

Growth Beyond Boundaries

YEAR IN REVIEW
2019/2020

IPI
SINGAPORE

Innovation
Partner for
Impact

Innovation Partner for Impact

About IPI

IPI is an innovation catalyst that opens up opportunities for enterprises to grow beyond boundaries.

As a subsidiary of Enterprise Singapore, it enables the innovation process of enterprises through access to its global innovation network, ecosystem support and consulting services.

Our Purpose

Creating opportunities for enterprises to grow through innovation

Our Promise

Growth beyond boundaries



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Message from the CEO

Since I joined IPI in September 2019, it has been a year of change amid uncertain times, exacerbated by COVID-19.

Despite the challenging market conditions, the IPI team proactively engaged the industry to catalyse innovation and completed 85 technology matches and assessment projects, meeting full-year expectations. We also focused on improving the way we work to create more value for the stakeholders we serve – the industry, technology partners and government agencies.

Linking innovators with corporate partners

Huge strides were made to create and scale up co-innovation opportunities between entrepreneurial innovators and corporates. We organised five innovation challenges and rallied the international innovation community to solve 105 problem statements from 36 corporate partners across various industries over the year. For example, we partnered leading multinationals like consumer healthcare goods company RB to scout for technologies and solutions that support healthy ageing at IPI's TechInnovation Challenge. We also co-organised the Trade and Connectivity Challenge and Sustainability Challenge with Enterprise Singapore.

Our efforts garnered a total of 403 proposals from over 290 SMEs and start-ups – an outcome that I am very pleased with. We will continue to build on this momentum to foster more collaboration opportunities for business growth.

Getting a boost from industry veterans

We rolled out our Innovation Advisors Programme, an important part of IPI's strategy to catalyse innovation among tech-centric, Singapore-based SMEs and start-ups.

Our pool of Innovation Advisors comprises veterans from various sectors and technology domains. They offer enterprises vital insights to identify market-led innovation opportunities, and help link them up with relevant technology and business partners to achieve accelerated growth.

In 10 months from September 2019, we have assembled more than a dozen Innovation Advisors, who have embarked on innovation projects relating to the food and healthcare sectors with several SMEs. The participating enterprises have been able to tap the veterans' rich industry insights, global business network and in-depth experience in technology-business integration.

Fresh insights open new doors

In our work, we have seen how technological advancements, industry trends and consumer shifts can open new doors.

To help organisations better understand today's evolving innovation landscape and the growth opportunities in specific areas, we launched our first white paper on lithium-ion battery recycling as part of our Emerging Technology Forum in November 2019. We are heartened that the pilot was well-received and look forward to bringing new insights into topics such as indoor air quality, wastewater recycling and food valorisation in 2020 and beyond.

Meet the new IPI – innovation partner for impact

Since our inception in 2011, IPI has been serving many enterprises and partners across a wide spectrum of industries, covering different technical domains. As we expanded our portfolio of services, global innovation network and range of programmes and initiatives, it was also timely to review how we communicate.

We launched a rebranding exercise and are thrilled to unveil a new brand identity that reflects our purpose: to create opportunities for enterprises to grow beyond boundaries. This new visual identity is not just a cosmetic exercise. It complements our renewed positioning and strengthened portfolio that has evolved to serve the needs of IPI's stakeholders. It also reinforces our commitment to partner and enable growth for our Singapore enterprises and the global innovation ecosystem.

Growth beyond boundaries – keep innovating

Given the eventful year, what we have achieved was possible only with the support from our industry and technology partners, the IPI team that stayed the course and persevered, as well as the strong support from our Board of Directors, including our former Executive Director, Professor Lam Khin Yong. I thank all of you unreservedly for your unwavering support and for journeying with us.

The coronavirus pandemic has changed the way we work across the world. Faced with ambiguity and a poor economic growth outlook, we are even more convinced that an openness to collaborate through innovation will enable businesses to emerge stronger and better positioned for growth. Let us continue to work together and we look forward to being your Innovation Partner for Impact in the years to come.

Yours sincerely,



Wong Lup Wai
CEO, IPI



Our Year in Numbers

INDUSTRY ENGAGEMENT

85

Successful
technology
matches and
assessment projects



125

Active
negotiations
facilitated



196



Singapore-based
companies newly engaged

OPEN INNOVATION CHALLENGE

5  Open innovation challenges organised

36  Corporates

105  Problem statements

403  Proposals received

291  From SMEs/
start-ups

OUTREACH

10  Events organised /supported

419  Technology offers and needs posted

23,995  Tech Alert subscribers

Key Highlights

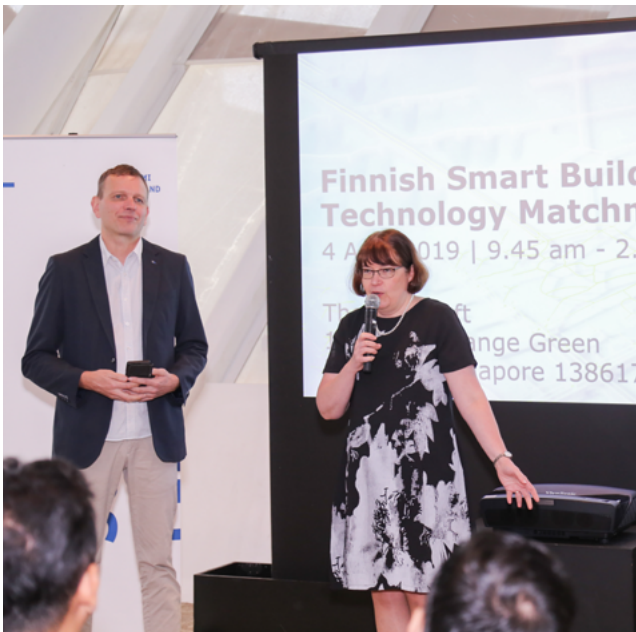


IEO forum fosters academic-industrial tech partnership

New initiatives to commercialise local intellectual property took centre stage at the Innovation and Enterprise Office (IEO) forum that was held on 3 April 2019.

