to gain knowledge of the journey of semiconductor manufacturing from sand to finished chip. Students will understand the eco-system and how all of them come together to support the semiconductor industry

Who should attend?

Non-technical audience who wants to know a high-level overview of semiconductor devices and how they are fabricated

Quality Management Systems for Semiconductors

16-17 Aug 2021

The course covers the fundamentals of quality systems, and how each component supports the overall architecture of the QMS. It gives a general overview of how to implement these systems in the company

Who should attend?

Non-technical personnel in the semiconductor industry

If you are interested to customize an in-house course for your company, or for any other enquiries, please contact daphne@ssia.org.sg

Scan the QR code for more details

SINGAPORE SEMICONDUCTOR LEADERSHIP ACCELERATOR PROGRAMME

AUG/SEP 2021

Suitable for senior-level managers and directors with responsibility for strategic decision-making

SINGAPORE SEMICONDUCTOR EMERGING LEADERS PROGRAMME

CALL FOR INTEREST

Suitable for emerging leaders
(individual contributors or managers leading small teams)

Please contact Daphne at daphne@ssia.org.sg for more information and sign-up.

Organised by:

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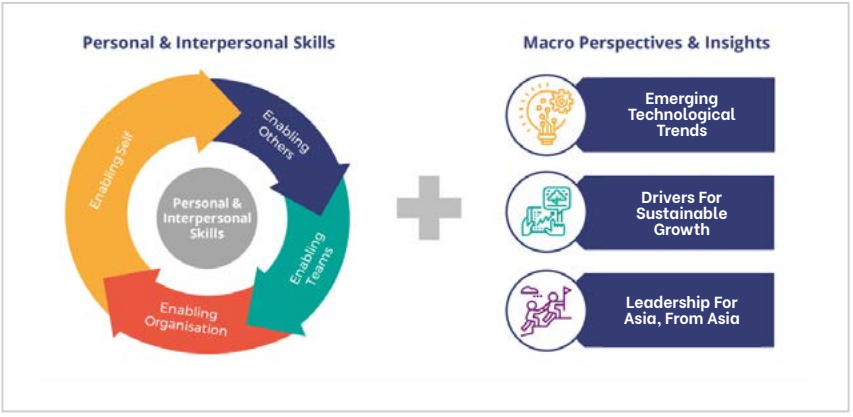
Two Customised SSIA Leadership Programmes To Be Launched

Singapore Semiconductor Leadership Accelerator (SSLA)

Since SSIA's signature leadership training programme, Singapore Semiconductor Leadership Accelerator (SSLA) programme, finished its last run in 2020, there have been calls from several industry leaders to continue this programme. Due to popular demand, SSIA has decided to extend the programme and launch the 6th Run this year.

The objective of SSLA is to accelerate the development of a pool of leaders who will bring our industry forward into the future. It aims at inspiring participants to continue creating revolutionary possibilities. Since 2017, the programme has helped grow a pool of 104 local leaders from 29 companies. This year, the programme will include both virtual modules and in-person small-group networking sessions.

Graduates of SSLA 5th Run (2020)



SSELP's course framework

Singapore Semiconductor Emerging Leaders Programme (SSELP)

SSIA has also designed a new leadership programme - the Singapore Semiconductor Emerging Leaders Programme (SSELP) to grow the emerging leaders who are individual contributors or managers leading small teams. It will be a month-long virtual learning journey around various aspects of leadership with a particular emphasis on self-leadership. The content will be highly contextualized and calibrated to the needs of Asian emerging leaders in the regional and global semiconductor industry. Participants will learn from experiential learning opportunities while developing networks with peers. SSLA will be launched in August/September 2021 (exact dates to be announced) while SSELP is now calling for interest.

Building a diversified talent pool will be key to the growth of the semiconductor industry in Singapore. SSIA hopes more companies will support this programme and drive the goal together. Please contact the SSIA team at **secretariat@ssia.org.sg** if companies are interested in nominating their staff to join the programmes, or to find out more.

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Emerging Stronger With Innovation And Collaboration

Though Singapore's electronics sector in general and the semiconductor industry in particular have outperformed other segments of the economy, this is just the start of a new era for the sector. The pandemic has pulled in all business plans of companies to digitalise to remain resilient for the future. The demand for semiconductor chip is expected to remain strong.

Innovation is key to ensure companies continue to stay competitive, and a strengthened local ecosystem will be crucial to offer them a robust platform to innovate and grow their businesses in Singapore and the region.

SSIA is committed in growing the local semiconductor ecosystem by providing platforms for businesses to collaborate and innovate, capturing new economic opportunities in electronics and manufacturing created by emerging technologies such as artificial intelligence (AI), 5G and the Internet of Things (IoT).

In this issue, we look into the new waves of innovations and opportunities across the semiconductor industry. There will be definitely more stories to tell in the coming years alongside the thriving industry.

The Next Generation of Wireless Technology

The excitement around the rollout of 5G technology could not be more palpable. We see this next-generation technology in news headlines and commercials, with promises to usher in the next wave of internet capabilities, speeds, and frictionless internet access. Let's look at what 5G is and how semiconductor advancements are driving this new technology.

5G technology can be summarized as the next iteration of wireless technology. 5G offers high-speed data transfer rates, much lower latency, or the time required for data to travel between two points, and the ability to handle significantly higher densities of devices per cell site.

The upgraded technology is the best-suited network to manage the increased data generated by IoT devices and next-gen electronics. 5G was designed with an extended capacity to better user experience (UX), power new deployment models, and deliver new services. 5G is expected to impact nearly every industry, enhancing transportation, agriculture, healthcare, and beyond.

How 5G will improve day-to-day life?

The advantages of 5G and edge computing are seemingly endless. Early indications anticipate the upgraded network will operate up to 100x faster than 4G and reduce network latency by 500%. Not only will 5G and edge computing improve the speed and efficiency of data transmission, but they will also significantly improve the performance of applications to allow for huge amount of data to be processed in real-time.

The reduced latency inspired by edge computing will bring the user closer to the network. In addition to the speed and processing power, 5G will also improve the connection between devices and virtual networks, streamline internet connectivity, and facilitate greater bandwidth for users.

Examples of what 5G will look like

Let's look at how it will revolutionize the way the world connects and communicates.

Public safety

Public safety is one of the areas that will benefit the most from the introduction of 5G. As cities adopt this next-generation technology, real-time analysis of video recordings could quickly identify dangerous situations in public places. Additionally, authorities could be automatically alerted in cases of car accidents or dangerous situations. Cities will also be able to

connect 5G equipment with mobile network coverage to monitor mobile devices including drones and robots.

Esports

The future of eSports depends on 5G. A sport that did not exist ten years ago, will soon be a billion-dollar business with over 300 million devoted fans. The continued growth of the sport, however, is contingent on the continued growth of the wireless network. eSports demands low latency for players to optimize gameplay, and to provide fans with the best possible viewing experience. Although most games were primarily played on PCs, they are now moving to mobile. Popular games including Fortnite, PUBG, Clash Royale, and Arena of Valor are all now available on phones. As 5G becomes more prevalent, eSports will benefit from the ease of watching and gameplay and likely attract more users, and continue to grow as a sport.

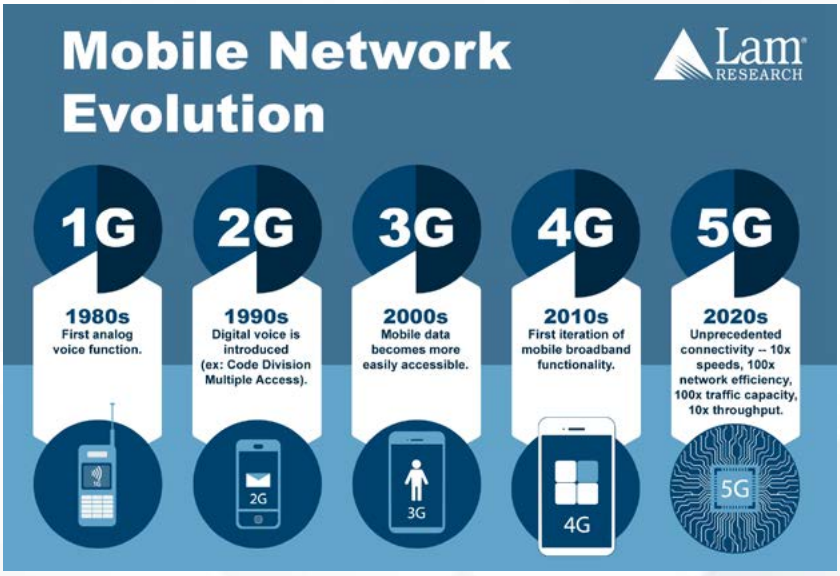
Manufacturing

The manufacturing industry will be vastly improved from 5G. Smart manufacturing will employ 5G networking capabilities to connect systems for real-time responses to changing conditions. Customer needs will be met in a more streamlined manner, as robots will be able to collaborate and synchronize remotely using 5G's lower latency and greater security.

5G Depends on Semiconductors

With the future rollout of 5G, the need for high-performing and reliable semiconductor chips has become essential. A study suggests that data creation will increase ten times by 2025, as data storage and analysis play an instrumental role in 5G, leading to an increased demand for chips.

