
1993 – 2018
for Industry
Partnership
for Impact
A*STAR
SIMTech

Develops high-value manufacturing technology and human capital for Industry

Our Cover

Partnership for Impact is the theme of the SIMTech 25th Anniversary Commemorative Publication. The design on the cover is the concept of X-Ray generation developed by SIMTech scientist Dr Wong Liang Jie. The hexagon pattern visualises graphene in X-Ray generation, depicting the strong SIMTech collaboration with industry. The waves ripple outward, signifying the propelling of industry towards success and impact for the economy. Meawnhile, the rainbow-coloured spike reflects the impact of our R&D partnership for industry. The silver background serves to commemorate SIMTech's silver jubilee.

Our Logo

2018 marks SIMTech's 25-year journey of R&D partnership with the Singapore manufacturing industry in the development of Intellectual Capital, Industrial Capital and Human Capital (3Cs) to enhance its competitiveness.

The Silver Jubilee logo signifies our 25-year R&D journey (represented by the 2 in red) in propelling the industry (depicted by the 5 in blue) to achieve success and create impact for the economy (denoted by the red star). The circular symbol is a fusion of the 3Cs, an outcome of our partnership with industry.

The SIMTech buildings in the background house its rich R&D talents, technologies and resources for industry.

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About Us

The Singapore Institute of Manufacturing Technology (SIMTech) is a research institute under the Science and Engineering Research Council (SERC) of the Agency for Science, Technology and Research (A*STAR).

SIMTech develops high-value manufacturing technology and human capital to enhance the competitiveness of Singapore's manufacturing industry. It collaborates with multinational and local companies in the precision engineering, aerospace, automotive, marine, electronics, semiconductor, medical technology, logistics and other sectors.

The technologies that SIMTech helps develop are in the areas of Manufacturing Automation, Manufacturing Process and Manufacturing System.

The research institute has also developed technology in three multi-disciplinary Research Programmes, namely the Microfluidics Manufacturing Programme, the Large Area Processing Programme and Bio-manufacturing Programme to meet emerging needs of industry.

As a technology provider, it is important for SIMTech to showcase, promote and engage the industry on specific technologies and applications.

This is achieved through its four Industry Innovation Centres, namely Manufacturing Productivity Technology Centre, Precision Engineering Centre of Innovation, Sustainable Manufacturing Centre and Emerging Applications Centre.

COMPANIES SERVED

> 3,700

INDUSTRY FUNDING

> $245m

R&D COLLABORATIONS

> 11,000

TECHNOLOGY LICENCES

> 770

NUMBER OF PMETS TRAINED

> 4,000

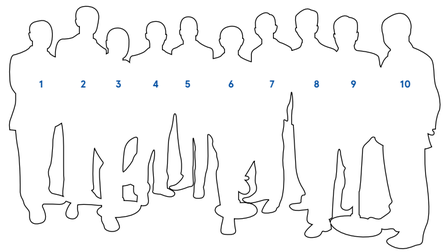
NUMBER OF POST-GRADUATES TRAINED

> 600

Our Management Team

FROM LEFT TO RIGHT:

1 Dr Zheng Hongyu, Director, Staff Development Office
2 Dr Zhang Ying, Director, Manufacturing Automation Division and Director, Research Liaison Office
3 Mr Lee Chee Choy, Senior Director, Corporate Affairs Office
4 Dr Chen Wei Long, Director, Sustainable Manufacturing Centre
5 Dr John Yong, Director, Industry Development Office
6 Dr Lim Ser Yong, Executive Director
7 Dr Stephen Wong, Director, Manufacturing Process Division
8 Dr Zeng Xianting, Director, Knowledge Transfer Office
9 Dr Lee Eng Wah, Deputy Executive Director
10 Dr Wang Zhiping, Director, Emerging Applications Division



Foreword

Let me congratulate the Singapore Institute of Manufacturing Technology (SIMTech) on the occasion of its Silver Jubilee.

SIMTech has come a long way since it was officially established in 1993 to better position itself to serve as a national focus for manufacturing research and to serve the manufacturing industry. It has successfully reinvented itself over the years to meet the ever-changing technological needs of the manufacturing sector, a key component of Singapore's economy.

SIMTech has been able to translate and transfer its technologies to help manufacturing companies raise their competitiveness and productivity. At the same time, it has also been able to develop new capabilities to position itself well for emerging opportunities. In this regard, SIMTech has been an unequivocal success, going from strength to strength to become a driving force behind the continued relevance and competitiveness of local manufacturing today.

The future of manufacturing will be driven by disruptive technologies, and local manufacturing companies must keep pace with global innovation trends to seize new opportunities and grow. This is why A*STAR launched the Future of Manufacturing initiative in 2015 with three public-private partnership platforms to drive technology innovation, knowledge transfer, and adoption by the manufacturing industry. The Model Factory@SIMTech is one such platform.

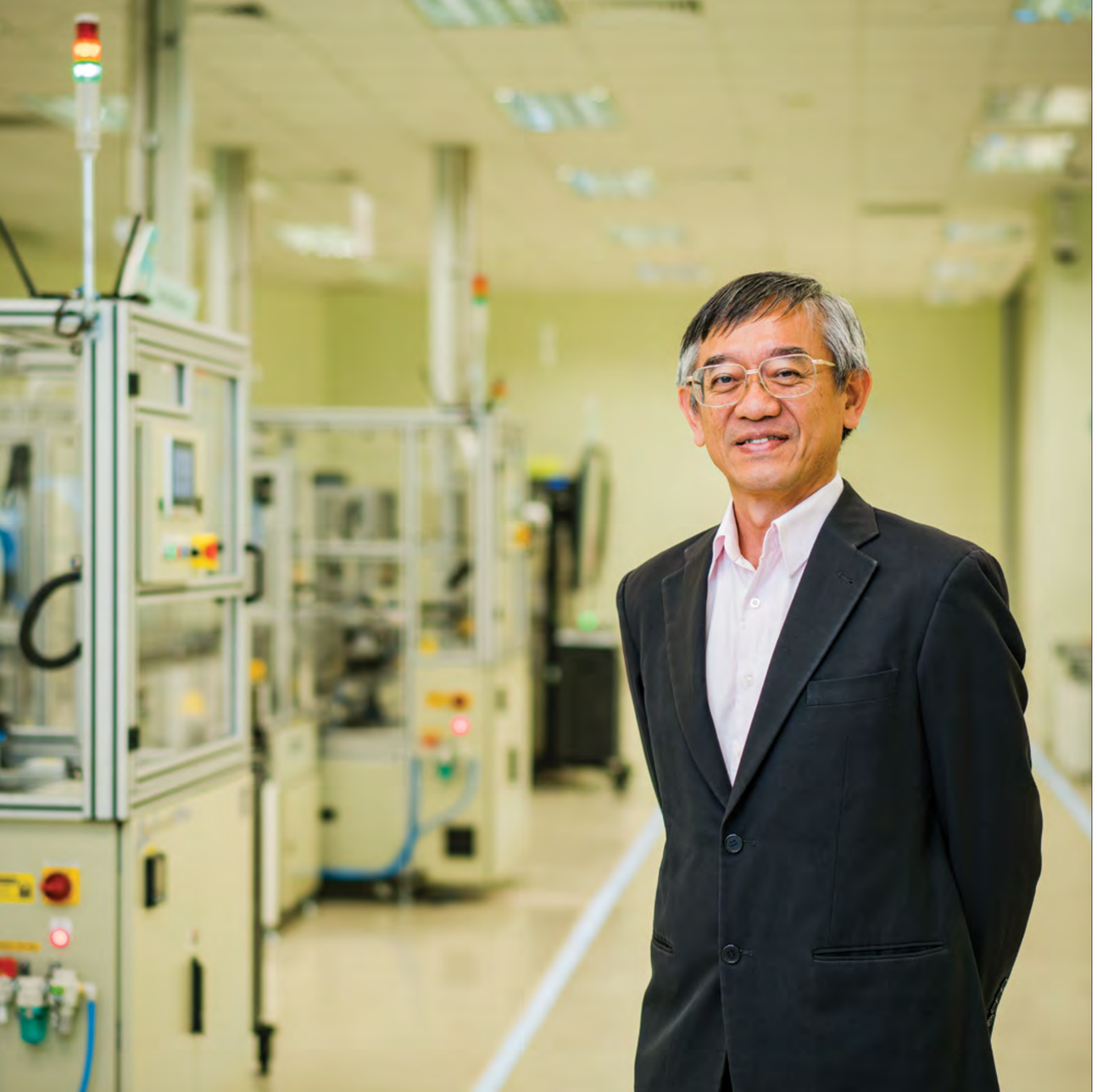
The Model Factory will allow SMEs to keep up with global innovation trends, and successfully break into new markets and grow, creating and capturing value for Singapore in the process. It will assist SMEs on their journey towards Advanced Manufacturing through adopting Industry 4.0 suite of capabilities.

At the same time, it also serves to encourage public-private partnerships that benefit the local R&D ecosystem as well as contribute to a more robust and competitive cluster.

Over the years, SIMTech has contributed very well to A*STAR's mission to advance science, and develop innovative technology to further economic growth and improve lives. Looking ahead, I am confident that SIMTech will continue to play a significant role in advancing Singapore's Future Economy through its strategies and initiatives for the manufacturing industry.

On this note, I would like to express my appreciation to SIMTech's Executive Director, Dr Lim Ser Yong, and the entire SIMTech team, past and present, for their contributions and achievements over the past 25 years and wish them every success in their next lap.

Mr Lim Chuan Poh
Chairman
Agency for Science, Technology and Research



A 25th Anniversary Message

SIMTech is committed to developing high-value manufacturing technology and human capital to enhance the competitiveness of the local manufacturing industry. Over the past 25 years, we have grown, both in strength and research capabilities, and have established a strong culture of working with the industry to develop technologies and capabilities spanning many sectors.

Building Technological Capabilities: From 1993 to 2001, the Institute, then known as Gintic Institute of Manufacturing Technology, focused on building a world-class research institution to support the manufacturing industry. In addition to establishing industry-scale research facilities, we have recruited many scientific and engineering talents globally and locally to work with the industry in R&D projects.

Enhancing Research: With the formation of A*STAR in 2001, the Institute was renamed to Singapore Institute of Manufacturing Technology (SIMTech). We began to forge partnerships with universities to undertake upstream research and focus on quality research, training of research students, publication of research outcomes in scientific journals and filing of patents, as we continued to serve the manufacturing industry.

Delivering Impactful Outcomes: Since 2005, SIMTech has placed strong emphasis on organising our engagement with the industry to deliver impactful outcomes in raising their competitiveness and productivity. We also offer continuing education training in advanced manufacturing to the Professionals, Engineers, and Executives in the industry. We have increased the number of projects and number of companies we served by 10-folds to more than 800 projects with over 700 companies a year. We train more than 600 industry participants and research students, and publish over 200 scientific papers every year.

Forging Partnership: SIMTech positions itself as a bridge between the academia and the industry. We have established joint labs with universities to conduct research in advanced manufacturing technologies and to train research manpower. We partnered with government agencies to assist many MNCs and SMEs in adopting technology to improve their business and productivity. We expanded our industry outreach to support more companies through our partnerships with trade associations and chambers of commerce (TACs).