Supported by IPI and co-chaired by the Singapore University of Technology and Design and Ngee Ann Polytechnic, the fifth edition of the forum saw the coming together of almost 80 local IEOs and government agencies to discuss new ways to accelerate IP adoption.

Joining them were guests from the Public Utilities Board, DesignSingapore Council, CoolestSG consortium and Smart Grid and Power Electronics Consortium Singapore.



Building smart, the Singapore and Finnish way

Over 80 participants from local and Finnish companies learnt key developments in the intelligent building sector at the Finnish Smart Building Technology Matchmaking Event.

Held on 4 April 2019, the event saw IPI joining hands with the Helsinki Business Hub, the Embassy of Finland in Singapore, Kiradigi and Business Finland to explore new collaboration opportunities in the building and construction sector.

This included presentations of innovative solutions from 10 Finnish companies in the areas of automation, artificial intelligence, IoT and robotics.



Cheers to technology partners

Since it was set up in 2011, IPI has transformed businesses with insights into new innovations, technology trends and potential partnership opportunities. A key part of its success has been technology partners.

As an ode to this partnership, IPI organised the Tech Partners' Networking Session at the Star Loft on 12 April 2019.

It was the seventh edition of the event, with IPI sharing its key initiatives and measures to over 50 representatives from Singapore's innovation and enterprise community, government agencies, trade associations and chambers, foreign embassies and industry partners.



Exploring the benefits of technology transfer

In an effort to help companies improve their knowledge and skills in commercialising new technologies, IPI organised its first Technology Commercialisation and Open Innovation workshops in April 2019.

The workshops shared key insights like tools to evaluate the commercial potential of technologies, different go-to-market strategies, and essentials of technology valuation and intellectual property (IP) licensing.

On top of small group discussions and workshops, IPI also invited a technology scouting expert from a leading beverage company to share information on the potential opportunities and pitfalls in open innovation.



Embarking on “Better Battery Recycling”

With the shift towards a circular economy, companies are looking to adopt more sustainable business practices. These include recycling products, with small and medium enterprises learning market insights on lithium-ion battery recycling from IPI’s inaugural white paper, “Better Battery Recycling”, at the Emerging Technology Forum on Lithium-ion Battery Recycling on 1 November 2019.

Supported by the Enterprise Singapore’s Urban Solutions Industry Cluster and the National Environment Agency, the event drew over 120 participants from battery manufacturers, suppliers and recyclers.



Innovation across borders: ESG and IPI participate in global summit

Singapore’s innovation expertise went international when Enterprise Singapore and IPI attended the 2019 EUREKA Global Innovation Summit – a platform for companies and innovation agencies to collaborate, share knowledge and secure business opportunities. It was held from 14 to 16 May 2019 in Manchester, United Kingdom (UK).

At the Summit, which was attended by global business leaders and policy makers, IPI Deputy Director Lim Ming Khai spoke on a panel that discussed collaborations with Asia. Lim shared about Singapore’s innovation and enterprise ecosystem, and how European companies can partner local businesses to access the rapidly growing Southeast Asian markets.

A new funding programme GlobalStars was also announced at the Summit. Set up by Singapore, Dutch and UK companies, the programme focuses on medical technology, smart mobility and advanced manufacturing.



Nurturing new business and technology partnerships

From healthy ageing to early detection of diseases in infants and children, corporates looked out for solutions that target every stage of life at TechInnovation 2019's unique crowdsourcing segment.

TechInnovation is IPI's flagship technology brokerage event that was held from 11 to 13 November 2019 at the Singapore Expo – for the eighth year running. Thought leaders and industry experts shared about emerging technology trends and open innovation best practices at the event, which also included the debut of a new thematic track on Design-led Innovation.

Jointly curated with the DesignSingapore Council and the Textile and Fashion Federation Singapore, the track brought together design thought leaders, practitioners and academia. They provided insights into the importance of converging design, technology and engineering disciplines to spur innovation.



Navigating regulatory complexities in the Health and Personal Care industry

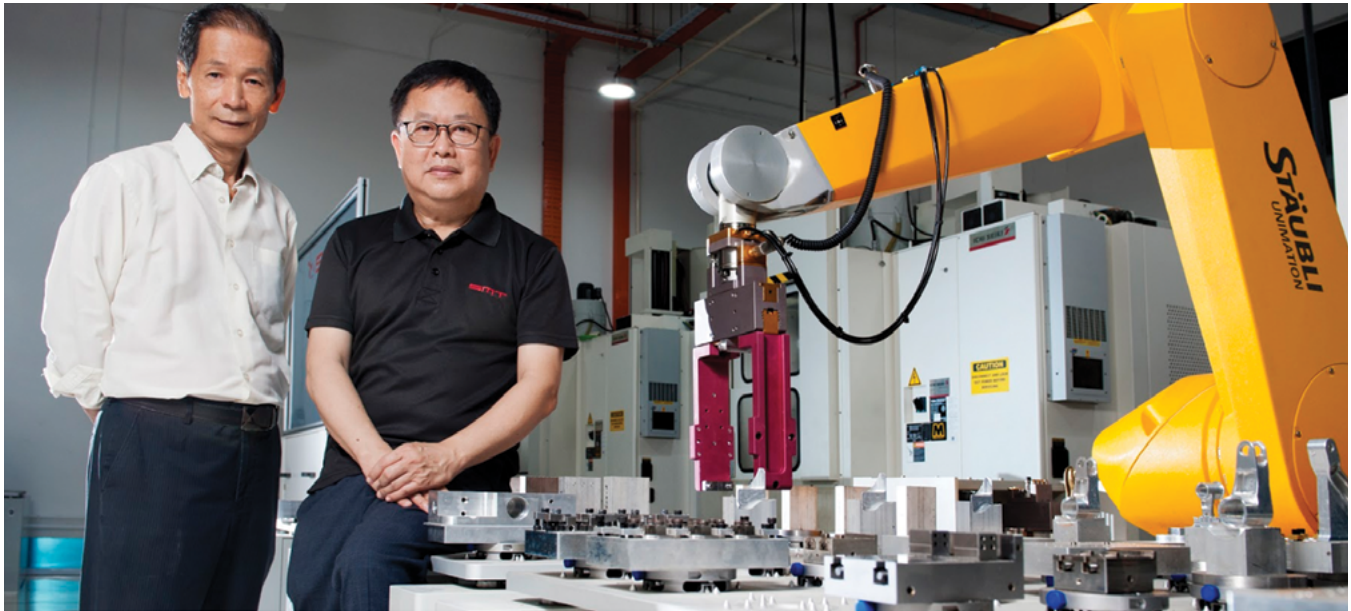
The regulatory framework for the commercialisation of medical and health products will constantly evolve, due to the emergence of new innovations and changing consumer concerns. This can be confusing for local enterprises trying to identify business opportunities.