The hype 5G has garnered is well-deserved, as technological capabilities will be catapulted to an unprecedented level. Despite the fact that it is misunderstood by most, the benefits of the upgraded network will affect all. As cities become safer, streaming becomes easier, and downloads complete faster, the capabilities of 5G will take shape. Chip technology – the unsung hero – is laying the groundwork for the rollout of 5G and far beyond.



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Lam RESEARCH

Wasn't that in BLADE RUNNER?

Credit: LADD COMPANY/RIDLEY SCOTT/WARNER BROS

The line between fact and fiction has become increasingly blurred, thanks to developments – including in semiconductors – that have brought to life conveniences, characters and creative inventions once spotted on the big screen

1. Hello officer KD6-3.7

In Blade Runner (1982), androids – aka Nexus 6 replicants – are virtually identical to humans and at least as intelligent as the genetic engineers who created them. While we're not quite there yet, semiconductor devices including low-power microprocessors, 3D sensors, accelerometers and gyroscopes are powering a new generation of life-like social robots. Just look at NTU's Nadine – she has her own personality, mood, and emotions, can adapt her responses and remembers previous conversations.

2. Driving the future

Who doesn't recall Johnny Cab, the automated taxi driver who ushers Arnold Schwarzenegger around in the 1990's hit Total Recall. Now imagine a smart car that can unload its passengers, park itself, then return for pick up when summoned via smartphone. Automotive Ethernet technology, which allows a massive amount of data to be exchanged between vehicle and external devices, has opened the door to a world of possibilities, this being just one. Using its Ethernet PHY, switch, controller and processor products, Marvell is revving the engines to bring autonomous driving technology to a whole new level.

3. Computing at your fingertips

Two decades ago, John Anderton (Tom Cruise) stood in front of a transparent screen, manipulating digital images by waving his hands in the 2002 blockbuster Minority Report. Today, Infineon's XENSIV 60GHz sensor chip enables Google Pixel 4 smartphone users to skip tracks, silence calls and interact with pokémon Pikachu with the wave of a hand. The radar chips basically turn human presence and

movements into natural interfaces – think about speakers and lights that turn on when you're in the room, and even measure your vitals.

4. Virtual worlds made real

In the cult science fiction movie The Matrix (1999), humans live in a computer-generated simulation. While we are still some distance away from Matrix-level Human Computer Interaction, the development in the field of virtual reality has been phenomenal. Last year, Micron announced the GDDR6X, the world's fastest discrete graphics memory solution that accelerates photorealistic 3D experiences at 1 terabyte per second, rates once thought impossible. The unprecedented speed of GDDR6X is at the heart of NVIDIA GeForce RTX 3090 and 3080 GPUs – helping to deliver rich, realistic, cinematic user experiences.

5. A connected universe

With the command "On screen!", Star Trek captains aboard the USS Enterprise could communicate face-to-face, and in real time with adversaries or allies on different planets or starships. Today, video calls are common tools for work, school or simply to catch up – and we have high speed data communications to thank for this. Inphi's Digital Signal Processing (DSP) chips, for instance, speed up communications inside and between data centres, improving the speed and quality of all the data traffic generated through emails, chats and video.

6. Watch this space

When it comes to wearable technology, it's hard to beat James Bond. One that stands out is Seamaster, the OMEGA watch worn by Pierce Brosnan in GoldenEye, with an inbuilt timer, remote detonator and a laser strong enough to cut a hole in steel. Today's wearable tech is far more benign, but no less impressive, offering seamless connectivity and location tracking, with Infineon pushing the envelope on lower energy consumption, and security solutions.

7. Bring on biometrics

Driver's licenses are a thing of the past in the 1987 science fiction movie RoboCop, where identification is established by the police force through digital facial recognition. Realtek's latest development – a next generation, low power, high performance wireless video-centric IoT edge device with built-in AI engine – brings us pretty close: a video doorbell capable of recognising multiple human faces simultaneously, surveillance cameras with human detection and motion tracking, and camera drones are just some of the things it enables.

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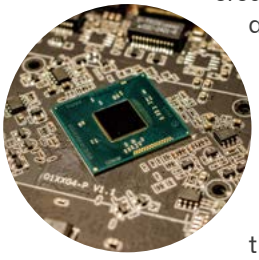
Navigating the US Market: Opportunities and Challenges for Singapore Semiconductor Firms

U.S. President Joe Biden and his administration are pursuing a range of trade policies with significant implications for the semiconductor sector and Singapore firms. Some of these policies are familiar from the Trump Administration; for example, certain restrictions on investment by and trade with Chinese companies. Other policies reflect new priorities, such as combatting climate change. These policies both pose challenges and offer opportunities for Singapore companies doing business with the United States. Singapore firms seeking to maximize their competitive advantage and avoid supply chain disruptions would benefit from taking a proactive approach to monitoring and complying with these new policies.

U.S President Joe Biden participated virtually in the CEO Summit on Semiconductor and Supply Chain Resilience on April 12, 2021 (Credit: AP)

Opportunities for Singapore Firms

On February 24, 2021, President Biden signed an executive order entitled "America's Supply Chains" that outlines a process for the U.S. government to identify and mitigate risks and challenges relating to supply chains for "critical and essential goods," including semiconductors and advanced packaging. Policy outcomes could include measures to reshore supply chains, create tax incentives for domestic manufacturing, and identify alternatives to existing supply chains.



President Biden has also pledged to seek $37 billion in funding to promote U.S.-based chip manufacturing. This follows existing legislation – the CHIPS for America Act – that would invest tens of billions of dollars in semiconductor manufacturing incentives and R&D. This push to dramatically expand U.S. semiconductor manufacturing capacity should provide opportunities for foreign firms to help the United States satisfy near-term demand and achieve its longer-term goals, whether through making direct investments in the United States, or selling components or supplying services to U.S. producers.

Export Restrictions for Manufacturers Using U.S. Goods and Technology

In addition to building up domestic capacity, the U.S. continues to exert pressure on market share held by Chinese technology companies and semiconductor manufacturers. The Chinese firm Semiconductor Manufacturing International Corporation (SMIC) was recently added to the "Entity List" administered by the Bureau of Industry and Security (BIS) of the U.S. Department of Commerce, resulting in a license requirement to send U.S.

export-controlled items to SMIC. BIS also continues to impose rules that restrict the ability of foreign foundries that use certain U.S. equipment, software, or technology to supply chips and other items to certain restricted Chinese entities.

In addition, the U.S. National Security Commission on Artificial Intelligence (NSCAI) recently issued a report recommending that the United States coordinate with foreign countries that produce chipmaking equipment on a policy of "presumptive denial" of export licenses for advanced chipmaking equipment to China.

Information and Communications Technologies and Services in the U.S. Supply Chain

A new Commerce Department rule enables it to review "any acquisition, importation, transfer, installation, dealing in, or use of" information and communications technology or services ("ICTS") with a nexus to "foreign adversaries." China is among the countries identified in the rule. The rule's scope is broad – applying to ICTS relating to critical infrastructure; networks and satellites; sensitive personal data; monitoring and home networking devices, drones; internet/telecommunications software; and emerging technology. The rule can apply to ICTS manufactured or supplied by persons in third countries that have certain specified connections to a foreign adversary, not just those provided directly by a foreign adversary. Commerce would have the power to prohibit specific transactions or order other measures to mitigate U.S. national security concerns. Companies will be able to seek licenses in advance to avoid post-hoc enforcement.

National Security Reviews of Inbound Foreign Investment

The United States continues to screen investments in the semiconductor sector through the Committee on Foreign Investment in the United States ("CFIUS"). In 2020, CFIUS cleared three different acquisitions of U.S. semiconductor companies from Germany, Taiwan, and the United Kingdom, but multiple prior deals involving Chinese firms seeking to acquire semiconductor firms have been blocked or withdrawn following CFIUS scrutiny. Given the Administration's prioritization of building up the U.S. semiconductor industry, foreign companies contemplating acquisitions and mergers with U.S. companies should be prepared for the possibility of a CFIUS review.

Forced Labour

The United States has increasingly focused on alleged forced labour concerns. U.S. Customs and Border Patrol (USCBP) has provided guidance on compliance with the U.S. prohibition on forced labour and begun to expand its use of "withhold release orders," which allow USCBP to detain goods suspected of being manufactured abroad with forced labour. Companies can expect an increase in investigations and enforcement actions related to forced labour and may wish to closely examine their supply chains to ensure compliance.

Conclusion

Navigating U.S. trade and investment policy is never an easy task, but there are major investment opportunities in the U.S. market in the coming years as a result of the Biden Administration's focus on building up U.S. semiconductor manufacturing capabilities. SSIA members can identify opportunities and navigate potential challenges by monitoring these developments carefully and considering their next move.

ABOUT THE AUTHORS

Jeffrey G Weiss, Meredith Rathbone

Steptoe

www.steptoe.com

A Breakthrough Technology For Semiconductor Nano-Characterization

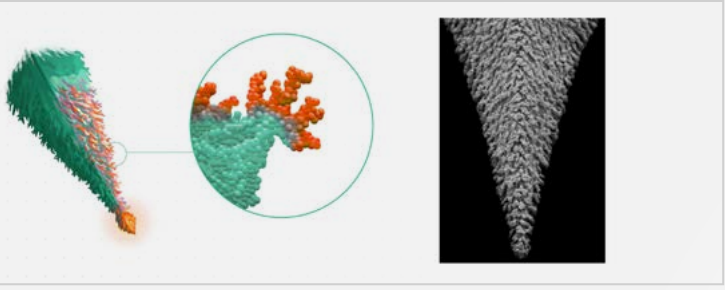
In the last few decades, the development of semiconductor processing technology has been trending towards the fabrication of devices with ever smaller nanoscale domains, which is directly correlated with the need for size and location characterization as well as material-specific identification with high spatial resolution. Furthermore, some current challenges in the semiconductors field, such as the detection of possible material defects or contamination, need to be solved.