These efforts have led to impactful outcomes such as new business initiation, revenue growth, R&D investment, and job creation and retention. Some of these successes are featured in this commemorative publication.

The Next Lap – Industry Transformation: SIMTech will be expanding its effort in the transformation of manufacturing industry to assist companies establish footprint globally with innovative technologies. We will work with industry partners to embed SIMTech's technologies into products, services and solutions for different application domains, both locally and internationally, to achieve greater impact and economic value capture.

SIMTech's vision is to be the R&D partner for the local manufacturing companies in their journey to become globally competitive. We would not have achieved our industry-relevant capabilities without the foresight of our former Executive Directors, Dr Frans Carpay and Dr Lim Khiang Wee, for steadfastly building up the institute and establishing its research capabilities. Our research and industry partners, TACs and related government agencies also played a pivotal role in our growth and achievements.

From me, my team and staff, we thank you and look forward to growing our partnerships in the next lap of industry transformation.

Dr Lim Ser Yong
Executive Director
Singapore Institute of Manufacturing Technology

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Industry Engagement

SIMTech supports companies in the manufacturing sector through industry assist, technology transfer, knowledge transfer and manpower development.

To engage the industry in a more holistic way, four Industry Innovation Centres were set up, each addressing respective industry needs such as upgrading capabilities of the precision engineering industry; enhancing sustainability in manufacturing; improving productivity and meeting industry emerging applications. Each of these centres, driving several initiatives, has established strong track records with major industry players and clusters.

Developing the manufacturing ecosystem is another tenet of SIMTech's industry assistance. A more strategic consortia approach is adopted to build capabilities of Small and Medium Enterprises (SMEs) to meet the needs of multinational corporations, enabling SMEs to become the suppliers of key manufacturing players and grow in the process.

Industry outreach is also accelerated through broadening SIMTech's engagements with trade associations and chambers of commerce (TACs) to reach out to their members. The Singapore Precision Engineering and Technology Association and Singapore Manufacturing Federation are some examples.

To enable companies to tap technologies for growth, knowledge transfer to upskill manufacturing and engineering executives is critical. Programmes developed with the then Workforce Development Agency and SkillsFuture Singapore are in place. SIMTech transfers industry case-based knowledge to industry through the systematic Learn-Practice-Implement model.

To groom a stream of relevant R&D Manpower for the local manufacturing industry, the Manufacturing R&D Certificate (MRDC) Programme equips fresh graduates with R&D skills and in-depth domain knowledge to be industry-ready. To supplement the need for experienced R&D manpower, industry can also tap on the Technology for Enterprise Capability Upgrading Programme.

Details of each of our industry engagements and outreach are illustrated in the subsequent sections of the commemorative publication.

Industry Assist: Enhancing Competitiveness

Industry Development Office works with the four Industry Innovation Centres in SIMTech to engage the industry

SIMTech's role in the development of the local manufacturing ecosystem is multi-faceted and supported by a strong research base, as well as an active industry development programme. The Industry Development Office (IDO) was set up to bridge gaps in the commercialisation value chain for SIMTech's technologies, and to facilitate knowledge and technology transfer of SIMTech capabilities to the local manufacturing industry. IDO partners government agencies and other organisations to realise innovation and technology transfer, driving collaborative industry projects, and opening up opportunities for local enterprises to engage new markets. Collaborative ties have also been forged with several trade associations and chambers of commerce (TACs) to reach out to more local enterprises.

Prior to 2007, the majority of SIMTech's engagement with industry has been assisting companies one at a time on an ad-hoc basis. To better address the needs of these companies, we re-organised ourselves to engage the industry by setting up four Industry Innovation Centres.

Industry Innovation Centres

SIMTech set up its first industry innovation centre in 2007 - the Precision Engineering Centre of Innovation (PE COI). Since its launch, PE COI has initiated 60 CIPs, completed more than 1,180 industry projects and 179 consultancy cases, as well as organised 285 events reaching out to over 12,800 participants.

The Sustainable Manufacturing Centre (SMC) was set up in 2009 to develop and implement innovative technologies that minimise emissions, wastes and toxicity in manufacturing, thereby strengthening the global competitiveness of Singapore's manufacturing industry. The Manufacturing Productivity Technology Centre (MPTC) was launched in 2011 to promote the use of technology and innovation to enhance manufacturing productivity through ensuring effectiveness, enhancing efficiency and engineering value creation.

The Centre has achieved more than 2,500 technology adoptions.The Emerging Applications Centre (EAC) was set up in 2014 to spearhead industry adoption of emerging technologies developed under SIMTech's research programmes such as the SIMTech Microfluidic Foundry (SMF) and Large Area Processing (LAP). Since its launch, EAC has initiated 9 collaborative industry projects (CIPs) to drive the application of printed electronics in Singapore in Roll-to-Roll Manufacturing, Packaging Development, Print & Media, and Smart Home Product Development.

These centres have established closer relationships with major industry partners and clusters, with each driving several industry initiatives.

Developing Manufacturing Ecosystem

In 2011, the modus operandi of companies engagement shifted from a one at a time on an ad-hoc basis, to re-look at the whole manufacturing landscape to identify segments of growth - be it in oil and gas, aerospace or medtech industries. SIMTech then worked with industry players from these segments to identify gaps in the local industry's technology and on where the value chain needed to be plugged in. By adopting this consortia approach, SIMTech focussed its R&D efforts in areas that would yield the most benefits for companies as well as the whole of Singapore's manufacturing sector.

"By helping multinational corporations to outsource some of their activities to local suppliers, SIMTech frees up their capacity to bring in more high value-add activities from headquarters to Singapore. As a result, our total manufacturing output should increase," said Dr John Yong, Director, Industry Development Office, SIMTech.

In the aersospace industry, for instance, SIMTech and its industry partners identified opportunities for local SMEs to supply parts for the cabin interiors of aircraft. It then worked with SIA Engineering Company (SIAEC) to identify components that could be manufactured by local companies, replacing international suppliers. SIMTech re-designed the parts to improve them and transferred the manufacturing know-how to produce them to a handful of SMEs. These SMEs are not only qualified to supply to SIAEC but have penetrated the high-value aerospace industry with SIMTech's help. "As a result of these efforts, there is greater value capture for the Singapore economy, and local SMEs can break into a high value-added business," said Dr Yong.

Broadening Our Engagement

In 2016, SIMTech's casts its net wider to partner with TACs for industry engagement. Two Memoranda of Understanding were signed with the Singapore Precision Engineering and Technology Association and the Singapore Manufacturing Federation in 2016 to co-organise conferences with SIMTech, and promote SIMTech's Operations Technology Roadmapping, Workforce Skills Qualification (WSQ) training courses and A*STAR Collaborative Commerce Marketplace portal to members of these TACs. SIMTech's latest initiative is the Technology Extension Partnership (TEP) Programme which helps develop strategic local partners for commercialisation of SIMTech technologies, build up their capabilities and support them in their internationalisation efforts. Currently, SIMTech is working with about 20 such partners to reach out to companies in Precision Engineering, Electronics, MedTech, Semicon, Construction, Transport, F&B, Retail and other service industries.

> *"We will continue to engage the industry through sector-wide initiatives to tackle industry problems and develop new competitive technologies.*
>
> *DR JOHN YONG MING SHYAN, DIRECTOR, INDUSTRY DEVELOPMENT OFFICE*

DID YOU KNOW?

In 2017, SIMTech worked on over 800 projects with:

589
Small and Medium-sized Enterprises

98
Multinational Corporations

32
Large Local Enterprises

Technology Transfer: Extension Partnership

The sharing of leading-edge technology with local companies is key to growing Singapore's manufacturing output

Transferring technology developed by SIMTech's researchers to industry is one of the ways that the research institute helps local manufacturers upgrade their capabilities in order to stay competitive and grow their businesses. This, in turn, helps to uplift Singapore's manufacturing sector as a whole.

SIMTech develops a broad range of technologies with the potential for multiple applications in the industry. These include solutions that improve productivity, promote sustainable manufacturing, or support the creation of new or emerging industries in Singapore. In terms of applications, these could be in the form of software that monitors a factory's machines to boost their utilisation or new manufacturing processes such as printed lighting.

SIMTech's technologies are developed at four Industry Innovation Centres, each with its distinct area of focus. These are the Manufacturing Productivity Technology Centre (MPTC), the Precision Engineering Centre of Innovation (PE COI), the Sustainable Manufacturing Centre (SMC) and the Emerging Applications Centre (EAC).

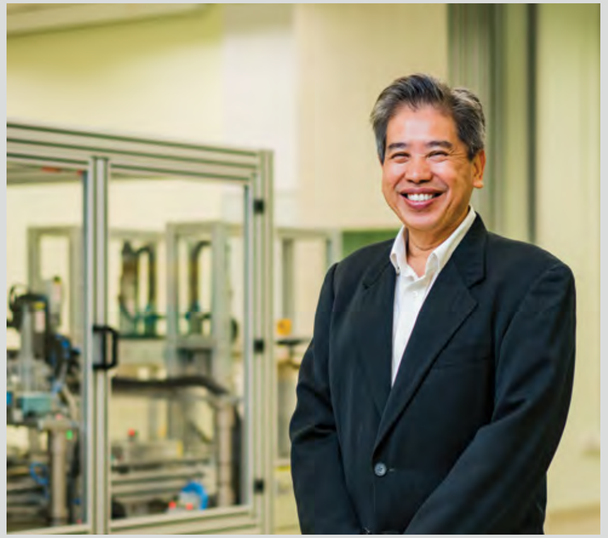
To ensure that the applications it develops are relevant, SIMTech continuously seeks the views and feedback of industry partners on the types of technologies they require. "We hold industry roundtables to discuss what are some of the issues companies are facing, and the areas where they need support in," said Dr Lee Eng Wah, Deputy Executive Director, SIMTech. Beyond industry feedback, SIMTech also analyses the global manufacturing landscape to stay on top of the latest trends and technologies.

Dr Lee noted that one challenge in transferring technology to SMEs is that many are too focused on resolving their everyday production and yield problems and do not pay attention to improving their manufacturing processes and innovate to create their own products.

"The challenge is to get the SMEs to shift their attention from just making high-quality products for others but to innovate and make their own products. To do this, R&D and transfer of technology are important," he said.

To showcase the benefits of adopting new technologies, SIMTech set up a "live" factory that has next-generation manufacturing technologies on display. Enterprises are able to tour the factory to get a better idea of how these technologies can help them improve.

> *"The challenge is to get the SMEs to shift their attention from just making high-quality products for others but to innovate and make their own products. To do this, R&D and transfer of technology are important.*
>
> *DR LEE ENG WAH,*
> *DEPUTY EXECUTIVE DIRECTOR*



Success Factors

To Dr Lee, one key sign that the technology transfer has been a success is if the company uses it in its everyday operations and continues to use it over the long-term. Another key success factor is if the company is confident enough to roll out the technology across its entire operations or further develops the technology into products to grow its business.

One notable success story is in the area of RFID technology. SIMTech's work in RFID over the years has resulted in a range of applications, from inventory tracking to monitoring the freshness of food. It has also developed an RFID-based school bus management system that tracks the attendance of students boarding and alighting the bus, and even captures the behaviour of the driver. Over 1,000 school buses have signed up with the system since its launch in 2017. Many companies that have adopted SIMTech technology are also leveraging it to enter new markets abroad.