To help businesses understand the changes and stay connected with other industry players, IPI organised the Stamp of Approval: Certification and Compliance forum on 4 September 2019. Over 100 participants from the Biomedical Sciences, Chemicals, Electronics and Personal Care industries attended.

They heard from guest speakers Ken Simpson, Principal Patent Attorney of Davies Collison Cave; Bernice Lau, Medical and Health Service Executive Auditor of TÜV SÜD PSB; and Jack Wong, Founder of Asia Regulatory Professional Association.

Saving manufacturing costs on the road to Industry 4.0

Manufacturing costs can be reduced by new intelligent systems. A first-of-its-kind software for such uses has been developed by LeanCost International and SMT Technology, which were matchmade by IPI.



Co-founder of Leancost International Moses Tan (left) and SMT Technology's Managing Director Gerry Ong (right) have developed an intelligent system that helps companies save on manufacturing costs.

The sight of Moses Tan hunched over a computer and typing away furiously was nothing new to his peers or family. As a consultant, his work involved advising manufacturing companies on workflow issues.

But even during his spare time, he remained glued to the screen. This was no regular work – he was busy developing an algorithm that would help the manufacturing industry accurately report product costs while also revealing inefficiencies in their processes.

After seven arduous years of programming, a new manufacturing data analytics algorithm was born in 2017. The same year, Tan co-founded IT start-up LeanCost International to chart a new path towards Industry 4.0 – the fourth industrial revolution.

The goal was to motivate high-mix low-volume (HMLV) manufacturers to adopt smart technologies to automate and optimise their operations into an ideal “zero-loss” strategy, where improvements in production would produce high returns on investment.

Turning complex data into simple sums

Product costing is seldom accurate as cost accounting methods have been using broad estimates of the costs incurred in production, instead of calculating based on the resources expended at each stage of the production.

While these miscalculations can be as small as one to 10 percent per part, such errors can result in some products being sold at a loss or charged at uncompetitive prices. As HMLV manufacturing such as precision engineering

involves producing a large variety of products in small quantities, companies need to accurately price their products to maximise profit.

“It is a seldom-mentioned problem that costing methods are at best estimations only,” explained the 66-year-old, who is also LeanCost’s chief executive. “A product can have different features, colours and sizes, and may also encounter unpredictable machine-related problems. This makes it difficult to calculate how much it would cost for each stage of the production and the final product, due to the many small changes along the way.”

His algorithm converts these technical operational data – which are usually presented as percentages – into simple equivalent costs in real time.

For example, it can accurately calculate how much wasted cost is expended at each stage of production. This allows the company to spot areas where costs can be saved and improve their pricing strategies.

“The bottom line of businesses is to make money, so if you don’t know the product’s original cost, then how do you know how much to sell it for?” said Tan, whose two-man company has spent \$15,000 and many man-days on further software developments in the last three years.

Apart from delivering process costs, the algorithm can also generate periodic reports that troubleshoot key problems affecting production. Insights gained include the top two to three processes that waste the most resources as well as identifying problematic machines.

“We believe in combining our technical expertise with like-minded local enterprises’ know-how to remain competitive today.”

Gerry Ong
Director
SMT Technology

“Troubleshooting now becomes automated,” he noted. “We pinpoint the key problems so that factory-wide resources can then be focused, instead of being spread out on trivial matters.”

Once installed, the algorithm requires no reprogramming as it has an auto-update function. To make it even more convenient, manufacturing companies can access key production information via a web application at any time.

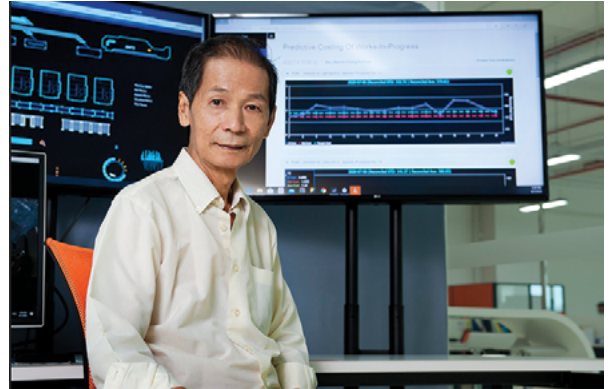
Collaborating through open innovation for a complete solution

However, LeanCost required a helping hand to take their product to the next level. Its algorithm needed to be combined with either an enterprise resource planning (ERP) system or manufacturing execution system (MES) software to work effectively.

ERP systems integrate operations such as sales and processes on a platform while MES software systems provide information on how to optimise production output.

“Our solution is like the air-con system in a car – it needs to be fitted into a car for it to show how it can work,” said Tan. “We needed a partner to implement and fine-tune it to work in a real-life manufacturing environment.”

To that end, the company approached IPI to find potential partners to help them grow their business. Despite initial challenges in securing successful technology matches for LeanCost, IPI persisted and eventually identified a suitable opportunity to bring together LeanCost’s capabilities and SMT Technology’s Industry 4.0 software solution. This collaboration was made possible thanks to IPI’s strong ties with the Singapore Precision Engineering and Technology Association (SPETA), of which SMT Technology was also a member.



Moses Tan wants to motivate high-mix low-volume manufacturers to adopt smart technologies to automate and optimise their operations.

By integrating the LeanCost algorithm into SMT’s Smartline software – a solution with MES functions that capture operational data – both companies successfully created the SmartCost system. SmartCost allows real-time monitoring of costs in manufacturing processes, a first-of-its-kind solution.

“We believe in combining our technical expertise with like-minded local enterprises’ know-how to remain competitive today,” said SMT Technology’s Managing Director Gerry Ong.