A key tool for nanotechnology research in semiconductors and other realms is Atomic Force Microscope (AFM). AFM-based techniques, such as TERS, s-SNOM or nano-FTIR, allow for the chemical identification of samples with a spatial resolution beyond the diffraction limit.

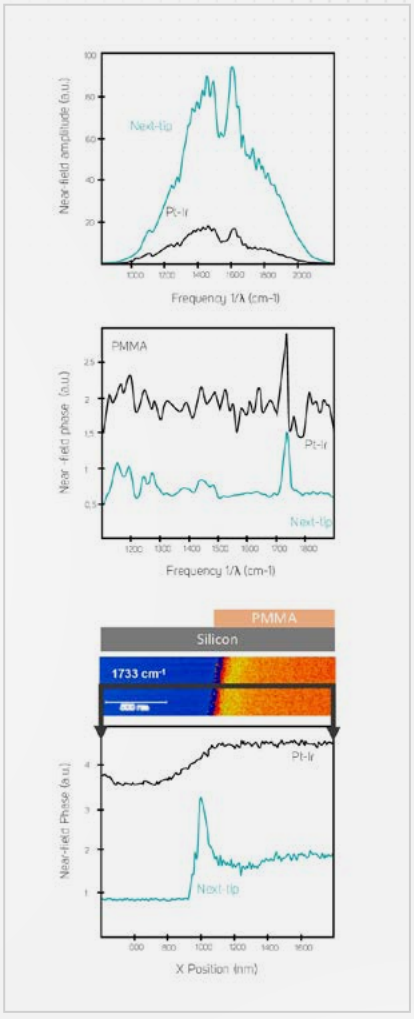
However, the use of a suitable AFM probe is crucial as it may limit the measurements due to a low sharpness (leading to an insufficient spatial resolution) or a lack or loss of metallic coating while measuring (resulting in a low or non-existent nanospectrocopic sensitivity), to name just a few. When it comes to infrared spectroscopies, the metallic coating is essential: it highly determines the spectroscopic sensitivity, the signal-to-noise ratio (SNR), and the spatial resolution.

New Morphology at the Tips Creates New Opportunities

The Next-Tip Nano-IR probes provide x5 higher IR signal, a higher SNR and an extremely high spatial resolution. This is possible thanks to their special coating with metallic nanoparticles that provides the probes with a new morphology, as it is shown in the SEM image. Also, the presence of branch-shaped nanostructures on the lateral faces of the tip results in an increased roughness. This feature leads to a longer lifetime of probes and a remarkably high spatial resolution: up to 3 nm!



Schematic and SEM image of Next-Tip nano IR probes



Our tips can be used in NEASPEC, BRUKER (Anasys) and Molecular Vista Systems.

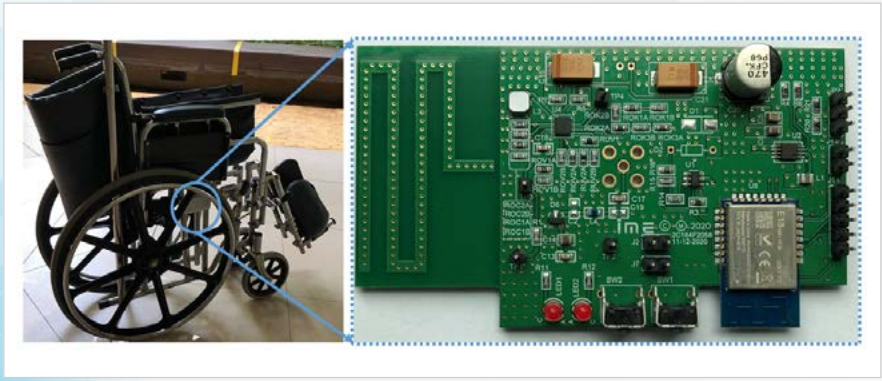
SOURCE OF CONTENTS

Next-TiP

www.next-tip.com
info@next-tip.com

How Radio Frequency Harvesting Can Power the Tracking of Wheelchairs and More

Energy from wireless communications signals can be captured and harvested to power low-energy electronic devices.



*Wireless powered sensor deployed for asset tracking application. Credit: A*STAR IME*

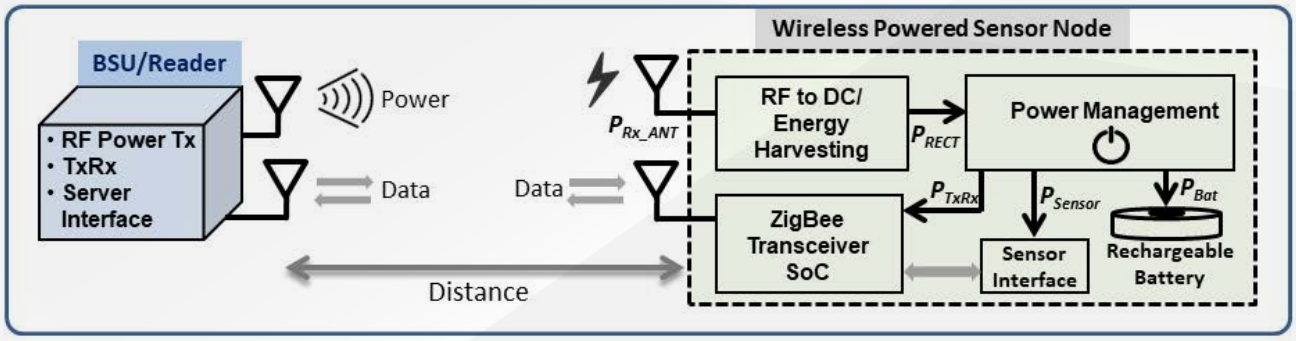
Wireless Radio Frequency Power Transfer Energises Asset tracking

Ever since Nikola Tesla's first demonstration of wireless power transmission over a century ago, the technology has since come a long way. Innovations in energy harvesting mean that we can now power low-energy devices with energy harvested from various sources, such as light, heat or radio frequency (RF) signals. Of these sources, RF waves are very promising due to their easy availability.

"In our always-connected world, radio frequency waves are readily available, being generated by transmissions from wireless networks, our mobile phones and laptops. As the amount of data we transmit increases exponentially, it provides great potential for energy harvesting," said Dr Raju Salahuddin, Scientist, Institute of Microelectronics (IME), Agency for Science, Technology and Research (A*STAR).

It means that connected devices with sensors can now derive their operating energy from RF wireless power transfer without using batteries. An example is an Internet-of-Things (IoT) deployment in a healthcare setting that tracks assets, like wheelchairs.

"Wireless-powered sensor technology will help the adoption of IoT across different sectors," said Dr Salahuddin. "That includes machine health monitoring in heavy industries, microclimate sensing in agriculture, smart home solutions, and in manufacturing plants where limited human access is preferred due to hazardous conditions."



*Wireless powered sensor deployed for asset tracking application. Credit: A*STAR IME*

Reducing Battery Dependency

When electromagnetic waves are captured and converted into usable continuous voltage (DC), it can recharge batteries, lengthen battery life, or even replace batteries and power ultra-low consumption devices.

Currently, batteries power most IoT devices, and a battery increases the device's cost, weight, and size. Besides, battery replacement is a costly and time-consuming process, especially when many devices are spread over wide or inaccessible areas. Hence, eliminating the need for a battery will reduce the size and cost of the device and improve its reliability, portability, ease of use, and environmental friendliness.

"Implementing this technology can help us reduce battery dependency, which will ultimately positively impact the environment," said Dr Salahuddin. "RF energy harvesting is a 'green', self-sustainable operation which can potentially provide unlimited energy supply to power up low-power devices remotely."

Improving Operation Efficiency

A*STAR's IME has improved the system operation efficiency for RF energy harvesting capability to the sensor nodes or end terminals. The team has custom designed the antenna and energy harvesting interface to improve long-distance wireless powering sensitivity.

This technology also reduces IoT energy consumption over time. The end-to-end IoT solution tracks overall energy consumption and can allocate operations intelligently to achieve better system energy efficiency.

"RF energy harvesting can offer accurate and timely tracking of fixed and mobile assets, while improving energy efficiency. When implemented, it can help to do away with searching for critical equipment and save on down time," said Dr Salahuddin.

Given the potential of the technology, IME plans to license it to small and medium-sized enterprises and startups. Partners will be able to utilise the RF powered or energy harvester design capabilities for asset tracking.

This can address smart nation solutions, industrial IoT, asset tracking, and environmental monitoring, which is a market that is expected to grow to US$1.09 billion by 2027, according to ResearchAndMarkets.com.

Next, the IME team has set its sights on integrating the energy harvesting technology for 5G IoTs. This will support more use cases and a larger number of nodes with lower latency, and power on even more low power wireless IoT devices.