To help extend the reach of technology transfer efforts, SIMTech started a programme that involves appointing Technology Extension Partners (TEPs); companies that act as intermediaries to transfer technology to other SMEs. "These intermediaries are not the end adopters but they take our technology, innovate it, and rolls it out to the end-user companies."

Working in collaboration with TEPs, SIMTech expects to greatly enhance the impact of its technology transfer efforts.

DID YOU KNOW?

SIMTech's technology transfer activities yielded the following benefits in 2017:

147
new commercial licences

Current portfolio of active licences are generating licensing revenues of over $1 million in royalties with a projection to reach even more for FY18

The commercial value generated by our portfolio of licensed technologies is estimated to be over $29 million in sales for our licensees

Knowledge Transfer: Immersive Learning

SIMTech is helping Singapore's manufacturing professionals to fill their skills gaps through relevant training programmes

One of SIMTech's key missions has been to help local companies upgrade their manufacturing capabilities and productivity by transferring knowledge through R&D and industrial collaboration projects.

To further drive this mission, SIMTech embarked on an effort 10 years ago to share knowledge through industry-focused training programmes as well. The Knowledge Transfer Office (KTO) was set up in July 2009 to develop and conduct a series of training courses and master classes certified by the then-Singapore Workforce Development Agency (WDA) under the Workforce Skills Qualification (WSQ) framework. WDA has since been renamed as SkillsFuture Singapore (SSG).

The content for the courses was developed based on the requirements of industry players in the manufacturing sector. "From our understanding of industry needs, we developed a unique model of supporting companies through training. This is something that other research institutes do not do," said Dr Zeng Xianting, Director, Knowledge Transfer Office.

SIMTech's training programmes adopt an innovative Learn-Practice-Implement model, which has proven to be effective in transferring knowledge and technology for industrial application or adoption by participating companies.

"In the Learn-Practice-Implement model, cutting-edge knowledge and skills are transferred through interactive classroom lectures and discussion, lab-based hands-on learning, and more importantly on-site practice and implementation. The process helps the companies learn the methodology so that they can apply it to their own problems and be able to solve it on their own in the future," explained Dr Zeng.

Staying Relevant for Industry

SIMTech conducts some 22 WSQ training programmes and 15 Master Classes in advanced manufacturing technologies. It also offers Masters degree programmes in Engineering Business Management and Supply Chain and Logistics Management in collaboration with the University of Warwick and the Singapore Institute of Management.

The KTO works constantly with industry partners to ensure the relevance of training programmes to the industry. "The challenge is to come up with a practical workable model to address the capability gaps and solve the problems of the customers. The companies identify the problems and we develop a course that is contextualised to overcome these. But it must be in an area that we have a core capability in," said Dr Zeng.

In this regard, SIMTech engages TACs and companies to ensure relevance and long-term growth of its training courses. Through such efforts, it has established partnerships with 12 TACs or partners to understand and identify the specific needs of each industrial sector. About 4,000 PMETs from more than 1,500 companies have taken part in the various courses over the years.

"Our training model provides clear and quantifiable measures of success. Companies can see the before and after results of their efforts. So, the benefits are visible and measurable. The growing number of participating companies, as well as repeat participants, is a testimony of the success of our training efforts," said Dr Zeng.

As KTO marks its 10th anniversary in 2018, it will continue to address the manufacturing sector's manpower and skills needs, he added. For instance, SIMTech is set to play a leading role in establishing respective training programmes in the area of Advanced Manufacturing as part of SkillsFuture Series.

> *"Our training model provides very clear and quantifiable measures of success. Companies can see the before and after results of their efforts. So, the benefits are very visible and measurable.*
>
> *DR ZENG XIANTING, DIRECTOR, KNOWLEDGE TRANSFER OFFICE*

DID YOU KNOW?

SIMTech's Knowledge Transfer Office training programmes are organised into four categories based on the nature of the training outcome. They are :

1
Workforce Skills Qualification courses certified by SSG

2
Modular-based training programmes under the SkillsFuture Advanced Manufacturing Series

3
Master Classes in advanced manufacturing by renowned experts in the field

4
Master degree programmes in Engineering Business Management and Supply Chain and Logistics Management in collaboration with the University of Warwick and the Singapore Institute of Management

Manpower Development: Grooming Talent

SIMTech is playing a key role in providing much needed R&D manpower for Singapore's manufacturing sector

To help Singapore's manufacturing sector move up the value chain amid intensifying competition in the region, SIMTech has been working to groom a pipeline of R&D talents who can support the growth of companies here.

Based on their interaction with industry players, SIMTech realised that SMEs, in particular, find it difficult to hire R&D engineers - an obstacle that significantly hinders their competitiveness.

"Many fresh university graduates prefer working for large companies as they perceive there are better career opportunities in these companies. For those fresh graduates who do join an SME, they do not have the R&D skills yet to make an immediate contribution," said Dr Zheng Hongyu, Director, Staff Development Office. "As such, SMEs will need to spend a considerable amount of time training new hires, but many companies do not have the resources to do so."

To alleviate the situation, SIMTech launched a two-year "Manufacturing R&D Certificate Programme" (MRDC) in 2015 to equip fresh graduates with R&D skills and in-depth domain knowledge through classroom and on-the-job training by working on R&D projects. Participants also gain industrial experience in their second year through an attachment scheme with a company.

"The aim is to train fresh graduates in R&D skills so that they are industry-ready for leading and executing R&D projects. The structured MRDC programme trains them in both soft skills like project management and technical presentation, as well as hard skills so that they develop into domain experts," explained Dr Zheng.

The first batch of 15 trainees graduated in 2017 and have all found jobs in the industry or with other research institutes. Three further batches of trainees have since been enrolled in the programme.

The training programme is also adjusted from year to year to reflect the changing needs of industry. For instance, the majority of the trainees recruited in 2017 are focused on automation and digital manufacturing as a result of industry demands.

Technology for Enterprise Capability Upgrading

Outside of the MRDC programme, SIMTech has been giving SMEs access to its R&D talents through the Technology for Enterprise Capability Upgrading (T-Up) scheme for the past 15 years. These involve SIMTech researchers spending up to two years in companies to help them identify and adopt critical technologies and build up their in-house R&D capabilities.

On average, SIMTech seconds 15 research scientists and engineers annually to the industry. In each T-Up effort, a company initiates an R&D project, where a SIMTech staff with the required expertise is deployed to the company to carry out the research project.

Companies benefit from T-Up by being able to leverage industry-focused expertise to plug the gaps in their capabilities. "SIMTech scientists and engineers are well-trained in R&D methodologies and with the right expertise, making it more relevant for industry," said Dr Zheng.

Since it was launched, over 100 companies have benefited from the scheme. Over the years, many SIMTech researchers have made significant contributions to the companies they have worked with under T-Up.

For instance, Ms Zhang Jing Jing from SIMTech helped Singnergy Corporation, a specialist in energy efficient sludge drying solutions, to develop an anti-stick coating technology which helped to solve the problem of sticking during the heating of high organic sludge feed material. This has allowed Singnergy to reduce business costs by up to 55 per cent per annum and expand into other areas like food waste management. Ms Zhang then joined the company after completion of the T-Up project.

Another SIMTech researcher, Mr Christopher Lee was seconded to precision engineering firm, Wavelength Opto-Electronic, where he helped build a traceability system that allows for real-time diagnostics of system performance for the company's patented commercial laser calorimetry system. He also joined the company after completion of the T-Up project.

> *"We have been working to groom R&D talents to support the growth of manufacturing companies here.*
>
> *DR ZHENG HONGYU, DIRECTOR, STAFF DEVELOPMENT OFFICE*

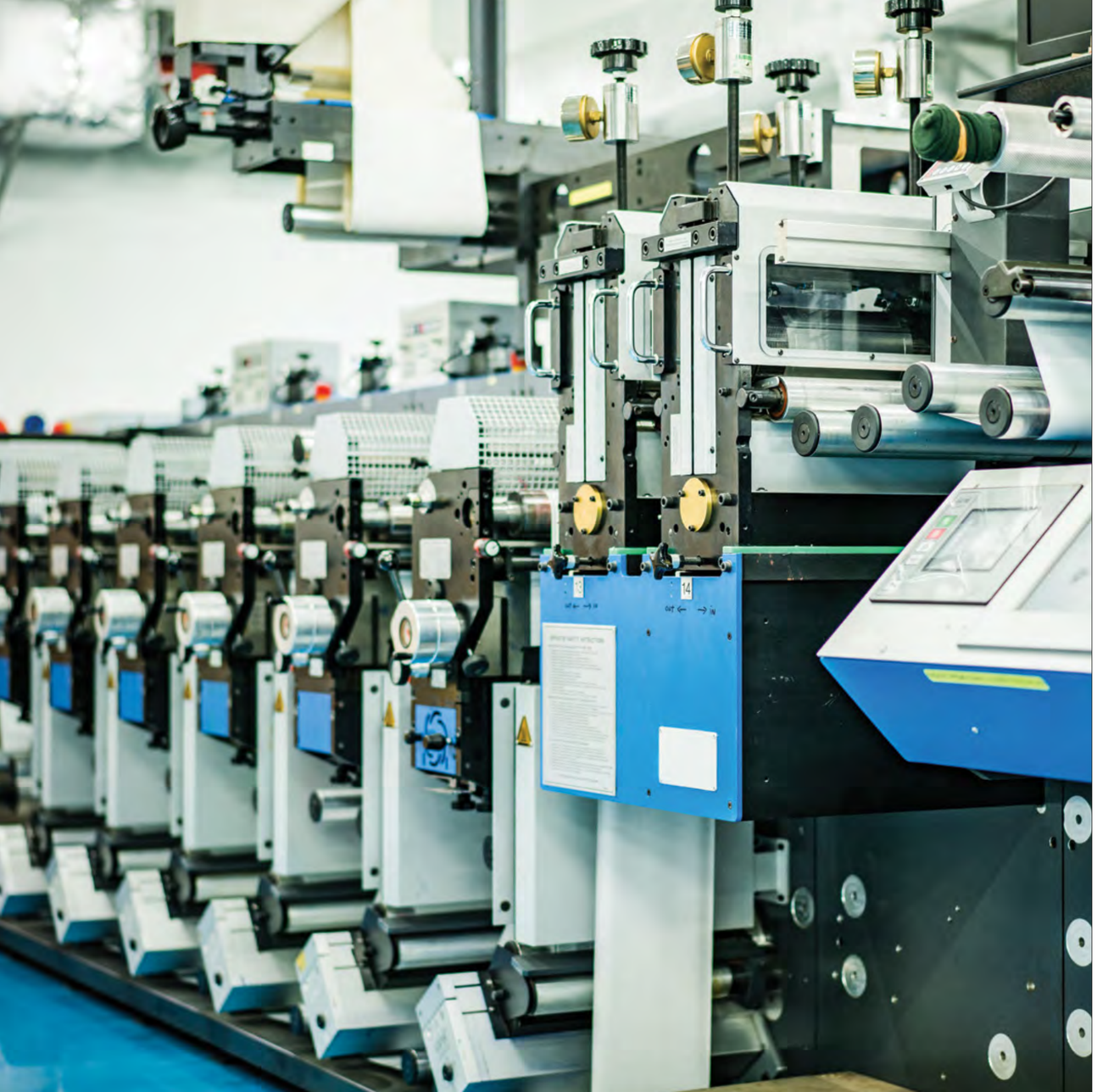
DID YOU KNOW?