SmartCost is a standalone system that harnesses the LeanCost algorithm and allows users to access cost information immediately from the cloud.

“Now, accountants can also take note of lower-than-expected production costs and study how to replicate the numbers,” said Ong. “Previously, they usually attended to solutions to increase revenue, not realising that maintaining lower costs can also help price products more competitively.”

Having debuted the SmartCost system at the Industrial Transformation Asia-Pacific exhibition in October 2019, Tan is looking forward to working with local companies in the packaging and food industries after the COVID-19 crisis.

“I firmly believe that I have not wasted my time (developing the system),” he said. “We will become more recognised because currently there’s no one else in the world with such a solution for any manufacturing industry.”

Harnessing pandan for wellness

The fragrant pandan leaf has long been an essential ingredient in Southeast Asian cooking, but it also has detoxification properties to nourish the body and skin. With IPI's help, Restoration Essence teamed up with researchers to unravel some of the science behind it.



Restoration Essence's co-founder Sara Soong believes in the all-natural approach to health and wellness.

Growing up, Sara Soong would watch her mother and grandparents grind and pound plants and herbs in the kitchen. But often, these did not end up in their cooking but on their faces and bodies.

Firm believers in natural remedies, they would even make special trips to herb farms in Malaysia to pick fresh ingredients.

"My family's all-natural approach to health and wellness made me very attuned to using herbs and plants to heal my skin and body. In fact, we hardly saw the doctor," said Soong.

After years of enduring skin problems, such as eczema and acne, and experimenting with numerous skincare products, she grew even more certain that natural ingredients were the best for our bodies. Her goal is simple: to tap the hidden potential of everyday ingredients that are commonly found in kitchens across Southeast Asia. Her star ingredient? Pandan leaves.

In 2016, Soong co-founded Restoration Essence, a homegrown brand retailing all-natural skincare products that are free of chemicals. These products are now sold online in Singapore, Cambodia, Malaysia and Thailand.

Formulating all-natural skin remedies

According to Soong, pandan leaves have natural detoxification properties and provide pain relief, making them effective for alleviating headaches, menstrual pain and other ailments. Her grandparents would often drink boiled pandan leaf water to ease the pain of arthritis.

As previous attempts to use ingredients such as egg white and green pea paste to combat her acne showed

little result, Soong decided to give pandan leaves extract a try instead. To her surprise, it cleared her skin.

"But most people only hear of pandan being used in food like pandan cake, or in taxis to ward off cockroaches. They didn't know these fragrant leaves have potential health benefits," Soong said. "As I wanted more people to know and benefit from this unassuming ingredient, Restoration Essence was created."

Getting this message across was not easy. She was going up against established skincare brands and promoting a key ingredient that is uncommon in the industry. What Soong lacked in resources and brand awareness, she made up for with sheer hard work.

She would regularly visit the Malaysian farms where she sources her ingredients, to monitor their processes and plant growth more closely.

The hands-on entrepreneur would then spend days at a stretch formulating the best ingredients for each Restoration Essence product. Besides being actively involved in the product development process, Soong also intensified her network and invested in online marketing to get the word out.

Slowly, the brand's popularity grew. In two years, her customer base nearly tripled to 600. Restoration Essence's skincare range, which includes pandan facial scrubs, body lotions, serums and sunblock that are also suitable for kids, grew from a modest six products to more than 30 items over the same period.

Committed to producing high quality, natural skincare products, Soong continuously refines her store

“Our mission is to restore our consumers’ health from within. It is not just about applying skincare products, you need to take care of the body as a whole too.”

Sara Soong
Co-Founder
Restoration Essence

collection so that they are suitable for more skin types and generally, for better user experience too. Some customers, for instance, found the pandan facial too coarse for the skin.

As Restoration Essence does not have any in-house research and development capabilities, she reached out to the Institute of Materials Research & Engineering (IMRE), under the Agency for Science, Technology and Research (A*STAR).

Engaging in open innovation for greater growth

The connection with IMRE was first made through an enquiry on IPI’s Innovation Marketplace, through which she was invited to attend TechInnovation 2018, the organisation’s flagship technology brokerage event.

At that juncture, Soong was looking to improve the texture and formulation of Restoration Essence’s pandan scrub as well as to develop a pandan sunscreen.

“I appreciated the prompt follow through from my enquiry, and the receptiveness and advice provided by IPI’s technology managers in response to what I wanted to achieve for my business,” she said of IPI Singapore.

At TechInnovation 2018, IPI introduced Soong to various potential partners, including IMRE. Through A*STAR’s T-Up programme, where A*STAR scientists and research engineers are seconded to aid local small-and medium-sized enterprises in their R&D, IMRE supported the company in the performance evaluation of a new ingredient in the product. IMRE also lent its materials science expertise to improve the texture of an ingredient in the formula.

Restoration Essence, which has seen double-digit growth year on year since 2017, is looking to break into China’s online market next and eventually launch in the Middle East.

The brand has now expanded into other aspects of wellness, such as gluten-free snacks and detox teas. It currently has about 50 products with prices ranging from about \$9 for pandan energy balls to about \$115 for an eye serum.

Soong also conducts workshops on how to effectively care for one’s skin and body.

“Our mission is to restore our consumers’ health from within. It is not just about applying skincare products, you need to take care of the body as a whole too,” she said.



Homegrown brand Restoration Essence’s skincare and food products are all-natural, created using everyday ingredients found in Southeast Asia.

When self-driving vehicles speak to you

MooVita and Sioux Technologies are exploring ways to improve communications between autonomous vehicles and passengers. Brought together by IPI, they aim to help Singapore become a smart nation.



Dr Dilip Limbu (left), Chief Operating Officer of MooVita, and Kelvin Ng (right), Managing Director of Sioux Technologies' Singapore office, are on a mission to help autonomous vehicles fully assimilate with the urban environment.

A box-like vehicle revs its engine as an elderly passenger announces his destination to a large screen on the dashboard. He then settles into his seat and enjoys the journey as the self-driving car navigates itself on the roads.