Learn more about this exciting research here: **www.a-star.edu.sg/ime/Research/iot-on-the-edge**

SOURCE OF CONTENTS

A*STAR's Institute of Microelectronics (IME)

Role of Predictive Maintenance in Industry 4.0

Plant Maintenance has progressed from Reactive, through Preventive and on to Predictive methods. This is a disruptive development driven by the confluence of several factors – miniaturized sensors; ubiquitous availability of wireless bandwidth and cloud computing capacity. Remote monitoring of equipment 24X7 is possible as a result. Combined with deep understanding of the mechanics, it enables machines to run forever within operating conditions!

AccuPredict's Approach to Predictive Maintenance

AccuPredict has nearly four decades of experience in providing Condition Based Monitoring of equipment with a long-term stable client base in Asia, Europe, the Middle East & Africa. We have upgraded the offering using IoT based sensors and ML algorithms to improve the efficiency of our Engineers. We approach Predictive Maintenance from Machine Fundamentals rather than pure Pattern Matching based solutions.

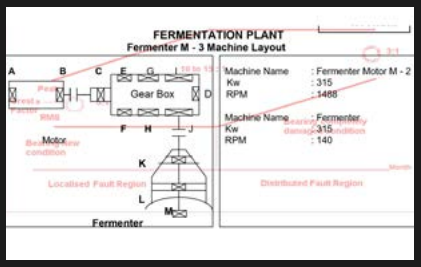
Here's how customers benefit from our differentiated approach:

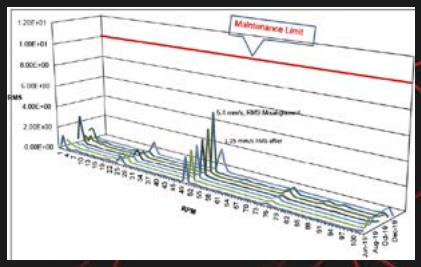
1. **Accelerate rollout of Predictive Maintenance:** We start providing corrective actions needed and MTBF from Day 1. Our trials do not take more than a month as we do not need to build and train machine models.

2. **Lead time to failure in terms of months rather than days:** We do this by tracking vibration trends at specific frequencies of each component rather than an overall pattern. Customers benefit by not having to disrupt manufacturing schedules. They are also able to reduce inventory of spare parts. Most importantly by keeping equipment and components within their operating parameters we enable customers to extend machine & component life. This is a critical ingredient of their ESG strategy.

3. **We use our deep experience in vibration analysis to help customers improve their equipment designs:** We use our understanding of equipment vibrations to identify changes needed to machine design to eliminate causes of resonance leading to component failure.

Case Study: Improving Reliability of Fermenter in Pharma Plant





Our Pharmaceutical customer's Fermenter was developing excessive vibration. We identified the issue was with bearing 'C' out of the twelve bearings we were monitoring. The root cause was a shaft misalignment. This would have led to a failure in 9 months. We advised the engineering team to complete the alignment at their next planned shutdown. This led to a reduction of the vibration to normal levels and avoided an unplanned shutdown.

ABOUT THE AUTHOR

Milind Yedkar
Milind is the co-Founder & CEO of Singapore based startup AccuPredict Services Pte Ltd (www.accupredict.io) that provides Predictive Maintenance as a service to manufacturers Worldwide
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Who We Are

Technology advancements in lighting, especially LED, are creating tremendous opportunities in the field of light. Lighting solutions today not only need to work and to last, they need to give customers a competitive edge. Companies developing automotive, mobile, IoT and illumination lighting applications require a partner who can collaborate with them to push the boundaries of light. With more than 100 years of inventions and industry firsts, Lumileds is a global lighting solutions company that helps customers around the world deliver differentiated solutions to gain and maintain a competitive edge.

As the inventor of Xenon technology, a pioneer in halogen lighting and the leader in high performance LEDs, Lumileds builds innovation into everything it does. What's more, quality and reliability are guiding principles for Lumileds. The company demonstrates this by maintaining control over materials, processes and technologies and by helping customers engineer the best quality of light for their application to achieve the highest levels of performance.

The best innovation happens when great minds work together. Lumileds acts with integrity as a trusted partner to its customers, honoring commitments, offering deep expertise, and going the extra mile — making the world better, safer, more beautiful — with light.

We're excited to bring improved flux to our industry-leading LUXEON 5050 Square LES LEDs, enabling a variety of industrial and outdoor applications with top-notch corrosion resistance and luminance output in a complete range of CCTs and CRIs.

Career Opportunities here

https://bit.ly/3wfo3zu

Find out more here

www.lumileds.com

DIVERSITY FOR SMARTER INNOVATION

At Applied Materials (Applied), we believe in the power of diverse perspectives, experiences, and backgrounds to strengthen our ability to serve the industry better. Our work culture is fine-tuned to ensure that each person has a fair and equal opportunity for career advancement which then ensures that we attract and retain top talent.

Women bring valuable perspectives, ideas and approaches to our industry that is traditionally male-dominated. This diversity is a key to our ability to solve our customers high value problems, and thus our competitiveness and business growth.

Singapore's Ministry of Social and Family Development (MSF) declared 2021 as the Year of Celebrating SG Women, and we want to celebrate some of the women and allies in Applied who are leading this charge into a more inclusive and resilient future.

Joyce Lim,
Vice President,
Global Supply Chain

Joyce Lim joined Applied Materials in March 2019 as the Vice President, Global Supply Chain, bringing with her over 25 years of leadership and functional experience.

> "There is a massive opportunity for organizations to **elevate female leaders with strong skills beyond technical competencies.** This will enable innovation and differentiate between organizations that successfully transform and those that get left behind.

Joyce Lim wants to dispel the misconception that women are not tech-savvy enough for the semiconductor industry.

"It is typically the exact opposite. Women have much to contribute," she said.

"Studies have shown that with the inclusion on woman into the workplace, there are lots of benefits such as increasing the pool of talent in the industry. Time and again, evidence supports the theory that gender diversity has a positive impact on the bottom line.

"According to McKinsey, the most gender-diverse companies are 21% more likely to experience above-average profitability," she said.

Joyce has over 25 years of experience in Supply Chain Management. She had experiences in managing all the Supply Chain functions while in Motorola before moving to Kulicke and Soffa (K&S) in 2010 to head the Global Supply Chain function. She was the Senior VP of Global Supply Chain and Operation of K&S before she joined Applied in 2019 as VP of Global Supply Chain, WorldWide Operations Group.

More and more women are taking an interest in the semiconductor industry and Joyce expects the trend to continue. Her advice to women stepping into any male-dominated industry is to stay focused in their role and be a person, not a gender.

"Come in with the right working attitude, behaviour, and work ethic. Show your passion and drive in what you do. Show accountability. The semiconductor technology will continue to evolve – new discovery, disruption technology, so keep yourself very engaged with the technology trends."

As an MBA student in Arizona looking for a job, Munirah Mahyudin quickly realized that Applied Materials had a welcoming culture and the promise of a satisfying career, something she was determined to be a part of.

Being a woman in a male-dominated industry meant finding her voice.

"I needed to stop being shy about asking questions. When you start asking questions, you start learning more and they will know you are capable," she said.

Currently, women make up about one-fifth of Applied's workforce, a figure that Applied is committed to scaling up as they increase representation in the company. This will put Applied in a position to reap benefits from the diversity that women bring to the workplace.

Although Applied is part of the manufacturing sector, it has come a long way from its factory roots. The skill set required has also evolved.

> "If everyone has the same mindset **we won't get creative solutions.**

Munirah Mahyudin, Commodity Business Manager

Munirah Mahyudin is Commodity Business Manager with Applied Materials and is responsible for procurement. She is also an executive committee member of the Applied Materials Women Professional Development Network.

Munirah explained that Applied has high-tech manufacturing facilities where the work is all done in clean rooms – places that are even cleaner than a hospital operating theatre.

To girls and women who are pursuing careers in the semiconductor industry, Munirah wants them to aim higher than where society wants to put them.

"I would tell my younger self to never doubt my ability or voice. Self-doubt takes away confidence and it will show. It will hurt your future," she said.

And while Munirah has conquered her self-doubt many times, having allies sharing the work at home also helped: "I know that for a lot of people, it always falls back on the woman to take care of the family. That's why family support is important. At the end of the day, you want both – family and a career."

Tan Way Tat, Director of Technology and Applications

Tan Way Tat is Director of Technology and Applications at Applied Materials. He has a strong passion for developing people, solving complex technical challenges, and driving continuous improvement projects.

The company culture makes or breaks a workplace, and Tan Way Tat strongly believes that the leadership should be accountable to make sure the work-place is safe and inclusive.

"In my team, I don't see the difference between men and women in their ability to contribute to the company. Promotion is based on increased in scope of work, responsibility, expanded capability," he shared.

Way Tat has seen more interest from the customer-facing field team in attracting female engineers to the company's talent pool, a traditionally male-dominated world.

"The interest in a diverse workforce is there to leverage on different points of view and approaches. This can spark creativity and innovation, which in turn helps address the complex issues that we face all the time," he said.

Having the diversity in his team also helped cover all angles in troubleshooting and engagement, especially when stakeholders and customers also come from a diverse background.

"It is important to be able to see things from their perspectives."

Technology advancement also meant that long hours of heavy manual labor is no longer a key factor in the semiconductor industry. More automation has meant that the work tends to be focused on data analytics.