15 trainees from the first batch of the Manufacturing R&D Certificate (MRDC) programme graduated in 2017 and have found jobs in industries or research institutes

3 further batches of trainees have been enrolled in the MRDC programme

More than 15 SIMTech research scientists and engineers are seconded to companies yearly

Over 100 companies have benefited from the Technology for Enterprise Capability Upgrading scheme



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Our Success Stories

Through various initiatives and programmes, SIMTech has successfully forged partnerships with a broad range of companies within the local manufacturing industry. These collaborations have helped to create value and capture value for the sector. At the enterprise level, the companies we have supported have gained from our assistance through a range of tangible benefits.

Some of the impactful outcomes include diversifying into new businesses, growing revenue streams, expanding internationally, and setting up in-house R&D facilities to continue these companies' R&D journeys. In the process, new, higher-value jobs were created or retained. In the following pages, you will read the success stories of some companies that we have worked with over the years. From start-ups to multinational corporations, these enterprises have leveraged SIMTech's technologies and expertise to bolster their internal processes or product offerings.

Some, such as Enhanzcom, have built an entire business around SIMTech's solutions, while multinational corporations like Philips have succeeded in cementing their leadership position with our help. However, these relationships are two-way streets. Through our collaborations with industry partners, we have garnered a better understanding of the market. This has allowed us to sharpen our R&D focus so that we can develop solutions with real-world applications, and be in a better position to meet the needs of industry players.

Company
Component Technology Pte Ltd

World-First 3D Inspection System For Semiconductors

Component Technology has transformed from a distributor for the semiconductor industry to an original equipment maker with SIMTech's support

For almost 20 years since its establishment in 1989, Component Technology had steadily built its business distributing bonders and X-ray inspection systems for the semiconductor industry.

In 2005, however, its Founder and Managing Director Berne Chung sensed that the company's business might be adversely impacted by a changing environment.

At that point, the bulk of the company's business came from distributing four key products. But Mr Chung believed that these distributorships might be in jeopardy in a few years – their principals may close, get bought over or choose to distribute their products directly.

"We reached a turning point in our journey. The industry was pushing for cost reduction, so it was getting increasingly difficult for a distributor to survive. So, we were thinking of what we had to do next to survive," said Mr Chung.

Fortuitously, he received an email from SIMTech then that introduced him to the research institute's services. After browsing its website, he decided to approach SIMTech with the aim of developing his company's own product.

While Component Technology's first project with SIMTech on image mapping technology for semiconductors failed, Mr Chung was undeterred. "That project failed, but I didn't give up. We learnt from that failure and had a better idea of what we wanted to develop."

On their next project, Component Technology and SIMTech jointly developed a first-of-its-kind 3D wire bond inspection system for the semiconductor industry, which was far superior compared with traditional 2D

LEFT: Mr Berne Chung, Founder and Managing Director, Component Technology

solutions. Component Technology spun off a 20-strong research and development (R&D) company called In.D Solution in 2007 to work with SIMTech on the project.

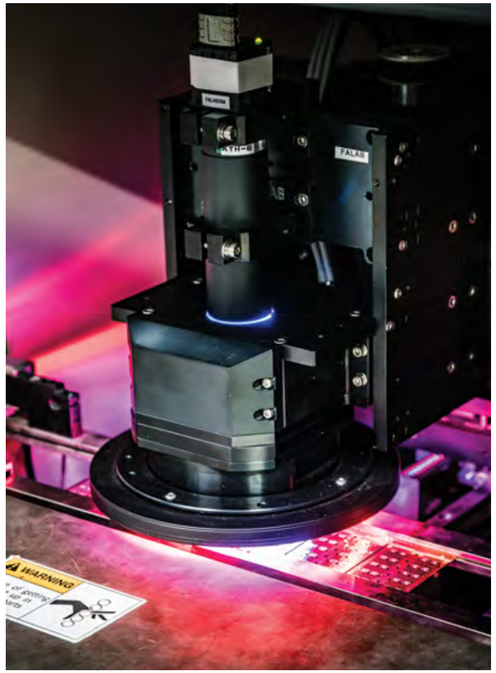
Over three years of development, the joint team developed 27 key technologies in wire bond inspection and filed two patents in stereo illumination and 2D/3D wire inspection innovations. "It was the first fully automated 3D solution in the market. It took a long time to get it working, but we managed to do it," said Mr Chung.

Dr Xu Jian, the lead SIMTech principal researcher who worked with Component Technology, noted that the fully automated system overcame the problems of human error and improved productivity. "Human beings are slow and the wires are also becoming thinner, so the chances of misjudgment are greater," said Dr Xu.

Component Technology showcased the 3D wire bond inspection system in Semicon Japan in December 2008, where it attracted a lot of interest. However, due to the global financial crisis that broke out in late 2008, investments came to a halt.

While the crisis affected the adoption rate, the company managed to deliver and integrate 20 inspection systems into production lines in a world-leading IDM (Integrated Device Manufacturer) in 2009. And since 2011, the company has sold more than 400 machines to leading semiconductor manufacturers worldwide.

The product's success has also led Component Technology to expand its staff strength from about 20 in 2006 to 130 today, with operations in Singapore, China, Taiwan, the Philippines, Thailand and Malaysia.



Component Technology's 3D wire bond inspecion system

"

With SIMTech's help, we have transformed from being a trading company to an original equipment manufacturer.

MR BERNE CHUNG, FOUNDER AND MANAGING DIRECTOR, COMPONENT TECHNOLOGY

"With SIMTech's help, we have transformed from being a trading company to an original equipment manufacturer," said Mr Chung.

Moving Forward Together

Since the positive reception to the wire bond inspection system, Component Technology has continued to collaborate with SIMTech. Indeed, since 2006, the two parties have worked together on 15 industrial projects.

Component Technology is now looking to move beyond the semiconductor industry and is working with SIMTech to develop inspection solutions for other sectors. These include an advanced inspection system for high-density thin gold wires as more automotive electronic devices use such wires to achieve greater reliability.

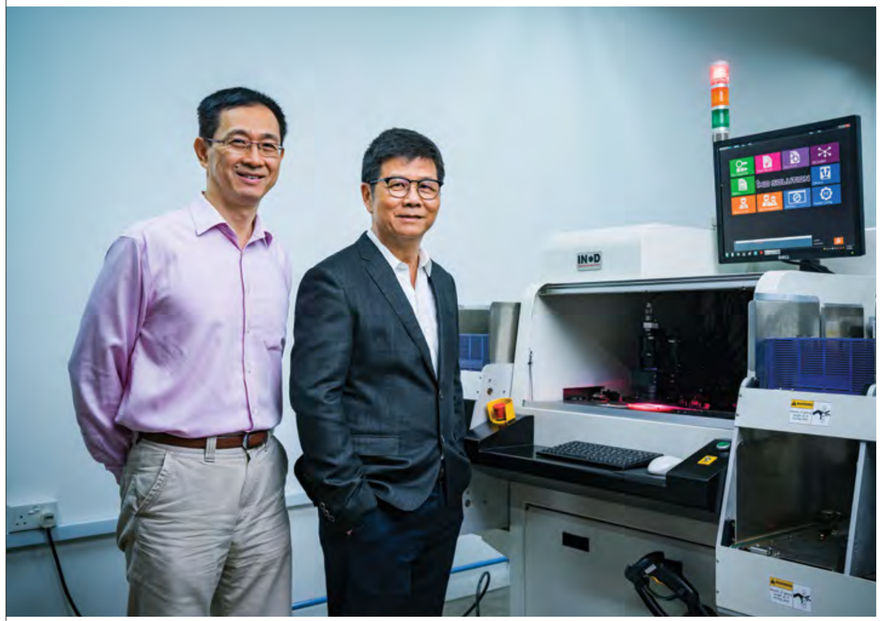
Mr Chung said: "The experience of working with SIMTech is very good. The support for our company comes from the very top of its organisation and it is clear that the researchers like Dr Xu have a passion for what they do."

In addition, Component Technology continues to channel its resources into research. It has invested $2 million in its R&D company, In.D Solution, to develop its 3D wire bond inspection system and X-ray CT system.

In.D Solution currently has four technical teams and its operations are supported by Component Technology's sales team, which was expanded to take on the additional role.

Finally, as testament to Component Technology's emphasis on research, Mr Chung said about 20 to 40 per cent of the company's revenue is re-channelled into R&D.

Dr Xu Jian, SIMTech Principal Research Engineer (left) with Mr Chung



DID YOU KNOW?

Through its collaborations with SIMTech, Component Technology has:

Transformed from a trading company to a leading 3D wire bond inspection equipment maker

Invested $2 million to set up a new R&D company In.D Solution that employs 30 research scientists and engineers

Sold 400 inspection machines since 2011

LEFT: Mr Sam Chee Wah, General Manager, Feinmetall Singapore

Company
Feinmetall Singapore Pte Ltd

Comprehensive Partnership For Growth

Feinmetall Singapore has tapped SIMTech's capabilities to overcome obstacles to its success

At Feinmetall Singapore's manufacturing facility in Marsiling, a dashboard housed in a control room integrates and displays information about the company's operations on multiple screens.

"This set-up lets us track our business operations in real-time and be notified immediately of lags. This ensures continuous flow of our processes and allows us to address any gaps quickly," said Mr Sam Chee Wah, General Manager of Feinmetall Singapore.

The company is a German-Singaporean joint-venture precision engineering SME that specialises in the design and manufacture of wafer probe cards for semiconductor wafer tests. Its solutions are used in myriad industries as well as in automotive, telecommunications and security applications.

Taking the company into the future is its $6-million, 6,700 sq ft facility that employs digital technologies to increase its productivity. Established in 2017, Mr Sam noted that the facility was made possible with the help of SIMTech.

In particular, the facility tapped technology solutions under the Model Factory@SIMTech initiative, such as the Overall Equipment Effectiveness Monitoring System (OEEMS) and Maintenance Management System (MMS).

"We have a long working relationship with SIMTech. During the early phase of our company's growth, we encountered challenges like extensive manual processes and limited production capacity. The collaboration with SIMTech over the years has helped us to overcome many of these challenges," he said.

Searching for Innovation

The company first learnt about SIMTech through Spring Singapore in 2007. Back then, Feinmetall was just a team of five employees and did not have the resources for innovation activities. It considered using the services of external consultants to automate some of its processes. However, it was concerned that a consultancy might not have the specialised knowledge and expertise required for the job.

"We chose to collaborate with SIMTech because it has a huge team of researchers and expertise. If I bring a problem to it, I am not just tapping the team of researchers that is already helping us, but the entire knowledge base of the institute," said Mr Sam.