In the future, owning such an autonomous vehicle (AV) may be the norm, especially for the elderly and disabled. At the forefront of AV development in Singapore is MooVita, a high-tech start-up specialising in driverless software solutions for urban environments.

Founded in 2016, the homegrown company has integrated its products on multiple vehicle platforms, including a fleet of self-driving pods for senior citizens currently in development, electric passenger buggies and passenger vehicles. It has also conducted on-demand driverless shuttle pilots in Singapore and Malaysia.

The company has its own AV line – various sizes of MooShuttle, as well as the MooAV Kit, a configurable equipment that can be attached to any vehicular platform to turn it into a self-driving one.

MooVita's goal is to expand to the larger Europe market, and develop a full stack External Human-Machine Interfaces (eHMI) software that can help AVs fully assimilate with the urban environment, said Chief Operating Officer Dr Dilip Limbu.

Successful development and deployment of the technology would allow them to interact with road users in a natural manner.

Multilingual messaging for a multilingual nation

While AV public trials here have gained momentum recently, with two new sites launched at the National University of Singapore and Sentosa last year, the AVs lack the capabilities to socially interact with the public, explained Dr Limbu.

In an ageing society like Singapore, the importance of a more human touch in automated transport “cannot be downplayed”, he added, especially for vulnerable road users (VRU).

To address this, MooVita is exploring the most effective mode to convey the AV's intent to VRUs through a multilingual-driven textual interface. This is crucial especially in a multiracial country like Singapore.

However, as the local research community is not as advanced as its European counterparts, MooVita decided to look for partners beyond local shores to speed up its plans.

Through IPI, the company learnt about the EUREKA GlobalStars-Singapore Joint Innovation Call in 2019, which aims to promote research and innovation partnerships between Singapore and several European countries. This ongoing bilateral initiative between Singapore and the EUREKA member countries gave MooVita the opportunity to seek a compatible technology partner in Europe.

In August 2019, MooVita was successfully paired with Dutch multidisciplinary high-tech solution provider Sioux Technologies, which has a strong human-machine interface (HMI) department.

“In an ageing society like Singapore, the importance of a more human touch in automated transport cannot be downplayed, especially for vulnerable road users.”

Dr Dilip Limbu
Chief Operating Officer
MooVita

Overcoming challenges to maximise potential

Sioux’s competitive edge lies in researching complex environments where humans and machines interact through clear and precise communication, such as in cleanrooms or on time-critical production lines. It is a 800 FTE powerhouse high-tech development and production company, with a presence in Netherlands, Belgium and Germany.

“We are good at user experience development on those kinds of processes, so we are able to harness this strength into developing eHMI,” said Kelvin Ng, Managing Director of Sioux’s Singapore office. “With our experience in the European market, we can also shorten the time to market and develop the system.”

For MooVita, transferring this knowledge into autonomous transport is vital. There will be a rapidly increasing number of situations where humans and machines interact with each other, explained Dr Limbu. MooVita is also in the midst of working with Sioux to do research on the design and production of multilingual messaging hardware.

Regular online discussions, which have become more important and prevalent during the COVID-19 period, have also helped both sides to better grasp each other’s strengths and weaknesses.

“Collaboration is more efficient when people are together physically, so we are trying to overcome that through digital means in order to optimise discussions,” said Ng.

While the design and development of the eHMI is still in its infancy, MooVita and Sioux are looking to conduct closed group trials in a real-world setting with people of diverse ages and ethnicities during the final phase of this project – expected to last until the end of 2021 at least.

“The challenge now is to understand the behavioural aspects of the external environment before implementation,” said Ng. “The whole idea is to make a human-like persona so that AVs can communicate with others on the road.”

Once developed, the eHMI methods and devices “will be of keen interest” to other AV manufacturers with diverse value chains and similar objectives, said Dr Limbu.

“The market potential of AV is promising, based on the anticipated global sales of autonomous and light vehicles in the near and not-too-distant future,” he added.

According to a 2018 forecast by business information provider IHS Markit, global sales of AVs are expected to hit 33 million units annually in 2040, with European sales making up 5.5 million units.

While COVID-19 has created a “new normal of work and life” for MooVita, it is planning further ahead to catch up on missed opportunities and hoping for minimal impact on the project schedule.

“As part of Singapore’s smart mobility ecosystem and (a) pioneer in autonomous mover solutions, MooVita is committed to helping Singapore fulfil one of her Smart Nation Initiatives – Smart Urban Mobility,” said Dr Limbu.



MooShuttles at The Float @ Marina Bay during the Intelligent Transport Systems (ITS) World Congress 2019.

More money, less waste: Eco-friendly oil bleaching process boosts revenue

GIIAVA's partnership with NUS, sparked off by IPI, aims to repurpose low-grade vegetable oil for higher value-added uses, which increases revenue yet benefits the environment.



GIIAVA's Technical Director, Dr Yashodhan Bhawe (left), and Associate Professor Yang Kun-Lin (right) from NUS are closing the resource loop by upcycling low-grade vegetable oil.

Dr Yashodhan Bhawe stood in front of several large tanks, looking puzzled. He was expecting a straightforward scale-up for a new vegetable oil-upgrading process, but things turned awry when “big masses of blobs” were produced instead.

It was an expensive lesson, recalled GIIAVA's Technical Director. One that took a significant chunk out of a six-figure budget from the project. Scaling up an oil bleaching treatment which removes contaminants, allowing the extracted oil to be used for higher-value purposes, was proving to be a challenge.

Today, after further refinements with research partner National University of Singapore (NUS), GIIAVA has designed a smoother and more eco-friendly system to extract, bleach and mass produce the vegetable oil – thereby generating a new and sustainable revenue stream.

Identifying roadblocks to fully utilise vegetable oil

GIIAVA is a leading manufacturer of lecithin products, which are food additives sourced from vegetable oils. Based in India and Singapore, its offerings include lecithin liquid and powder, which are produced in a plant on Jurong Island.

During the initial processing stages, soybeans are crushed to extract oil, which is then mixed with hot water to produce soy lecithin. Along the way, unsuitable substances that affect product shelf life are removed, along with some vegetable oil.