With the current accelerated pace of digitalization, technology is going to touch every aspect of our lives, making the outlook for the semiconductor industry very bright.

"This industry will enjoy tremendous growth, plenty of career development opportunity for both men and women who have a passion for technology," said Tan.

"Women have a strong tendency to pause and listen, and this helps in better understanding of concerns when it comes to troubleshooting and brain-storming ideas. The women I've worked with are generally very meticulous and have strong follow-through."

> "Women have much to bring to the table – **their ability to listen and pick up non-verbal cues** translates into better understanding of customer concerns and overall customer management skills.

For more information, please visit www.appliedmaterials.com

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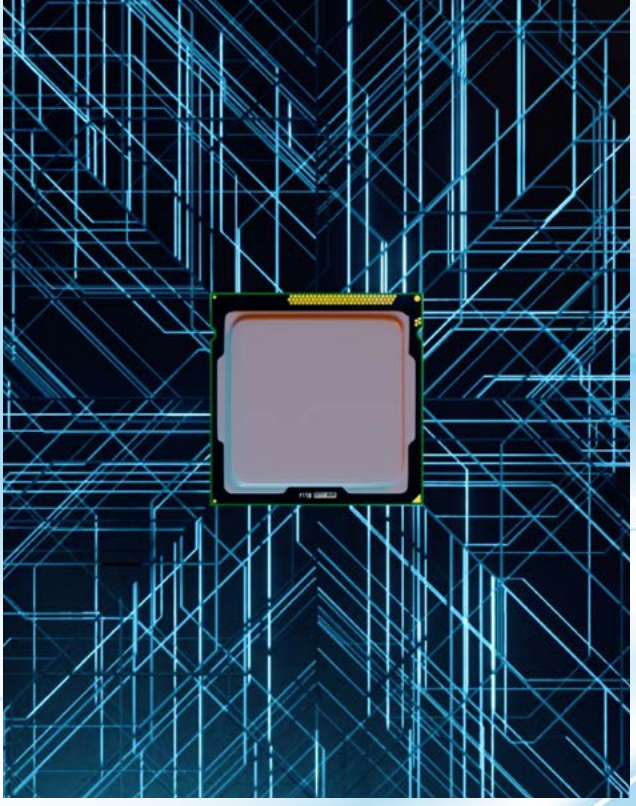
Semiconductor Tradewinds March/April 2021



These days, every day is an exciting day in the semiconductor segment with the global chip shortage causing high demand throughout the supply chain from material suppliers to chip and assembly suppliers. This causes strain throughout the industry, and any minor hiccup has a significant impact on the chain. The shortage is not just for the automotive segment but also impacts many other segments ranging from mobile devices to optical devices.

New Records

Global chip shortages continue driving the semiconductor industry to new highs. Most foundries and OSATs reported record revenues in Q1, with TSMC reporting record revenue results of US$12.76 billion for the quarter. IC Insights is forecasting that total semiconductor shipments will rise 13% this year to a record high of 1.135 trillion units.
A similar situation is seen in the photonics industry with very high demand constrained by shortages of LED chips and raw materials.

Chip shortage is not the only supply chain problem as raw materials prices and lead time are also significantly increasing. Many suppliers are using this shortage to increase prices, and this shortage is predicted to last into 2022.

Photo from Taiwan Semiconductor Manufacturing Co., Ltd.

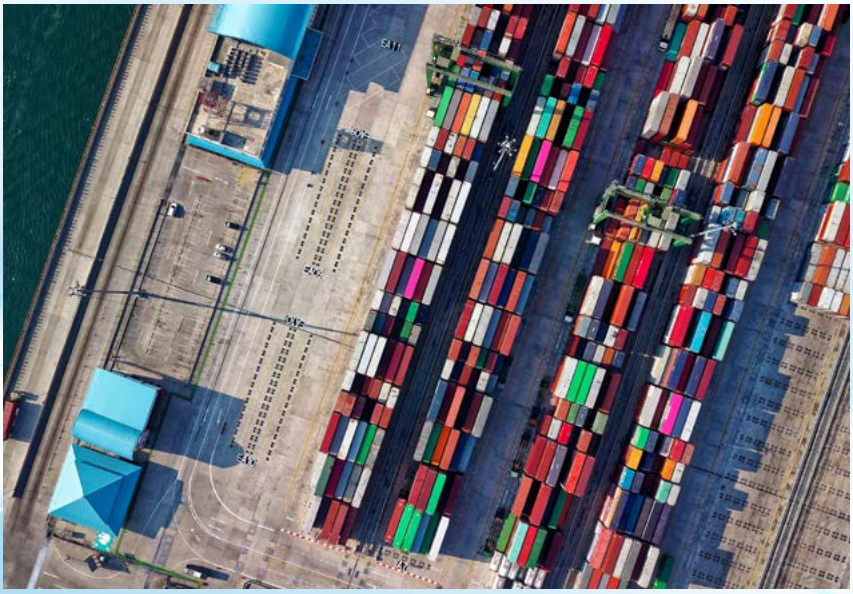
Supply Chain Hiccups and Threats

The global chip shortage means that any hiccup in the supply chain has a major impact. Recently, there have been several events that have further tightened supply.

In Texas, US, a power outage caused by a major winter storm in February 2021, led to the shutdown of Samsung, NXP and Infineon's fabs in the state for around a month. Samsung has reported the event caused US$270 million loss. A major fire in March at Renesas Naka N3 300mm Fab in Ibaraki Japan shut the Fab down for 1 month. The facility will only be back at 100% production capacity by the end of May.
In April, a power trip caused by a cut power station cable lasted almost 8 hours disrupting TSMC's Tainan Fab14 P7 40nm line.

There are other potential threats. The pandemic is still not under control in many countries. Besides, the worst drought in the last 50 years in Taiwan is threatening the water supply there. Whilst the US-China trade war is no longer escalating, geopolitical situation between China and Taiwan is another risk. Both of which are unlikely to occur but these potential threats still cannot be eliminated.

Globally, the chip shortage is waking governments up as to how concentrated in Asia the semiconductor supply chain is, especially for foundry manufacturing. The top 2



manufacturers, TSMC and Samsung, hold 73% market share, with TSMC accounting for 55% according to Trendforce. Taiwan and South Korea collectively hold 81% of the global market in foundries.

As a result, both US and Europe are trying to increase the amount of locally produced manufacturing.

Government Support

The US government has announced its intent to offer US$50 billion in incentives over the coming years to attract local semiconductor manufacturing. Whilst Europe has not announced details of its incentive program, it is planning similar incentives and the EU has set aside 20% of the US$814 billion coronavirus response fund for investment in technology, with silicon expected be a key priority.

With the US & Europe looking to increase their market shares, governments of Taiwan and South Korea have recently announced they intend to put in place measures to keep their leading positions.

Increasing Capacity

Whilst the incentives on offer from the US and EU look large, the amounts pale compared to the amount of investment which the world's leading semiconductor manufacturers have recently announced. TSMC has recently announced a 3-year US$100 billion investment plan of which US$30 billion is expected to be spent this year to build Fabs in both US and Taiwan. Samsung will also spend US$30 billion this year on its semiconductor business, and plans to invest US$116 billion on its non-memory business through 2030 with new Fabs in the US and South Korea. SK Hynix has announced it plans to spend $106 billion on new complex of 4 fabs in South Korea. Meanwhile, Intel has announced it will spend US$20 billion on two new plants in the US and planned for more factories in US & Europe. In addition, other leading foundries and memory producers have also announced capex of up to US$10 billion each to increase capacity. All the investment is fuelled by the current global shortages and predicted demand for fifth-generation (5G) mobile networks, connected cars and artificial intelligence (AI) chips.

Most of these new capacities are expected to come on line in 2023/2024, which mean boom times for the semiconductor equipment industry, and don't forget this is only the investment planned outside of China. China will also continue investing heavily in the semiconductor industry in the next few years as it continues with its 'Made in China' policy.

Prevailing Tailwinds

It looks at least for this year there should be strong prevailing tail winds powering the semiconductor segment to new records. There are some concerns on the horizon that some of the current demand may be double bookings and inventory building. However, at least for the next few quarters, the picture looks rosy. In the longer term, there is a question of whether the rise in demand caused by 5G, automotive content and AI will be enough to fully utilise all planned new Fab's coming online in 2023/24 onwards. Only time will answer that but, in the meantime, we should enjoy the boom times whilst they last.

ABOUT THE AUTHOR

Mark Dyson
Head of Global Subcon Manufacturing of Osram Optoelectronics

AEM Recognized for COVID-19 Response at 2020 Intel Supplier Continuous Quality Improvement (SCQI) Program Award

AEM has won the Supplier Achievement Award (SAA) in the COVID-19 response category from the 2020 Intel Supplier Continuous Quality Improvement (SCQI) Program Award. The SAA recognizes companies in the entire Intel supply chain who are steadily improving across the board and are exceeding expectations in at least one critical area.

In particular, AEM was recognized for its extraordinary performance, innovation, and resolve demonstrated in the face of pandemic-related supply-chain challenges. The company was also appreciated for its efforts to ensure uninterrupted supply and help Intel meet customer needs while keeping its employees and communities safe.