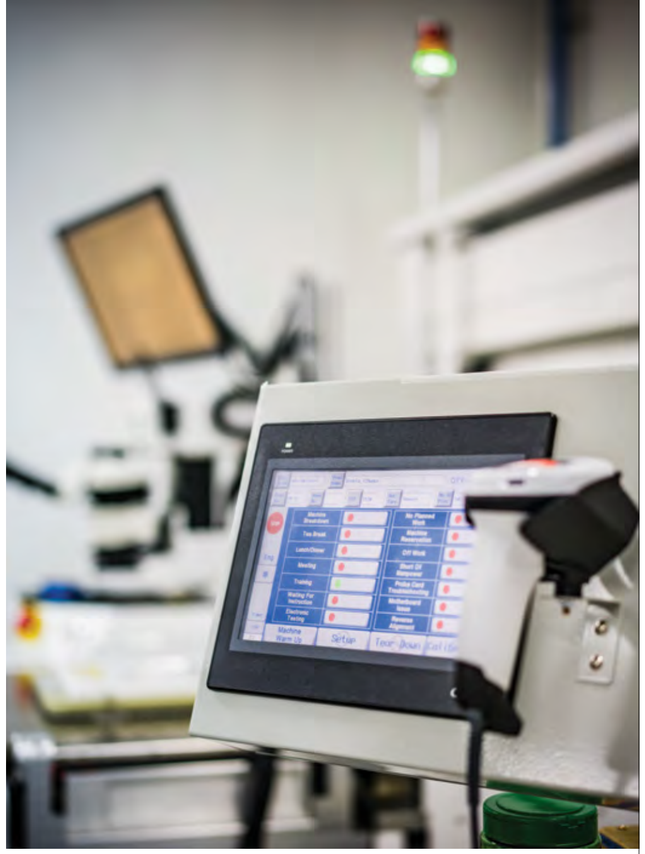
Over the years, the research institute has helped Feinmetall improve its product offerings through technical collaborations. Among them is a project to upgrade the company's capabilities in improving its wafer probe card circuit.

For this project, SIMTech designed and integrated a thermal protection circuit module in the existing probe card designs. This helped to eliminate the need for power protection equipment and reduced testing time, set-up procedures as well as manpower and space constraints. The move resulted in cost savings for the company.

"The good thing about working with SIMTech is that it is not only able to identify and address your business needs, but it is also able to identify upcoming opportunities. It has flagged the fifth-generation wireless systems, or 5G, as an area for us. We are still looking into it," said Mr Sam.

Leveraging R&D expertise

Feinmetall has also participated in SIMTech's Technology for Enterprise Capability Upgrading (T-Up) programme, where researchers are seconded to companies to support their research and development (R&D) operations. Mr Sam noted that businesses can benefit from this initiative if they treat the researchers as their own employees and include them in meetings and gatherings.



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The good thing about working with SIMTech is that it is not only able to identify and address your business needs, but it is also able to identify upcoming opportunities.

MR SAM CHEE WAH, GENERAL MANAGER, FEINMETALL SINGAPORE

"This is a great initiative especially for an SME like us, because establishing our own R&D department is not viable as we have to train the researchers from scratch. On the other hand, the SIMTech researchers already have the skills and knowledge for our needs," he said.

He added: "To make the most of the initiative, companies must not be afraid to share their information with the researchers. This is how you facilitate knowledge exchange and innovation."

Feinmetall plans to continue collaborating with SIMTech to fuel its next stage of growth. To keep himself updated on the institute's latest technology offerings, Mr Sam makes time to attend its showcase, which is held twice a year. He said: "I am always excited to see what it has to offer and how its technology can be applied to Feinmetall."

Mr Sam and his team at Feinmetall

LEFT AND BELOW: The OEEMS in action

DID YOU KNOW?

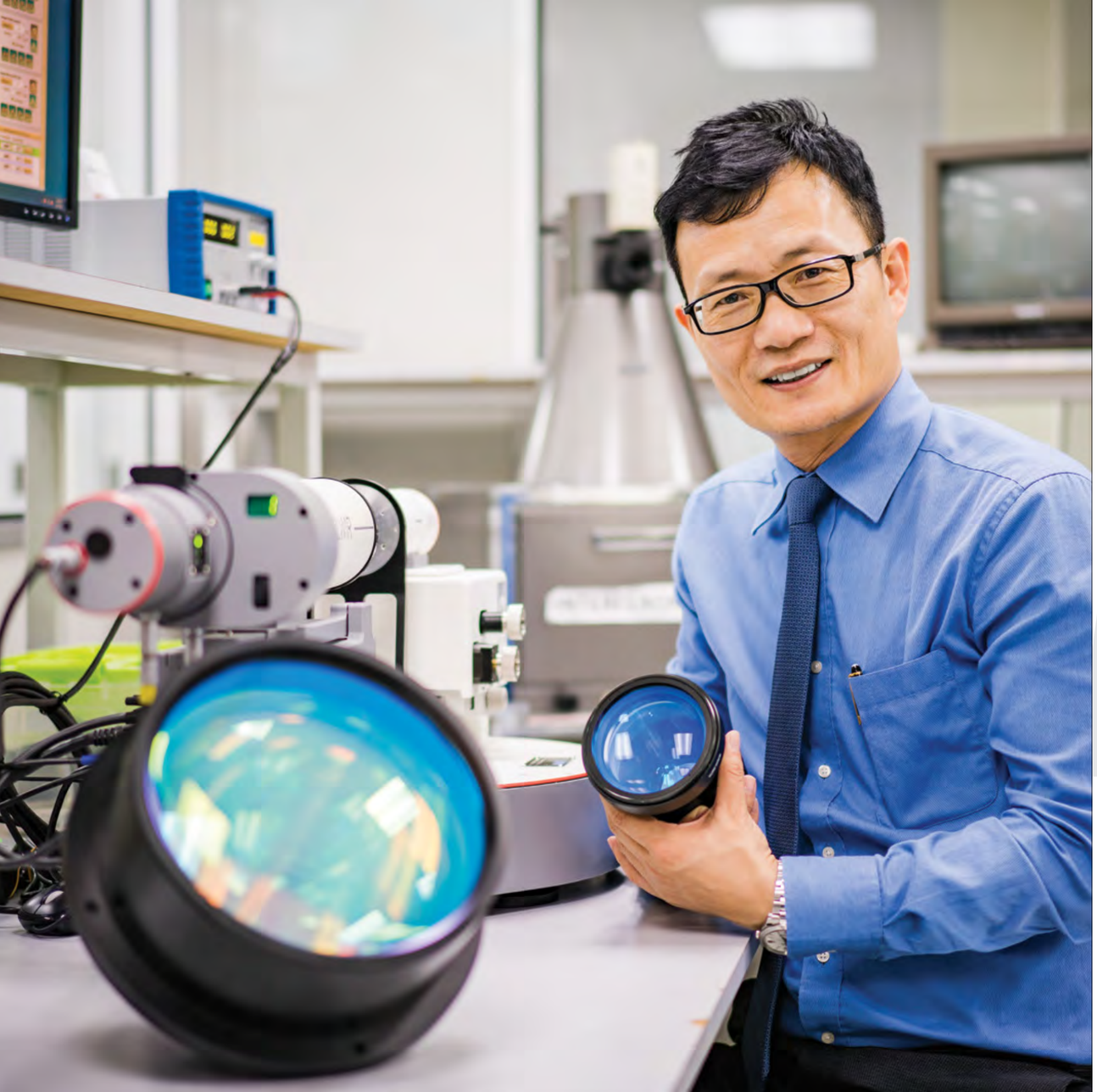
Feinmetall's collaborations with SIMTech since 2007 have achieved the following milestones:

1
Set up a new manufacturing plant with R&D facilities in 2017 and 2018

2
Grown its staff strength from 31 to 60 in the past three years

3
Increased its total revenue from $7 million to above $10 million over the past five years

4
Achieved annual average growth not less than 30 per cent for the past five years



Company
Wavelength Opto-Electronic Singapore Pte Ltd

Path To Global Expansion With New Technology

With the support of SIMTech, Wavelength Opto-Electronic has grown from being a components maker to a developer of high-value solutions

When Mr Robert Huang, Founder and CEO of optics firm Wavelength Opto-Electronic, was looking to move his company up the value chain, a friend in the industry suggested he approach SIMTech for assistance with research and development (R&D).

After attending a seminar organised by SIMTech, he decided to go into a partnership with the research institute.

In 2007, Wavelength worked with SIMTech to develop a roadmap for its future expansion under the institute's operation and technology roadmapping (OTR) programme. The five-year OTR guided its transformation from being a producer of optics components to a manufacturer of high-value solutions used in a wide range of products, from contact lenses and mobile phones to medical and surveillance equipment.

"Facilitated by SIMTech, the OTR gave us good visibility on what we needed to do to grow in the next five years," said Mr Huang. "Along the way, it served as a check to make sure we stayed on course. I would say we achieved about 70 per cent of what we set out to do under the OTR."

Guided by this comprehensive plan, the company filed its first patent in 2008, developed a rapid prototyping unit in 2012 and built an R&D laboratory in 2014. Mr Huang estimated that the company has worked with SIMTech on more than 10 R&D projects since the start of their collaboration.

One key, jointly-developed project was an automated contact lens inspection system which helped to significantly increase the speed of the internal inspection process.

It used to take the company about 30 seconds to manually inspect a contact lens. With the introduction of the automated system in 2017, however, the time has been reduced to just three seconds. The solution has also garnered interest from multinational corporations which are keen to use the technology for their own quality control operations.

Wavelength was unable to develop the system on its own as its technical resources were limited, especially in the area of software development, revealed Mr Huang.

"It is fortunate we were able to engage SIMTech. The knowledge and experience of its research staff convinced me that we should work with SIMTech to develop this solution," he said.

Wavelength's experience in working with SIMTech researchers has been a very positive one. Mr Huang said: "SIMTech staff are very knowledgeable and experienced in many areas. Whenever we encounter a technological issue, we will think of approaching them for assistance first. They are also very dedicated and resourceful. Not

LEFT: Mr Robert Huang, Founder and CEO, Wavelength Opto-Electronic

only is it easy for us to contact them for assistance, but they are also proactive in calling us to check on our progress."

He has been able to observe the professionalism of SIMTech researchers up close under the research institute's Technology for Enterprise Capability Upgrading (T-Up) initiative, which gives companies access to its researchers and expertise. Under this scheme, four SIMTech researchers have been seconded to Wavelength so far.

One of them, Mr Ng Bing Qiang, was involved in developing an image processing solution for Wavelength's automated inspection system. He has since joined the company as a software engineer. Furthermore, SIMTech provided customised training for 10 of the company's employees that was designed to enhance their respective competencies.

Mr Huang believes that the collaborations with SIMTech on R&D and new product development over the years have been instrumental in helping Wavelength climb the value chain rapidly, transforming it into a high-value systems provider. As a result, the company's turnover expanded from US$2.6 million in 2007 to around US$30 million in 2017. Its workforce has also grown to 250 employees worldwide, with about 30 team members in Singapore.

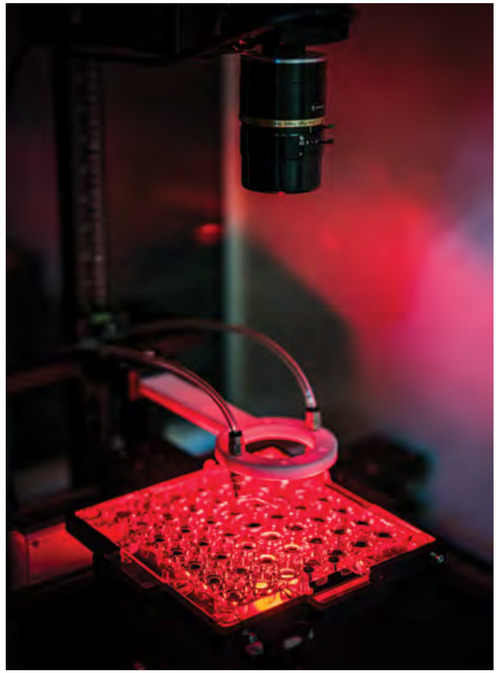
Banking on R&D for Future Growth

Today, Wavelength is making its mark as a leader in the specialised laser and infrared optics market. Going forward, it plans to invest 10 per cent of its total group revenue a year on R&D efforts to fuel future growth. It participated in a second enhanced roadmap in 2016 to help achieve its goal of growing its revenue by 35 per cent annually over the next five years, said Mr Huang.