While the removed oil is still useful, its darker coloured

appearance from being mixed with the other by-products often results in a lower fetching price or being disposed of. “Most consumers are very sensitive to colour and appearance,” explained Dr Bhawe. “A lot of compounds and mixtures that are usable at high-value applications are unmarketable due to these defects.”

To lighten the colour, hydrogen peroxide is typically mixed with the oil by-products to oxidise the contaminants. However, the process takes four to eight hours and requires a high temperature of 60 to 80 degrees Celsius, which uses a lot of energy.

GIIAVA, which exports its products across 35 countries globally, decided to find a partner with the know-how to optimise the chemical reaction and upcycle the oils more efficiently.

Introducing opportunities for open innovation

In December 2015, IPI introduced GIIAVA to Associate Professor Yang Kun-Lin from the Department of Chemical and Biomolecular Engineering at NUS, which had patented a market-ready solution.

With NUS' catalytic hydrogel beads with metal complexes – the fruit of research work that took about five years – the process could be completed more efficiently within 60 minutes at room temperature.

This collaboration not only saves time and costs, but the lower energy consumption also reduces any negative impact on the environment.

“Our initial target wasn't oil bleaching,” said Prof Yang. “We were interested in treating industrial wastewater with our

“In chemical engineering, we are always taught to ‘close the cycle’, so you need to know where products are exiting. We are cleaning up our cycle so we know that every output is adding value to the economy, as opposed to ‘disposing’ of it at a lower cost.”

Dr Yashodhan Bhawe
Technical Director
GIIAVA

bioprocessing technology. But after we met GIIAVA, we realised there could be a potential application in oil bleaching too.”

As the catalytic hydrogel beads turn GIIAVA's oil by-products from an unappealing dark brown shade to a lighter hue, Dr Bhawe estimates that the by-products can be sold for a higher price with its more “palatable” colour.

Overcoming difficulties in scaling up

By the start of 2019, NUS was able to create a solution in the lab and gave GIIAVA an exclusive licence in September that year to replicate the process at the manufacturing level.

“Normally, researchers develop the solution first before we start looking for customers,” said Prof Yang. “But Yash provided an opportunity that allowed us to tackle a real-life problem – that’s the benefit of having an industrial collaborator.”

In return, Dr Bhawe has found Prof Yang's input invaluable. Scaling up production was a struggle at first. For instance, the catalytic hydrogel beads were found to be “too soft” for industrial processes, he shared.

But with Prof Yang's expertise, the kinks were ironed out quickly and a sturdier version was made within a short period of time.

“It was quite useful to work with an academic who understood the constraints that an industrial sector partner would have,” said Dr Bhawe.

Besides the end goal of cranking up the output, factors such as the extent of contact between ingredients during the mixing process had to be considered as well.

“With a 100ml beaker, it's fairly easy to mix the molecules well. But with a 10-tonne beaker, it's different,” said Dr Bhawe. “Through trial and error, building mechanisms and scaling up tenfold at a time, we overcame some of the challenges and have developed some tricks internally to optimise mixing.”

Taking the collaboration to greater heights

For GIIAVA, the biggest success of the collaboration is not just more financial gains for the company but the environmental benefits it reaps. Through upcycling, less oil is disposed of and the raw materials used can be maximised, which helps to conserve the planet's resources in the long run.

“In chemical engineering, we are always taught to ‘close the cycle’, so you need to know where products are exiting,” said Dr Bhawe. “We are cleaning up our cycle so we know that every output is adding value to the economy, as opposed to ‘disposing’ of it at a lower cost.”

Once this upcycling process for vegetable oil achieves consistent results in Singapore, GIIAVA hopes to deploy this technology in its six other plants in India – its main market.

“Our company's group strategy is focused on India, a market that's developing quite rapidly,” said Dr Bhawe. “We would like to go global but we want to start with a familiar region before expanding.”



GIIAVA's production facility on Jurong Island is responsible for the de-illing of lecithin and manufacturing of animal feed.

Dare to dream: Accelerating innovation through IoT solutions

From access to grants, state-of-the-art technology and co-innovation opportunities, the IoT Innovation Challenge 2018 co-organised by IPI, Enterprise Singapore and the Centre of Innovation for Electronics & IoT has helped four Singapore start-ups fast-track their goals. We speak to them to find out how the competition has transformed their businesses.

SpaceAge Labs

Deepak Pitta

Chief Executive Officer & Co-Founder

What's unique about your business?

SpaceAge is revolutionising how companies operate and maintain remote and distributed assets through IoT devices, low power wireless connectivity and enterprise-grade IoT, and machine learning software. We essentially help our customers digitalise their businesses in industries such as water, urban greenery, landscape and outdoor facilities management.

Our business can deliver full stack IoT solutions, from hardware to connectivity and software, while ensuring performance and cybersecurity.

What industry challenge did you pick?

We picked Singtel's problem statement that required us to propose an IoT solution to track assets with high accuracy in outdoor environments.

Our solution, Warbler, can track outdoor assets at sub-metre accuracy (compared to 3-5 metres by standard GPS trackers) and transmit the position data in real time via cutting-edge wireless IoT networks, such as Long Term Evolution Machine Type Communication (LTE-M) and Narrow-Band Internet of Things (NB-IoT).

Our software analyses and uses the position data to build applications that track workers or equipment on worksites, build asset maps in real time and enable performance-based contracting for outdoor work such as road sweeping and grass cutting.

How has the IoT Challenge impacted your company?

This IoT Challenge has not only helped us improve our technical capabilities, but also helped us build relationships with key strategic partners and potential customers. We believe that in the next 12 to 18 months, this product and these relationships will contribute significantly to our sales.



SenzeHub

George Heng

Chief Executive Officer

What's unique about your business?

Using analytics, we create wearable device solutions that measure key health indicators to detect potential crises that might arise. This includes collecting details like the patient's present location, his vital signs reading and health abnormalities.

In particular, we focus on large scale multi-user monitoring of data in places like hospitals and nursing homes.