Chandran Nair, Chief Executive Officer of AEM, said: "We're humbled to receive the award and recognition from Intel, who is our valued customer and partner. With customer intimacy at the core, we understand our customer's challenges and are agile, bold, and collaborative in our problem-solving approach. We continue to partner closely with our customers – innovating, enhancing reliability, and delivering success."

During the onset of the pandemic, AEM's immediate priorities were early Business Continuity Plan (BCP) implementation and Safe Management practices across sites. With the subsequent lockdowns in Singapore and Malaysia, AEM's focus shifted to getting ahead of the COVID-19 impact by establishing supply chain resilience and mitigation plans through sites' self-sufficiency, securing essential materials through global sourcing, and increased safety stocks.

Amidst the pandemic, AEM partnered with customers to enhance availability and collaborated to scale up engineering projects and expanded capacity across the Singapore, Malaysia, and China manufacturing sites to support production ramps and the timely execution of engineering commitments. AEM's Engineering Teams operated on split shifts as part of the BCP, and the Field Service Engineers (FSEs) also leveraged Virtual-Reality (VR) technologies for virtual teaching and training across all manufacturing sites due to global travel restrictions. These measures ensured seamless production and fulfillment of all production shipment schedules, equipment installations, and development milestones. AEM surpassed their customers' shipment orders for a record revenue year.

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Reinventing Manufacturing with 3D Printed ESD Tooling

About Markforged and ONYX ESD

Markforged (3D Printer Manufacturer) recently launched its latest material called Onyx ESD. It is the most advanced polymer ever developed. It's precision-engineered to possess an extremely tight range of surface resistance (static dissipative value of 10^5-10^7 ohms) – meeting ESD-safe requirements of the most stringent manufacturers. This material is perfect for the electronic and semiconductor industries to produce Electronics enclosures, transfer and packaging trays, pick-and-place, transfer tools and more.

Columbia Elektronik Case Study

A company that has benefited from Markforged ESD would be Columbia Elektronik AB, a Swedish manufacturer of complete test fixturing solutions for the Nordic electronics industry. The company has seen an increase in demand for ESD-safe materials due to the changing manufacturing landscape and rise in the need for more complex electronics.

Test snap-fit fixtures pictured (above) hold electronic components in place during testing. Previously, the team would either machine these fixtures or outsource 3D printed ESD-safe parts. Neither was a perfect solution – machining the parts in house limited geometric freedom and used internal machinist time, while third-party 3D printed ESD-safe parts had poor surface quality and dimensional accuracy.

3D Printing with Markforged, they were able to save their customers both time and effort when using their product by improving functionality enabled by the freedom of additive manufacturing. They designed the 3D printed Onyx ESD fixtures in one piece instead of two, eliminating the need for additional assembly time or tooling. The team was also impressed by the cost reduction and the sleek surface finish of the fixture parts, straight off the print bed. "Now with Onyx ESD, we will be able to print high-strength ESD-safe parts on demand that are customer ready. With Markforged Onyx ESD, engineers and designers at Columbia Elektronik will finally have the tools they need to meet rising demands in their industry," said Christer Lang, Design Engineer Columbia Elektronik.

Onyx ESD Spool

Chemtron Pte Ltd – Local Markforged Partner

Chemtron Pte Ltd **www.chemtron.asia** who is representing Markforged locally in Singapore is a complete 3D Solutions Provider where they empower local companies to adopt this 3D technology to cut cost, shorten lead time and automate workflows for our customers. They sell the 3D Printers as well as provide 3D print services for their customers. You are able to reach out to them at **info@chemtron.asia** for more information about this.

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An Interview with Regina Liew from UTAC

Regina and her team at UTAC

Regina is the Senior Vice President, Chief Procurement Officer, Customer Service, Business Planning at UTAC with over 18 years of experience in the semiconductor industry. SSIA had an exclusive interview with her sharing diversity and inclusion in her company.

Why do you think an inclusive and diverse company culture is important?

Many studies have suggested that there is a strong correlation between diversity and performance of an organization. By respecting the unique needs, perspectives, ideas and insights of all employees, an organization can differentiate itself from its competitors and earn deeper trust and commitment from its employees. Having its headquarters and 3 operating sites in Singapore, it is vital that UTAC leverages on this unique characteristic to expand our talent pool and potentially impact our ability to create and innovate.

Can you name one of the D&I initiatives in your company and how does it support the female talents?

UTAC takes a more holistic approach towards D&I, from the perspective of nationalities, race, gender and age as reflected in our demographics. We are one of the employers to sign the Employer's Pledge of Fair Employment Practices initiated by TAFEP and have integrated our commitment with practices through policies such as Equal Employment Opportunities and Discrimination, Harassment and Retaliation Prevention Policy to ensure a safe and conducive environment for work. We have also designed a Diversity Workshop to help promote and educate our workforce towards a more inclusive work environment and helps to eliminate "unconscious bias" that may exist at workplace. To further support female talents, we have started tracking female representation at management, mid-managerial and professional levels, as well as high potentials. Given that we are in the semiconductor manufacturing industry, women's representation is naturally lower compared to industries such as banking and finance. While a firm believer of meritocracy, these metrics are used as complementary benchmark/ baseline to guide us in our hiring, development and mobilizing female talents across the organization. Company policies, procedures and benefits such as flexi work hours, pregnant employees and new mothers policy are aligned to meet female workforce's needs to balance work and home life. We are making progressive advancement to increase female representation in our organization and more needs to be done. All these would not have been successful without the strong buy-in from senior leadership team led by our CEO, Dr John Nelson who recently signed the Global Semiconductor Alliance (GSA) Women's Leadership Initiative (WLI) CEO Pledge to demonstrate our commitment to being a part of the solution to increase female representation and inclusion in the semiconductor industry.

As a sponsor of the SSIA Semiconductor Women's Forum event, how did you find the event and its significance in promoting an inclusive culture in your company?

Bringing about cultural change is, and will always be, a continuous process only to be achieved over time. The SSIA Semiconductor Women's Forum was paramount to this process by raising greater awareness of all aspect where change will need to happen, to tackle change, inclusiveness and trust. We are proud to have been a sponsor of the event.

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UTAC

SWE Launches Its Local Affiliates to Empower Women Engineers in Singapore

The Society of Women Engineers (SWE) is the world's largest advocate and catalyst of change for women in engineering and technology for nearly 70 years. The group is proud to announce its new affiliations, SWE@SG, chartered on 10 March 2021 in the sunny island of Singapore. The new society will empower women to achieve their full potential as engineers and leaders in Engineering and Technology, provide support across all stages of their careers and demonstrate the value of diversity and inclusion.

Virtual Launch of SWE@SG

During this year's International Women in Engineering Day (INWED), SWE@SG, with the support from SSIA, will host a virtual event to celebrate its official launch, the amazing work, and achievements of female engineers in Singapore on 23 June 2021.

Themed as 'All Together. Empowering Women Engineers in Singapore', the event will provide an inclusive platform featuring experts and speakers from leading engineering firms to discuss key industry policies, actions to enable parity for women leadership in STEM, and trending topics on innovations, access and progress for all.

Innovations for All
Showcasing new innovations and engineering breakthroughs led by Singapore engineers.

Access for All
Sharing insights on the latest policies, societies in Singapore and readily available resources to equip and empower fellow engineers.

Progress for All
Highlighting SWE@SG's new research that focuses on analysing the current profile of women leaders and providing a progressive roadmap to address gender parity in leadership by 2030. The segment will also feature a panel discussion to talk about the actions needed to propel women progression in STEM.

With the launch of SWE@SG, we now have a forum to bring like-minded professionals together, hence augmenting and amplifying their common goals of promoting diversity and thereby building a strong foundational engineering base in Singapore.

At SWE@SG, our goal is to provide an open and inclusive platform to allow engineers to connect, network, promote the growth and development of female engineers, support their career aspirations and ultimately build a sustainable workforce in Singapore.

Be part of the meaningful event to celebrate the significant milestone of SWE@SG, recognise the contributions of female engineers and applaud the efforts of local societies with parallel visions in shaping the future of engineering. For more information regarding the event, please contact the event committee at **swe_sg@swe.org**.