Among other initiatives, it plans to further break into the consumer optics market and intends to set up operations in the United States to better penetrate the huge market there. The company currently has two manufacturing facilities – one in Singapore and another in Nanjing, China. Wavelength will continue to tap SIMTech's resources as part of these efforts in the future, said Mr Huang.

He suggested that the research institute could consider expanding its range of services to support SMEs on the business aspect of their operations, as well as help open doors for internationalisation.

That said, he is expecting Wavelength's partnership with SIMTech to bear fruit for many years more. "Without SIMTech's support over the years, we wouldn't have grown as quickly as we have. Its assistance has been invaluable. We would recommend SIMTech to any SME that is involved in manufacturing and is looking to grow."



Wavelength's automated inspection system

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Facilitated by SIMTech, the OTR gave us good visibility on what we needed to do to grow in the next five years.

MR ROBERT HUANG, FOUNDER AND CEO, WAVELENGTH OPTO-ELECTRONIC

DID YOU KNOW?

Wavelength's collaborations with SIMTech on R&D and new product development over the years have contributed to the company's growth in the following ways:

Turnover expanded from US$2.6 million in 2007 to around US$30 million in 2017

Workforce has grown to 250 employees worldwide, with about 30 team members in Singapore

Company
Philips Electronics Singapore Pte Ltd

Heating Up The Market With New Technology

Philips's collaboration with SIMTech yielded a solution that maintained its lead in the global laundry iron market

In the 1990s, Philips Electronics was one of the leading makers of steam irons, partly due to its innovative anodised sole plate coating that was developed in Singapore. With its scratch-resistant, easy-glide and non-stick properties, the coating enabled Philips to offer its customers a smoother ironing experience.

However, the company faced a setback when it discovered that a competitor had beaten it to filing a patent for the coating technology by just a few months.

"We faced an issue with freedom of use for the coating. Another company was also working on the same technology and it had filed its patent earlier. We needed to find another solution to maintain our leadership position," said Mr B K Ching, Senior Director at Philips Electronics Singapore, which conducts end-to-end research and development (R&D) activities for Philips Garment Care Business.

To sustain its lead in the market, Philips sought to develop a superior sole plate coating that used wet chemicals based on sol-gel technology. To do this, it set up a joint competency centre with SIMTech in 1999 to industrialise the sol-gel coating solution.

A 10-person team comprising members from Philips and SIMTech worked intensely to bring the new premium product into production. The first version of the iron with the wet chemical coating came out in 2001, with a second version in 2002.

The breakthrough that was commercialised by Philips enabled the company to grow its market share and reinforce its leadership in high-end irons, which were manufactured, assembled and tested in Singapore and Batam. In 2002, market research firm Euromonitor International named Philips the world's No. 1 brand in ironing.

"The impact of the new iron for Philips in the high-end market was very significant. If we did not have

LEFT: Mr B K Ching, Senior Director, Philips Electronics Singapore

this solution, we would not have been able to continue with our growth in the garment care market," said Mr Ching.

A One-team Approach

As testament to the effectiveness of the collaboration, the SIMTech-Philips team was awarded the National Science and Technology Award in 2002 for its work on the sol-gel solution.

The partnership saw SIMTech providing research, laboratory testing and analytical services, while Philips focused on the application, integration and production aspects of the new formulation at its manufacturing facility. Mr Ching credited their success to a "one-team" approach.

"The arrangement with SIMTech was very beneficial. If Philips did it alone, we would have needed a much bigger team. But as we were using the sol-gel technology for only one application, it would have been difficult to justify the investment," he said.

"SIMTech also offered us a team of international talent, which is hard to find in Singapore. We all worked towards a common goal and that helped to make the collaboration a success," he added.

One of the lead researchers in the SIMTech team was Dr Linda Wu, who had joined the research institute from Philips to help set up the competency centre in 1999.

"The collaborative approach worked because it is a non-competing structure where both parties benefit from the know-how. While Philips has a specific application, at SIMTech, we have the scope to look for broader applications," she said.

Building on Success

Following the launch of the sol-gel-based iron, Philips continued to collaborate with SIMTech to improve the technology as well as on a number of other R&D projects in the following years, even till today.

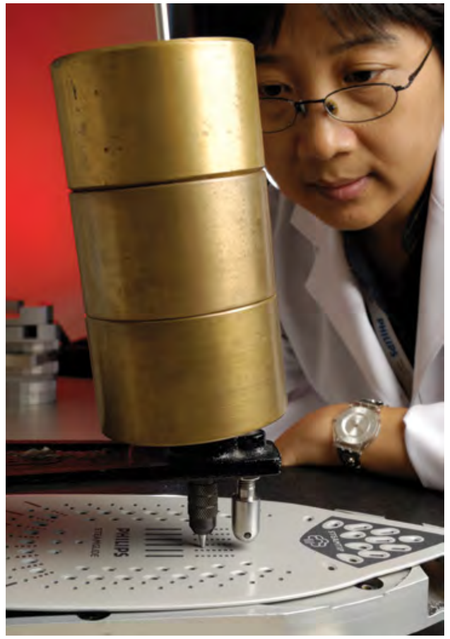
These included developing printable decorative coatings for its irons; identifying cost savings and yield improvements through alternative sole plate surface treatments; and looking at ways to improve the glide performance of irons at elevated temperatures.

These and other co-developments have led to seven jointly-owned patents with Philips on sole plate coatings.

Beyond coatings, SIMTech has also helped Philips in other areas of manufacturing, such as evaluating a new process for liquid forging for the production of steam generators and exploring laser welding for the assembly and sealing of the boilers.

Collectively, SIMTech's contributions have resulted in Philips improving the turnaround time for its product development and reduced the need for the company to bring in technical specialists from its corporate laboratories in the Netherlands.

This, in turn, has enabled the company to strengthen its R&D efforts in laundry iron innovation in Singapore. Mr Ching said: "The experience with SIMTech has opened our eyes to what we can achieve when we want to develop new technology."



R&D work being carried out on coatings for steam irons

Dr Linda Wu, Senior Scientist, SIMTech, with Mr Ching

> "
>
> *The experience with SIMTech has opened our eyes to what we can achieve when we want to develop new technology.*
>
> *MR B K CHING, SENIOR DIRECTOR, PHILIPS ELECTRONICS SINGAPORE*

DID YOU KNOW?

Philips Electronics Singapore's collaboration with SIMTech started in 1994. SIMTech had supported the company's R&D efforts in creating functional materials, elements and devices to be used in the products, and to solve issues encountered during the production

The partnership reached a new level in 1999 when the two parties set up a joint competency centre to co-develop wet chemical coatings based on sol-gel chemistries as an alternative to enamel and stainless-steel iron sole plates to enhance its steam irons

Philips has, over the years, utilised the research institute's analytical facilities in carrying out defect and failure analysis in new product development as well as product improvement

Moving forward, SIMTech will continue to assist Philips in strengthening the chemical formulations and process know-how of sol-gel coating for its steam irons as well as new technologies addressing its future needs

Company
Quantum Chemical Technologies (Singapore) Pte Ltd

Partnership With The Right Chemistry

Developed with SIMTech, Quantum Chemical Technologies' new printed electronics solution opens up a new product segment for the company

The relationship between Singapore Asahi Chemical & Solder Industries Pte Ltd (SACSI) and SIMTech started over 20 years ago with projects related to the development of solder paste. Since then, the two parties have collaborated on 27 successful projects.

In 1997, Quantum Chemical Technologies (Singapore) Pte Ltd was set up to undertake the research and development (R&D) component of the SACSI group of companies and oversee its intellectual property (IP) aspect. Quantum embarked on its first collaboration with SIMTech in 2014 as it sought to expand its product lines in printed electronics applications.

SACSI and Quantum aimed to leverage the research institute's know-how on producing silver nanowires (AgNWs) on a laboratory scale and turn it into an automated mass-production process.

These silver nanowires could be further formulated into conductive AgNWs inks and used in a wide range of applications, including touchscreens, printed lighting, photovoltaic solar cells, wearable devices and displays harnessing printed electronics technologies.

By leveraging printed electronics technologies and solutions, the company would eventually reduce the process cost compared with that of conventional electronics processes.

"SIMTech already had the preliminary research in this area and we in Quantum/SACSI looked further into the synthesis of AgNWs with various parameters and materials," said Ms Chew Kai Hwa, Quantum's R&D Director. Following the successful outcome of the pilot phase, a second phase of the project to mass-produce the silver nanowires started in 2016.

A Track Record of Collaboration

SACSI was established in 1977 as a manufacturer and distributor of high-quality solder products and related soldering chemicals for the electronics, telecommunications and electrical appliance industries. The company started working with the then GINTIC

LEFT: Ms Chew Kai Hwa, R&D Director, Quantum Chemical Technologies

(now SIMTech) in 1994 by using the research institute's facilities for testing and characterisation purposes.

"As a developer of electronics material, the benefit of working with SIMTech is that it has state-of-the-art equipment for both industrial application and testing as well as scientists and engineers with experience from the application aspect. This saves us a lot of R&D efforts and manpower costs, allowing us to operate under very lean conditions," said Ms Chew.

She added: "R&D is a continuous process for a company and, to reduce the cost, we signed up with SIMTech to utilise its facilities every year."

Opening New Doors

Quantum has already filed a patent together with SIMTech for the silver nanowire production technology and is now working to commercialise its silver nanowire materials and conductive ink products. The company is also looking for partners who are keen to explore more applications of silver nanowires in the areas of printed electronics. "We have completed the project and we are now able to successfully mass-produce AgNWs with various dimensions to cater for different applications. We have since formulated several kinds of inks for different applications and will continue to do so with our partners in their new applications and development," said Ms Chew.

"This is an advanced material and the sky is the limit for its application. If the industry continues to look into conductive electrodes in plastics using the printed electronics applications, then the market for our AgNWs will be very promising. But if this trend doesn't take off due to technology limitation or the lack of acceptance in the industry and users, then that is a risk we have to face," she added. Ms Chew noted that working with SIMTech's researchers has allowed the company to save on some equipment and manpower costs, as well as offered a good training ground for its marketing and application engineers to increase their understanding of the application and processes of printed electronics.

Moving forward, Quantum will continue to use SIMTech's facilities for testing and introduce the research institute to some of its users who have just started looking into new applications pertaining to emerging technologies. She said: "I would advise SMEs and start-ups in Singapore to make use of research institutes in A*STAR like SIMTech to leverage their facilities and capabilities. There is nothing wrong with staying small and nimble as you can do big things with a small team."