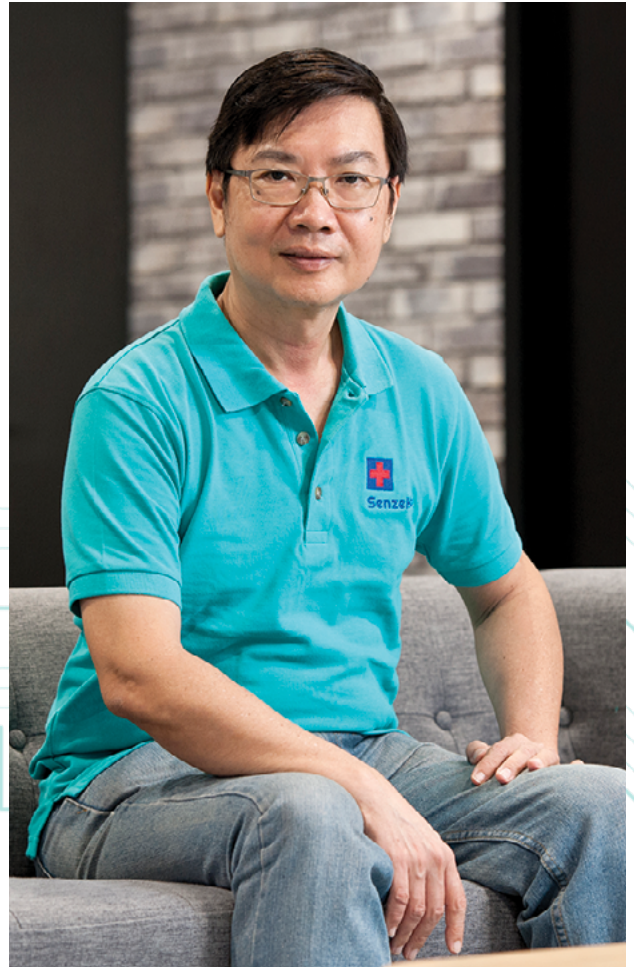
What industry challenge did you pick?

My dad was hospitalised for four months in 2018 and I saw first-hand the heavy workload of nurses who had to collect patients' vital signs data once every four hours. Coincidentally, about a month later, this appeared as a problem statement during the IoT challenge.

Hence, we developed a wearable solution to measure and transmit data automatically, which would allow hospitals to care for more patients in the same amount of time.

How has the IoT Challenge impacted your company?

As a start-up, the designing and manufacturing of physical products can be costly. The grant helps us to defray production costs.



Aevice Health

Rex Tan

Co-founder & Chief Technology Officer

What's unique about your business?

We are a healthcare start-up that develops smart wearable devices, mobile platforms and analytics to improve the lives of patients suffering from chronic respiratory conditions.

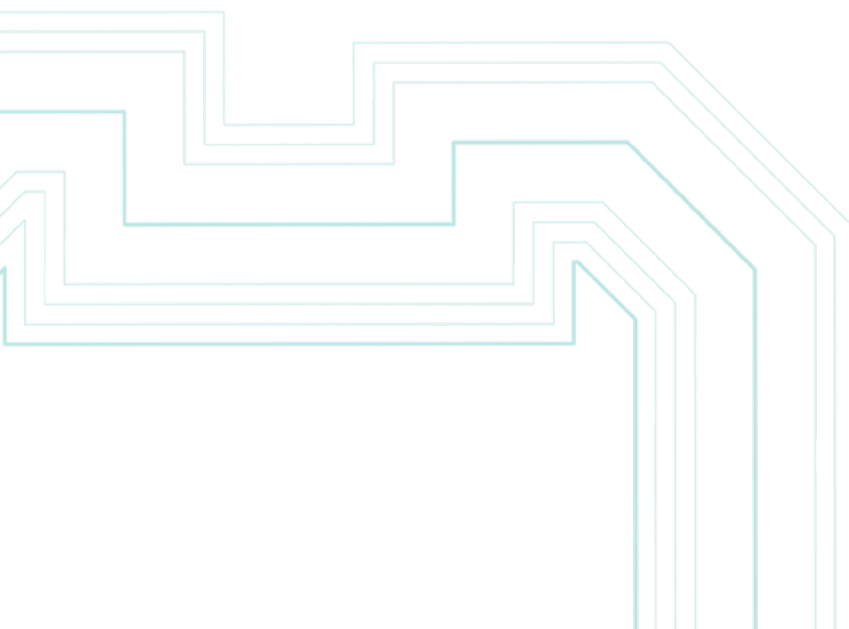
What industry challenge did you pick?

Airesone, our patented wearable device, helps children with asthma better monitor their condition. But we have always wanted to scale up our product to target adults with underlying respiratory and health conditions as well, and chose to focus on that at the IoT Challenge.

We knew that the support and guidance we would get at the challenge would help us fast-track our goal of expanding our technologies and growing our consumer base.

How has the IoT Challenge impacted your company?

It gave us the opportunity to partner Aztech Technologies to develop our prototype. As a start-up, this is a valuable opportunity. Working alongside one of the global leaders in breakthrough innovations means being able to reach new frontiers.



ProSpace Analytics

Steve Ong
Founder

What's unique about your business?

We deliver artificial intelligence-enabled workplace analytics and meeting room scheduling platforms to global enterprises, co-working space providers, architects and designers.

Our platform automates office space data collection, improves user productivity and uncovers opportunities to increase workspace return of investment.

What industry challenge did you pick?

We wanted to create a single unified platform where people could use thermal imaging to understand space usage. By using hotspots instead of the actual faces of people, we are able to address privacy concerns.