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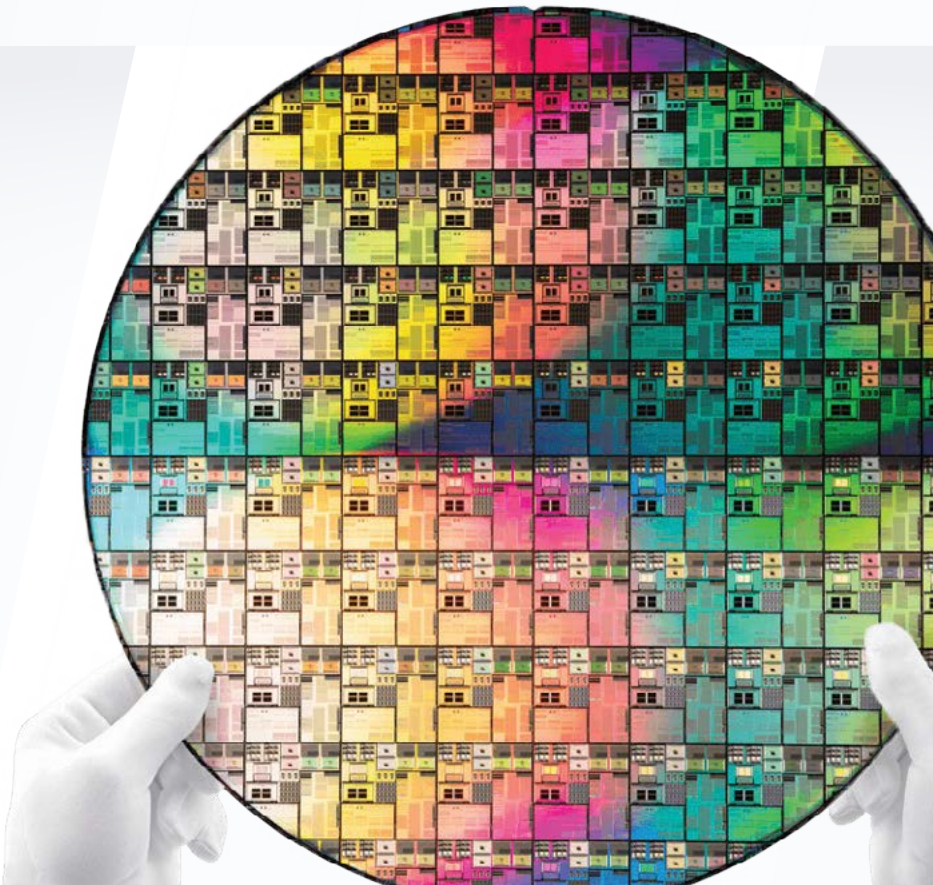

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Continuing as a Leading Global Material Manufacturer

The AGC Group's Electronics business provides essential materials and solution to the semiconductor industry. In its electronics material business, AGC contributes to the most advanced sectors in the semiconductor industry for both front-end and back-end processes. Our products are proven to hold high reputation in terms of the superior quality performance with high durability.

AGC has been supporting the wafer fabrication industry in Singapore for more than 30 years. With the growing importance of semiconductors as an essential component, the role of AGC Asia-Pacific as a material supplier will be substantially crucial. We promise to produce products that continue to support the day-to-day life of the people around the world.

AGC's products include Synthetic Fused Silica Glass AQ seriesfor stepper lens and photo mask, SiC (Silicon Carbide), CMP Slurry for chemical polishing and Frit Paste for back-end assembly.

Synthetic Fused Silica Glass AQ series

The synthetic fused silica glass AQ series is a high-purity, high-quality functional material based on AGC's abundant experience accumulated over its long history of technological R&D in fine glasses, fine chemicals, and fine ceramics.

Applications :
1. Lens material for semiconductor lithography system
2. Lens material for FPD lithography equipment
3. Photo mask substrate
4. Other optical materials
5. Glass wafer

Silicon carbide (product name: ROICERAM™-HS)

Silicon carbide (product name: ROICERAM™-HS) has characteristics of high purity, high strength, low thermal expansion and excellent acid resistance and heat resistance. AGC has 30 years of experience as a supplier of parts for semiconductor manufacturing furnaces mainly in high temperature process. Our technologies accumulated in the semiconductor market have led to applications in high temperature oxidation/diffusion furnace, LPCVD furnace, and structure material for precision equipment in recent years.

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AGC delivers slurry and polishing solutions that can be used for CMP processes, using an originally designed abrasive and manufacturing process. To realize multi-layered structures with high planarity and low defects, we optimize slurries that meet various applications in FEOL process.

Applications :
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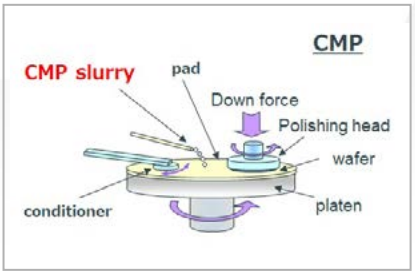
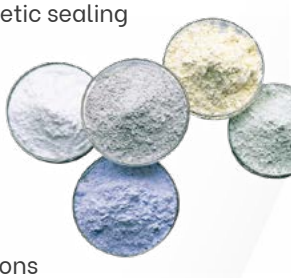


Glass Frit, Glass Pastes and Low Temperature Hermetic Sealing Parts

Materials for electronics applications used for the purposes of insulation, and hermetic sealing are available in a variety of forms, including powder, paste, preforms, and tubes. These glass materials are mainly used in electronics applications for insulation, hermetic sealing, and protection purposes, etc. AGC leverages its strengths in design and analysis to expand applications of glass as a high-performance electronic material.



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Wisdom of a Decision-Maker – Biases that Maybe Tripping Up Your Decision-Making

In today's uncertain and volatile environment, leaders have to make a proliferation of good decisions to ensure the business continues to succeed and move forward. What sets a good leader apart is their ability to make significant decisions with speed and accuracy. Isn't good leadership all about making good decisions?

We make decisions every day, some more critical, others a little less so; however, do you know if your decisions are good or if they were influenced by your own biases? Each of us makes decisions based on a myriad of information sources, including our own experience, data gathered, and other individuals' inputs. The fact is we all have personal biases that have influenced those decisions.

So, when we think of decision-making, the classical approach uses decision trees, looking at probabilities, and arriving at a conclusion. This has worked well in the past decades; however, given the rapid pace of change in our VUCA (volatility, uncertainty, complexity and ambiguity) world, this approach alone may not be enough. In recent years, a lot of work has been done on behavioral biases that have impacted the decision-making process and how methods of the past may not guarantee the same results in the future, and I so happened to have a discussion with Nikhil Raval on this very subject.

Why Is It So Hard to Make Good Decisions?

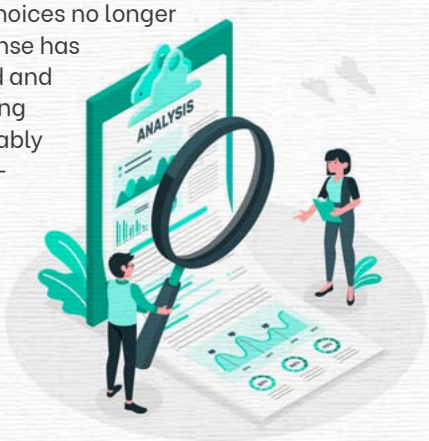
Nikhil is a Leadership, Learning, and Change-OD Expert. He harbors more than 25 years of experience and works with senior leaders and firms across the globe on challenges at the intersection of Business and People. He spent fifteen years working in the US, which included nearly ten years in Financial Services with firms like Charles Schwab, Franklin Templeton, and American Express. More recently, he was also the Managing Director of Duke CE in India. In my interview with him, I asked: Why is it so hard to Make Good Decisions, and how does the brain impact those decisions?

He responded by relating that all good leaders need an excellent decision-making process and method(s) to ensure precision while making those decisions. However, despite having a great approach, your decisions might still get hijacked because of one's biases.

He related that three common biases impact Decision Making in the Business World:

SUNK COST BIAS

The first is sunk cost bias; here is where our deep-seated prejudices make choices that justify past choices even those choices no longer seem valid. The expense has already been incurred and can't be changed going forward and it is probably irrelevant to decision-making.



CONFIRMATION BIAS

The next is confirmation bias; this describes

our underlying tendency to notice, focus on, and give greater credence to evidence that fits our existing beliefs. For example, if we think drinking eight glasses of water is good, we tend to look and find the reports supporting this notion. This could be true for many other beliefs, from investing to parenting or leadership style.

ANCHORING BIAS

The third bias is anchoring bias; this is a cognitive bias that causes us to rely too heavily on the first piece of information we are given about a topic. Then we use it as the primary piece of information that heavily influences our choices.

So the logical question is, how do you overcome these biases if you have them, and what are some of the methods to overcome the three common biases?

Nikhil went on to share the three previous biases and the strategies to overcome them:

Biases and Strategies

- *Sunk Cost Bias*: Sometimes trying to avoid the fear of failure or having the pressure to get a result, you start to question yourself. You don't want to be that black sheep or fail when everyone is looking to you for results.

  STRATEGY: Look for someone who has a fresh pair of eyes or a different perspective that could be a counterbalance to your view.

- *Confirmation Bias*: You only find data that supports your point of view or hypothesis.

  STRATEGY: Look for contradicting evidence (you know it exists) and ensure you review them. You may still make the same decision; however, you would have done your homework and got a more balanced perspective.

- *Anchoring Bias*: Making decisions based on early information, or we become anchored by values that aren't even relevant to the decision at hand.

  STRATEGY: Question the assumptions beyond the first piece of evidence by asking How and Why questions.

Ending our discussion, Nikhil mentioned three additional points to consider in making better decisions; firstly, you have to be self-aware of your style; secondly, make a decision diary to track outcomes of your previous decisions; thirdly, just slow down take a step back and reflect especially for crucial decisions.

So here are three questions for you to reflect on about decision making:

1. How do you tend to make your decisions?
2. Which biases (if any) have impacted your business decisions?
3. Which strategies should you use to overcome your biases?

ABOUT THE AUTHOR

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Celebrating 50 years: Jennifer (fifth from the left) at a celebration marking the 50th Anniversary of the semiconductor industry in Singapore in 2018

Jennifer Teong: Success Hinges on Balance

A 30-year semiconductor industry veteran, Jennifer, VP of Manufacturing & Quality at Silicon Labs International, leads the company's Singapore site, and serves as a board member of the Singapore Semiconductor Industry Association (SSIA).

She is also a mother of three.