ABOVE AND LEFT: Applications for Quantum's silver nanowire technology

> *"I would advise SMEs to make use of research institutes like SIMTech to leverage their capabilities.*
>
> *MS CHEW KAI HWA, R&D DIRECTOR, QUANTUM CHEMICAL TECHNOLOGIES*

Quantum Chemical Technologies is the R&D arm of Singapore Asahi Chemical & Solder Industries

DID YOU KNOW?

SIMTech's contributions have helped Quantum venture into a new product space and also to develop the value chain for the printed electronics industry in Singapore

SIMTech transferred the know-how of silver nanowire synthesis to Quantum and further improved the yield and quality of silver nanowires for automated mass production

The collaboration saw the development of roll-to-roll manufacturing processes to produce silver nanowire transparent conductive film with high performance and low cost

The two parties have jointly filed the patent to protect the intellectual property generated from the technology

Company
SIA Engineering Company Limited

Paving The Way For SMEs To Enter The Aerospace Sector

SIMTech's work with SIA Engineering Company is helping to develop the local aerospace value chain

In an effort to add value to its services, SIA Engineering Company (SIAEC) wanted to find a way for local SMEs to supply the polymeric components that were required in aircraft cabins, and to help airline customers manage their cost and reduce their reliance on large Original Equipment Manufacturers (OEMs).

However, local plastic moulding companies at the time were unable to enter the aviation industry due to their lack of expertise in product design and manufacturing of aircraft cabin parts. Strict aviation compliance regulations also made entering the industry a challenging move.

To overcome this hurdle, SIAEC approached SIMTech in 2012 to build the expertise and technology needed by local firms to become suppliers to aerospace companies. The research institute helped to identify parts in the aircraft cabin that failed frequently and developed processes to improve them.

Thereafter, it embarked on Collaborative Industry Projects (CIPs) with local SMEs to transfer the know-how to make aircraft cabin parts. Since 2012, SIMTech has worked with eight SMEs in this manner to manufacture a growing range of components for SIAEC.

"The collaborations have provided value to our airline customers. Typically, if a cabin part fails, the airline goes back to the OEM. But the OEM is not motivated to fix it, as it would prefer the customer buy a new part," said Mr Foo Kean Shuh, Senior Vice-President, Line Maintenance and Cabin Services at SIAEC.

"By working with local suppliers, we are able to produce the parts, offer lower prices and continuously improve their reliability. SIMTech has helped the SMEs plug the gaps in their expertise to achieve this outcome," he added.

Two examples of CIPs with SIAEC involved transferring expertise to two local SMEs – Proway and Maxservo – to manufacture a polymeric cup holder and cocktail tray.

SIMTech helped the participating SMEs upgrade their knowledge in design, simulation and manufacturing of polymeric materials according to aerospace industry

LEFT: Mr Foo Kean Shuh, Senior Vice-President, Line Maintenance and Cabin Services, SIA Engineering Company

Mr Foo with Dr Sun Zheng, SIMTech Deputy Director, Sustainable Manufacturing Centre

SIMTech helps to upgrade capabilities in manufacturing aircraft cabin parts

“By working with local suppliers, we are able to produce the parts, offer lower prices and improve reliability.

MR FOO KEAN SHUH,
SENIOR VICE-PRESIDENT,
LINE MAINTENANCE AND CABIN SERVICES,
SIA ENGINEERING COMPANY

standards. In addition, it transferred its technologies on fabrication of cup holders and cocktail trays according to SIAEC’s specifications. SIMTech also helped them to set up quality control systems to better penetrate the high value-added aircraft cabin parts manufacturing market.

“As a result of our CIPs, local SMEs have developed new capabilities and have since been approved as SIAEC’s service providers, paving the way for them to venture into the aviation industry,” said Dr Sun Zheng, a SIMTech researcher who worked with SIAEC on the CIPs.

“The value capture for them is the ability to supply parts to SIAEC and venture into both local and overseas aviation industries, opening a new revenue stream for the companies and broadening local suppliers’ offerings to the aerospace industry,” he added.

Building In-house Capabilities

Beyond helping SMEs enter the aerospace industry, SIMTech has also transferred skillsets directly to SIAEC in enhancing the design and manufacturing of cabin parts.

Leveraging this new expertise, SIAEC set up a fabrication team in 2016 to produce some of the components it needed in-house. This new team, in turn, opened additional opportunities for SIAEC.

“Production is a new area for SIAEC. It has the potential to be a substantial business for us. We are not making the same part, but improving it,” said Mr Foo.

“SIMTech has been very professional and forthcoming during our collaborations. The solutions and processes it developed have been well-received by our customers.”

Aircraft cabin components manufactured by local SMEs

DID YOU KNOW?

SIMTech’s Collaborative Industry Projects (CIPs) with SIA Engineering Company (SIAEC) are opening new avenues for growth for both the aerospace company and SMEs that supply it

As a result of a CIP, one participating SME, Proway, has seen its company revenue increase by 30 per cent and it is now looking to expand its business to Indonesia and Vietnam in the next two years

Another SME, Maxservo, has seen its annual revenue increase by 25 per cent

The SMEs have secured businesses from overseas clients

For SIAEC, the value capture is its reduced reliance on Original Equipment Manufacturers (OEMs) and the enhanced competitiveness with the availability of local suppliers at its doorstep

LEFT: Mr Edwin Seah, Founder and CEO, Enhanzcom

Company
Enhanzcom Pte Ltd

Getting SMEs Ready For The Digital Revolution

Enhanzcom built its business around SIMTech's Unified Configurable Architecture technology

Since 2009, local technology company Enhanzcom Pte Ltd has been helping other SMEs in Singapore to digitise their workflow with its core product, Fitprise – a web-based software system designed to fit and integrate business operational workflows for industries.

Fitprise is up to 40 per cent cheaper than solutions from other enterprise resource planning (ERP) systems and can be developed in half the time. The system was created locally at SIMTech and enhanced over the years by Enhanzcom.

"Many systems on the market have a pre-defined workflow. What we provide is a system that can be customised to each company's individual workflow. Fitprise reduces the effort to develop a system," said Enhanzcom Founder and Chief Executive Officer, Edwin Seah.

"We further developed the platform to suit the needs of the market. As time passed, customers wanted more enhancements so we have added these improvements to meet their needs."

SMEs who use Fitprise benefit from lower costs and improved productivity. One of the company's first clients, local cable system firm LanTroVision, adopted Fitprise in late 2009 to address issues of staff accountability and ownership of projects. Since then, LanTroVision has saved at least $150,000 in manpower and time savings annually as a result of implementing Fitprise.

Unified Configurable Architecture

The technology behind Fitprise was developed by SIMTech researcher Dr Song Bin and his team.

Dr Song realised that many SMEs did not have the resources to integrate their IT systems into their workflow. He worked with two SMEs to explore how they could digitise and streamline their workflow, but felt that it took too much time to build ERP solutions from scratch for each company.

"I wanted to create a software platform that could be easily configured and quickly deployed in different companies and industries," said Dr Song.

His solution was a Unified Configurable Architecture (UCA) software development platform that would later drive the Fitprise system. When Mr Seah met Dr Song in 2007 through a mutual friend, he immediately sensed a business opportunity. He subsequently started Enhanzcom with funds from his own pocket, his wife and another investor.

Enhanzcom licensed the UCA platform from SIMTech in 2008 and developed it further to become Fitprise. It

took another two years before the product was ready for commercialisation.

Building A Business from Scratch

Mr Seah said that Enhanzcom's entire business was built on the core technology provided by SIMTech. "Our company was built around the UCA platform developed by SIMTech. Without it, there would be no business."

He added that beyond providing the technology, SIMTech has also helped to reach out to the market to promote the Fitprise solution, helping Enhanzcom overcome the limitation of having only a 10-person team. "SIMTech is like our big brother. With them by our side, customers are more confident when they take on our solution."

Mr Seah noted that, in recent years, SIMTech has become more proactive in understanding the needs of industries. The knowledge it has gained has helped it to develop solutions that can be used without the need for modifications.

Expanding Abroad

Looking ahead, Mr Seah is planning to expand internationally with Fitprise. Already, the company has tied up with partners in Indonesia, Malaysia and the Philippines. Nonetheless, he feels that there is still much potential in the Singapore market. "We have to progress beyond the local shores, but I feel that Singapore still has a large, untapped market in the SME space.

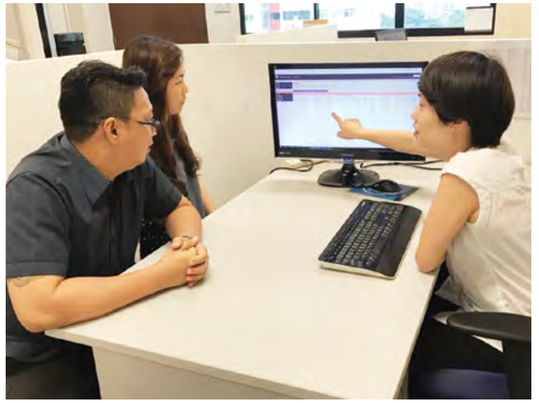
Mr Seah explains the benefits of the Fitprise solution

> *"SIMTech is like our big brother. With them by our side, customers are more confident when they take on our solution.*
>
> *MR EDWIN SEAH, FOUNDER AND CEO, ENHANZCOM*

There are around 180,000 SMEs here and only a small percentage has adopted digitisation and ERP solutions," he said.

Enhanzcom is also looking to work with SIMTech to leverage UCA for applications such as business intelligence and business mobility. "We want to see how we can tap SIMTech's resources to help us in this area. We have to move with the times, we can't be using the same technology from 10 years ago."

He added: "Our journey together is not ending; it is taking on a different dimension. SIMTech has the knowledge to understand problems in a deeper way, while we, as the commercial company, understand the market. So, there is synergy: When we tell SIMTech there is a need, it can tell us if it has the technology to meet those needs."



An Enhanzcom team member discusses the Fitprise system with a customer

Dr Song Bin, Senior Scientist, SIMTech (left), with Mr Seah

DID YOU KNOW?

Over the last five years, Enhanzcom has seen revenue growth of 45 per cent and it has become profitable

The company is focusing on growing its presence in Indonesia and predicts that the market could contribute up to 30 per cent of its revenue in the next two to three years

Company
JEP Precision Engineering Pte Ltd

Digital Transformation On The Shopfloor

SIMTech tailored its Overall Equipment Effectiveness system to help JEP Precision Engineering boost its manufacturing efficiency

JEP Precision Engineering is a local SME which makes parts for the aerospace and semiconductor industries.

When JEP decided to move to a new, larger factory at Seletar Aerospace Park, it took the opportunity to incorporate new digital technologies into its operations as a means to improve productivity.

"We identified the low utilisation rate of the machines as an issue that was affecting productivity. I looked around the market for technology that could help us improve utilisation and found that SIMTech was able to customise a solution for us," said Mr Soh Chee Siong, JEP's President.

The company approached SIMTech for assistance in 2016.

In June that year, the research institute trained 10 JEP employees under its "Implementing Overall Equipment Effectiveness (OEE) for Productivity Improvement" programme. During the training, SIMTech started a pilot trial to monitor four of JEP's machines. By using an OEE Manufacturing System to track their operation, it aimed to reduce time wastage due to machine stoppages.

The encouraging results from the trial convinced JEP's management and workers that this was the right way to go. "Once our people saw the results of the system, they were more willing to accept the new technology and way of working," said Mr Soh.