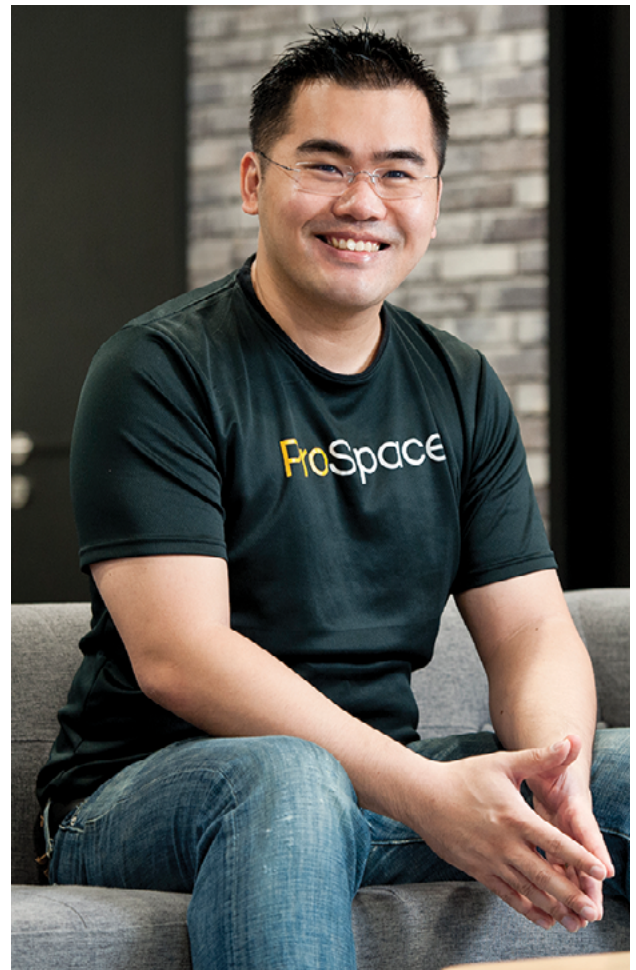
Businesses can then integrate the data into room sharing solutions to understand details like the indoor temperature and space requirements. For example, this data can then be integrated with the building management system to regulate the energy consumption within the building.

In addition, as privacy and security controls are very important for our clients, we wanted to create a platform that would not incorporate any video usage.

How has the IoT Challenge impacted your company?

It gave us access to the latest technology in the market like key components and know-how, which we could use to develop and enhance our products.

One of the biggest challenges we faced is sourcing for affordable components, and IPI has been a valuable partner in providing advice while helping us adopt best practices.



Hear from Our Partners



Raj Rao

Vice President & Head of Open Innovation
Ferrero

The global food science landscape is evolving at a rapid pace, moving from internal development to one that seeks external innovation. Collaborating with the right partners is critical in creating solutions that will define the future. IPI has been invaluable in helping us to find valued partnerships in the region and tapping the great potential of Asia's business ecosystem.

Jason Humphries

Co-founder
Good Pharma Dermatology

IPI is responsible for the genesis of the successful Singaporean brand, Suu Balm. They identified us as an entrepreneurial consumer health start-up, matchmade us with the Singapore National Skin Centre (NSC) and held our hand through the partnership agreement process. As we continue to expand the business overseas, this has led to further innovations in consumer skincare that are rooted in clinically observed medical needs — a huge competitive advantage.



Rutjawate Taharnklaew

Advisor to the Executive Management Committee
Betagro, Thailand

IPI is not only a technology accelerator but also a facilitator, matchmaker and supporter of companies in search of new technologies and innovations to improve their business. Through our participation in TechInnovation, we saw how IPI connected companies and technology providers through start-up pitching and crowdsourcing sessions, interactive exhibitions and more.



Grace Chew

Technical Director and Co-founder
Hydroemission

As a horizontal technology provider, it has always been a challenge to identify scalable applications for our technology. The endless range of applications made it extremely difficult to focus on every market opportunity. This changed after we started collaborating with IPI, which connects us with corporations that have very specific problems relevant to our expertise. These technology matches foster the creation of innovative and disruptive products with huge market potential.





George Poh

CEO
Unisteel Technology

Working with IPI since 2011 has been extremely rewarding, and Unisteel has benefitted in many ways. These include making new technology partners, building a business network and connecting with Institutes of Higher Learning and research institutions. It is amazing to see how IPI's network of technology and industry partners has grown within such a short time.

Melvyn Ho

Initiative Leader Open Innovation
Clariant

IPI has always been swift and professional in helping us meet our technology interests with their technical expertise. For the past few years, IPI has played a vital role in the success of Clariant's Open Innovation effort, by providing a strong network of businesses and academics that allowed us to drive innovation beyond our company.



Tran Thi Thu Huong

Director General
Department of International Cooperation
Ministry of Science and Technology of Vietnam

At TechInnovation 2019, we witnessed how IPI reached out to the industry and academics in and outside of Singapore. The way it supports and connects stakeholders inspired us. We believe its most valuable asset is its human capital and talents. We are impressed by the positive energy, passion, and patriotism of the management, and are looking forward to building a sustainable innovation ecosystem for our Vietnamese and Singaporean academia and enterprises together.

Dr Rangika de Silva

Head of Technology Transfer
Sri Lanka Institute of Nanotechnology

Our technology transfer office highly benefits from IPI, which assesses technologies and publishes information on them on their online platform, enabling us to connect with international clients. IPI provides us with an invaluable service and we look forward to strengthening our ties further.





Per Christer Lund

Director
Innovation Norway

At Innovation Norway, the trade promotion office of the Norwegian government, we work with IPI to connect innovative Norwegian solutions with market needs in Singapore and Southeast Asia. The IPI team has been immensely supportive in helping us assess technology and solutions relevant for the region. TechInnovation has been and continues to be a great arena for us to showcase the Singapore tech ecosystem to Norwegian companies and official VIPs like our Finance Minister.

Nick Pagett

Director of Global
CSIRO

IPI's Innovation Marketplace is a high value resource that brings research outputs and business needs closer together. As Australia's national science agency, CSIRO appreciates IPI's global outlook and the exchange of experiences when developing its own open platforms for innovation. IPI's annual TechInnovation event does a tremendous job in showcasing global science and technology ready to break out of research institutes to solve some of the world's greatest challenges.



Irene Cheong

Director, Industry Liaison Office
NUS Enterprise

We're delighted to have IPI as a trusted partner. Their deep and extensive relationships within the local ecosystem and with international companies have been vital. They have enabled us to connect with industry partners who help to transform our research and intellectual property into usable and commercial solutions.

David Toh

Chief Technology Officer
NTUitive

IPI has, for the past six years, been an integral platform partner of NTUitive, the innovation and enterprise office of the Nanyang Technological University. In more ways than one, the team at IPI has helped to bridge important knowledge asymmetries that persist between business needs and technological innovators. We expect to enjoy more years of fruitful collaborations with IPI.





Growth
Beyond
Boundaries