"When I speak at seminars or on panels at universities, I'm often asked how I managed to progress in my career and raise three children at the same time," she says. The answer is almost always a variation on the theme of balance – of time, priorities, work, and life – and a pragmatic approach to making it work.

"If I have a job that requires travel, my husband, who works in an engineering role with a statutory board, takes a job where he can be at home more," she explains. The same concept is applied at work, whether balancing her multiple responsibilities or between immediate and longer-term goals.

Mentee and Senior Product Test Engineering Manager, Amanda Fu, can attest to that: "Jennifer reminds me to not only look at immediate urgent problems, but to also think far ahead on important tasks that may shape our future," she says.

Jennifer's journey into the semiconductor world began when she became one of a handful of her junior college classmates to opt to study engineering at the National University of Singapore.

Work-life balance: Semicon industry veteran Jennifer Teong has progressed in her career by balancing time, priorities, work and life

"I wanted to be able to learn a few key principles and apply them, so engineering was the way to go," she explains.

Attending on a Chartered Electronic Industries (CEI) scholarship, she had the opportunity to intern at the company, rotating through the different divisions, including microelectronics. "That's how I got into the semiconductor field, and once I was in, my love for it started to develop." She graduated with a MSc in Electrical Engineering (Microelectronics), and today takes the opportunity to promote engineering as a career at universities, with a focus on advancing women in the semiconductor industry.
"There were 60 to 70 of us in my EE class, and fewer than ten of us were women. Most of us are still in engineering-related roles to this day."

Jennifer is a strong proponent of internships as a way to better understand the industry, and regularly mentors young managers. "I enjoy taking people under my wing," she says. "These are people who are early in their career, and already have high competencies in technical areas. The challenge is to move them from an individual technical contributor role to a leadership role – that's where I can usually provide guidance."

Giving back: Jennifer volunteering with her SLI colleagues at a foodbank in August 2020

Setbacks are taken in stride – "without setbacks you will not be able to grow" – and recognising weaknesses is an important part of the learning process, she says. "You cannot ignore your weaknesses, you need to know them, accept them, and put effort into overcoming them."This approach has worked well for her and the team she leads.

"Without setbacks you will not be able to grow. You cannot ignore your weaknesses, you need to know them, accept them, and put effort into overcoming them."

Breaking new ground: Jennifer (centre) with CEO Tyson Tuttle and colleagues during the opening of the new SLI office in July 2017

"Jennifer is a true role model for women in technology with a great deal of influence over a team in Singapore that is 45% female in a typically male-dominated industry," says Silicon Labs Senior VP of Worldwide operations, Sandeep Kumar. "People look up to her as an example to follow."

"In our Field, We Need Innovation"

In the world of technology, Ee Sze Khoo is fewer than six degrees of separation away from you.

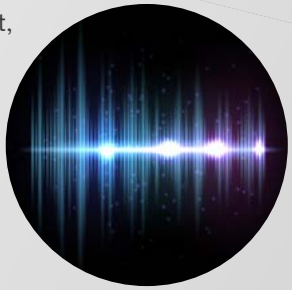
MediaTek's RF Design Leader and her team are the brains behind the company's transceivers, found today in cellular phones, IoT trackers, TVs, set-top boxes, Bluetooth earphones and speakers, and possibly in the device you're reading this article on – one in three mobile phones is powered by a MediaTek technology or chip.

It's no surprise then that the world's fourth largest fabless semiconductor company considers her a high flier, and one whose efforts have been key to MediaTek products that are smaller, consume less power, and that enable numerous new applications for its customers.

Interestingly, Ee Sze's career in semiconductors began at the research end of IC design – after graduating from Nanyang Technological University with a Bachelors of Electrical and Electronic Engineering (EEE), she spent seven years in research and development at the Institute of Microelectronics (IME).

"Since I was young, I've liked solving puzzles and problems," she says. Working in a research institute gave her a good foundation for what she would later go on to do. "I read journals and conference papers, textbooks and created prototypes. I also got my Master of Engineering from the National University of Singapore in 2002, which I did part-time."

Thus armed, she joined the MediaTek technical team in 2004, just two months after the Taiwan-based fabless semiconductor company set up its Singapore unit. "The original team was very small," she recalls. "It was after the team grew and we needed local managers that I came to manage a design team of six." She also became a project leader for a design team focussed on transceivers.



Clearly in her element, Ee Sze went on to pioneer a technique that "linearised" the RF power amplifier used in MediaTek's first 3G transmitter.

"Signals travel in waves, and waveforms get distorted," she explains. "When we neaten the distortions, the amount of power

Creative escape: Ee Sze (third from the left) at an Escape Room team building exercise with the RF division

This ability to spot and solve problems – and anticipating challenges – is a quality she also hones in the young designers that she mentors. "I don't tell them what to do. Instead, I hint, or ask questions," she says. "I like to allow them to try out new ideas. If you are too conservative, you will not move forward.

"In our field, we need innovation. And that's what I encourage."

consumed, for example in a handphone battery, is minimised, thus lengthening battery life."

In 2010, the 3G cellular chip went into mass production, and the technique continues to be used in MediaTek's 4G/5G transmitters today.

Four years later, in 2014, she and her team received the MediaTek Worldwide Annual Special Contribution Project Award – the company's top award for designing the company's first CDMA solution.

Another of her products, MediaTek's 2G cellular SOC, which launched seven years ago and for which she was the RF project lead, remains a leader in its product class, unchallenged in terms of both cost and performance.

Problem solving remains central to the work she does today.

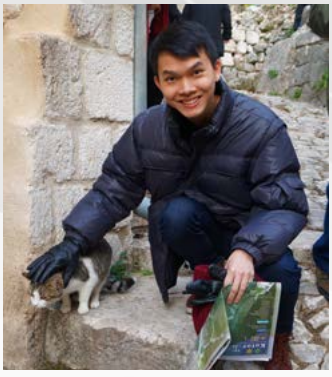
"It almost never happens that there are no problems," she says. "We simulate and take precautions to mitigate them, but there are many things that can disturb a chip, and always paths we haven't thought of – there will almost certainly be a surprise."

Pikachu Power: The mouse-like Pokémon character with powerful electrical abilities provided inspiration for Ee Sze and the RF team at MediaTek's annual Dinner & Dance 2020

Enabling the Future

Technology can only evolve as quickly as the talent that imagines and creates it. Here's how Singapore's semiconductor industry draws the brightest minds into the business, and once there, ensures they stay at the top of their game.

1 The **Singapore Industry Scholarship (SgIS)** is a government-industry initiative that grooms the next generation of leaders for sectors critical to Singapore's economy. Scholars benefit from internships and mentorships, and attend dialogue sessions and leadership forums. Aloysius Koh, Xilinx's first SgIS scholar, interned with the company as an undergrad, during which he was trained in actual industrial requirements, from physical implementation theories to hands-on design work. This helped put him on the fast-track – he completed deliverables for a complex design on 7nm technology within five months of joining Xilinx as a Design Engineer upon graduation. Several companies also offer private scholarships. Lam Research, for instance, awards three scholarships to NTU engineering students each year.



Chang Jun Qing from AMD

2 The **Industrial Postgraduate Program**, an initiative by the Economic Development Board (EDB), offers graduates the opportunity to hone their R&D skills through a combination of study and hands-on experience tackling a real life challenge at a company. AMD Product Development Engineer Chang Jun Qing, who is pursuing his PhD in AI and Machine Learning at NTU, describes the IPP as the best of both worlds – the opportunity to deepen his knowledge in an area he is passionate about, while finding a solution for a challenge that will make a real difference to the company he is working with.

Chew Yee Kiat from ASM

3 Industry veterans believe in honing talents early – **internships** are the best route to getting to know the industry, and the role you can play in it. Says Chew Yee Kiat, 25, who interned at ASM and joined the company upon graduating last year: "One thing I liked about my internship is that we were able to work in different departments such as engineering and planning. This allowed us to get exposure to what they did on a day-to-day basis, and to explore what we were really interested in doing. It helped me start my career in the right direction." Some companies offer fresh grads similar opportunities. Infineon, for instance, took in some 60 SGUnited Trainees this year, and its Jumpstart graduate programme will rotate them through three departments over a two-year period.

Sylvester Heng from Applied Materials

4 Young hires are typically assigned a **mentor** who provides support and guidance. Says Sylvester Heng who joined Applied Materials in 2016: "My leaders and mentors have supported my development and matched my enthusiasm every step of the way. They provided me with opportunities to partner the best engineering minds across the globe to tackle engineering challenges in my core role, and to bolster my interpersonal skills and enterprise skill sets in my secondary role as Regional Office Management Associate. This has nurtured me into a T-shaped learner, allowing me to simultaneously build domain expertise and cultivate the disposition for collaboration across disciplines."

5 Given the constantly evolving nature of the semiconductor business, **life-long learning** is essential to keeping skills current. SSMC, for instance, supports its employees' learning and career development through learning tracks within the SSMC University program, which equips its employees with current and future skills. Each employee receives a personalised learning roadmap or customised development track. The core competency track equips employees with basic to advanced technical skills. In the academic track, the company offers an education sponsorship scheme (LEAP – Life-long learning Education Assistance Program) to assist employees who are interested in furthering their education. In collaboration with ITE, SSMC also offers NITEC courses for its employees in-house. Short-term assignments to parent companies, meanwhile, allow employees to learn from best-in-class organisations.

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