Following the trial, SIMTech further tailored the system to the company's requirements and helped implement the OEE system for 90 of JEP's 115 machines at its 200,000 sq ft manufacturing facility, which opened in October 2017. Among other benefits, the system offered the company plant-wide visibility and traceability, hence helping to improve machine utilisation rates by close to 30 per cent.

LEFT: Mr Soh Chee Siong, President, JEP Precision Engineering

JEP aims to leverage its smart factory capabilities to secure higher-value contracts with major aerospace Original Equipment Manufacturers (OEMs) for the production of aircraft parts. It is also looking to enter the China market to work with players in the aerospace, semiconductor as well as oil and gas sectors, said Mr Soh.

The successful OEE implementation led to JEP being named the first SME Digital Champions for the Smart Factory initiative under the Singapore Government's Precision Engineering Industry Transformation Map.

From Manual to Automated

Before the OEE system, JEP staff had to manually track the status of the machines as well as the order flow of the production line. This information then had to be updated on a board five times a day.

"We used to do things with pen and paper, which was very tedious and inefficient and also resulted in errors in the data collection. But with the automated system, we can get live data that is transparent to everyone," said Mr Soh.

> *"We used to do things with pen and paper, which was very tedious. With an automated system, we can get live data that is transparent to everyone.*
>
> *MR SOH CHEE SIONG, PRESIDENT, JEP PRECISION ENGINEERING*

JEP staff can now monitor accurate machine data on a real-time dashboard display and take necessary action immediately to deal with problems that crop up.

Moving Towards Industry 4.0

The success of the OEE collaboration has led to new tie-ups between SIMTech and JEP. One ongoing project involves the deployment of automated handheld measurement devices used to inspect machine parts, known as the Handy Measurement Assistant (HMA) for Computer Numeric Control (CNC) Tool Wear Offset.

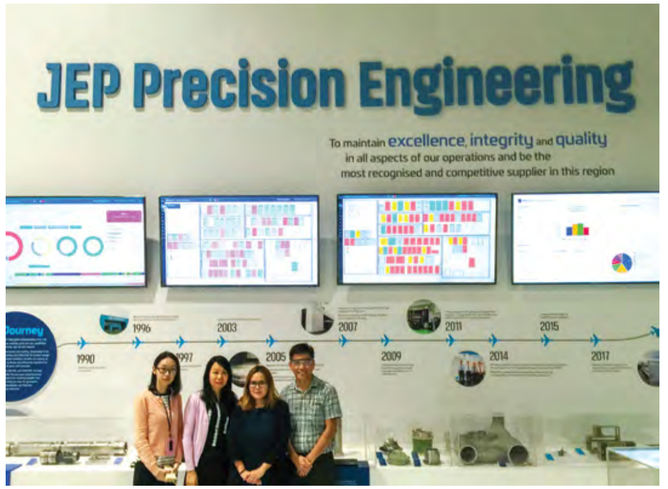
Currently, JEP uses a manual gadget to inspect parts and take readings and the data is then manually keyed into the machine settings. The HMA device designed by SIMTech will allow these measurements to be taken automatically and sent to the machine via a Wi-Fi connection.

"Beyond better productivity, the beauty of an automated solution is that it becomes mistake-proof. In a manual system, if we input the readings incorrectly, it can cause the machine to crash, which is a big issue," said Mr Soh.

The launch of Model Factory@SIMTech's Manufacturing Control Tower in 2017 and JEP's continual development of its digital manufacturing capabilities will likely see the two parties collaborate further in the future.

Mr Soh said: "We are fortunate to have had a very good and experienced team of researchers from SIMTech. It has a wide range of experts in various fields and it has been very responsive to our needs. We will definitely be engaging it to help us with our Industry 4.0 journey."

LEFT AND BELOW: The OEEMS gives Mr Soh and his team a holistic view of the factory's operations



DID YOU KNOW?

The OEE Monitoring System has helped JEP Precision Engineering in the following ways:

Implemented OEE Monitoring System on 86 CNC machines and 4 Coordinate Measuring Machines to visualise metrics in real-time, identify key wastage and improve productivity

Increased machine utilisation at the Flexible Manufacturing System line from 56 per cent to 75 per cent

Improved throughput by 10 percentage points to 15 per cent

Reduced idle time by 15 percentage points to 20 per cent

LEFT: Ms May Yap, Chairwoman and CEO, LHT Holdings Limited

Company
LHT Holdings Limited

Revolutionising Pallet Design

Since 2008, SIMTech has supported pallet manufacturer LHT Holdings to improve its processes and upgrade its capabilities

Listed on the Singapore Exchange, LHT Holdings manufactures and supplies wooden pallets and cases to its customers for the packing of industrial products. It also trades raw timber-related products and manufactures its proprietary technical wood. In addition, it rents pallets to businesses.

In search of a better solution for pallet design, LHT Holdings' Chairwoman and CEO May Yap approached SIMTech for assistance. "As an SME, our resources are limited and there is no capacity to set up a large-scale R&D team to innovate for us. If we were to set up our own team, we would also have to spend time training the staff on the timber business. But with SIMTech, the researchers already have the knowledge and experience," she said.

In 2014, SIMTech helped LHT develop a 3D system to automate pallet and crate design. A key feature of the system is that it reduces design time by 50 per cent. "People who are not in this line think that designing a pallet is just about drawing it out, but what they do not know is that the dimensions and material used must be able to withstand the load it carries. At the same time, the design must also take into consideration the mode of transportation," explained Ms Yap.

With this in mind, SIMTech researcher Dr Song Bin and the project team included features in the design system that enabled LHT to accurately calculate the amount of pressure a pallet can withstand, as well as the amount of material needed. Dr Song said: "The idea was to design a system that not only addresses LHT's current needs, but also to pre-empt any future needs of the business."

Ms Yap also recalled sketching drafts of wooden pallets on pieces of paper at client meetings in the past. "At that time, the only pallet design software available was from the United States. When we approached the people who designed the software, they mistakenly thought we were a company based in China and did not want to license the software to us for fear we would copy it," she recounted.

"SIMTech provided us with a system that enables us to be ahead of the game in our industry. With our drawings on paper, everything was two-dimensional and it looked messy after corrections were made and we had to present it to our customers. With this system, it is knowledge-driven, three-dimensional and professional.

"And when you need to make edits on the go, this technology gives you the opportunity to store and share your work quickly," added Ms Yap.

A Track Record of Innovation

LHT has been working with SIMTech since 2008 on a range of projects. Ms Yap learnt about the research institute at a precision engineering seminar organised by Spring Singapore (now Enterprise Singapore). Since then, she has been encouraging her fellow SMEs to tap the resources and expertise of SIMTech.

She said: "I want to leverage SIMTech's expertise for as long as I can. We have a very good working relationship. Its staff are always a call away and the researchers who work with us are very committed and have a good understanding of our business. The best part is that the same researchers have been working with us for a decade."

Dr Song and another SIMTech researcher, Mr Ao Yin Tai, were previously involved in helping LHT develop an Event-driven Business Process Management (EDBPM) system in 2012 that manages and streamlines end-to-end pallet manufacturing processes such as orders, deliveries and inventories.

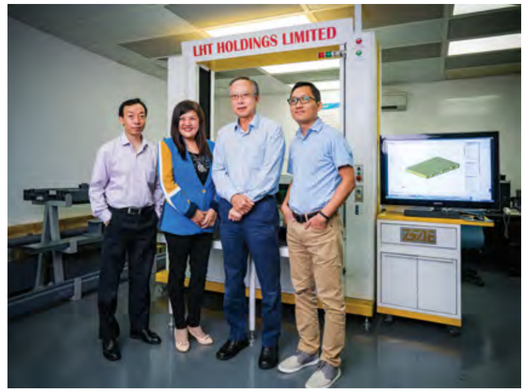
LHT has also worked with SIMTech through the Technology for Enterprise Capability Upgrading (T-Up) programme. This is a platform that directly assists SMEs to innovate and develop new capabilities and knowledge to increase their productivity and competitiveness.

Under this programme, Mr Ao was seconded to LHT for 10 months in 2014 and 2015. During this time, he carried out product life cycle assessment and identified areas of improvement for the company. He also helped to develop a raw materials management system that can be integrated with EDBPM to reduce the inventory of raw materials by 15 per cent and lower the company's operational costs by $130,000.

Most recently in 2017, LHT worked with Model Factory@SIMTech to re-engineer its existing pallet assembly line and to deploy a smart and sustainable pallet assembly line as part of its growth plans. Model Factory@SIMTech is a live production facility that provides a platform for manufacturers to learn and experiment with new digital solutions.

The way Ms Yap sees it, SMEs must be prepared to work openly with SIMTech to benefit from the collaboration. "Singapore is probably one of the few countries in the world where the Government provides such support to SMEs. To make the most of your collaboration, you need to be forward-looking and willing to take risks.

"You need to trust the professionals from SIMTech and have open discussions with them so that you can innovate together."



LEFT TO RIGHT: Mr Ao Yin Tai, Principal Research Engineer, SIMTech; Ms May Yap, Chairwoman and CEO, LHT Holdings; Dr Song Bin, Senior Scientist, SIMTech; and Dr Tran Le Quan Noc, Scientist, SIMTech

> *"SIMTech provided us with a system that enables us to be ahead of the game in our industry.*
>
> *MS MAY YAP, CHAIRWOMAN AND CEO, LHT HOLDINGS LIMITED*

DID YOU KNOW?

LHT Holdings has benefited from working with SIMTech on the following projects:

RFID PALLET LEASING & TRACKING SYSTEM
Productivity gains from the implementation amounted to annual savings of over $50,000 for the company and around $375,000 for its clients

RAW MATERIALS MANAGEMENT SYSTEM
This integrated system helped LHT to reduce raw materials inventory by 15 per cent and lower its operational costs by $130,000

3D SYSTEM TO AUTOMATE PALLET AND CRATE DESIGN
The 3D system reduces product design time by 50 per cent

Company
Teckwah Industrial Corporation Limited

Making The Leap To Higher Productivity

Teckwah has seen productivity gains and cost savings with the help of SIMTech

Teckwah Industrial Corporation Limited was established in 1968 as a producer of cardboard packaging in Singapore.

Over the years, it has not only evolved by staying relevant and meeting its customers' ever-changing needs, but has also grown to become a leading service provider in customised supply chain management services, from advanced packaging solutions to mission critical and reverse logistics solutions.

Due to rapid changes in the industry, the company constantly sought to transform the way it operated in order to thrive in an increasingly competitive environment.

"We were looking for a structured approach to become more operationally efficient," said Ms Mai Ah Ngo, Teckwah's Executive Director.

With support and guidance from SIMTech, Teckwah adopted the Operations Management and Innovation (OMNI) Methodology to improve its operational processes. The OMNI programme helps organisations achieve productivity improvements with a set of tools and processes.

Teckwah rolled out OMNI from 2011 to 2014 and achieved several successful outcomes. These include carrying out 18 productivity improvement projects, saving around $560,000 in costs, and re-engineering and migrating its logistics system.

Training Productivity Champions

Dr Roland Lim, the lead SIMTech researcher on the OMNI project, said that the research institute was able to offer Teckwah a "learn, practice and implement" model of knowledge transfer. Such a model involves classroom learning as well as on-site mentoring and training on the shopfloor. "Beyond implementation, we also aim to groom productivity champions within the company who can help train others," he said.

As part of the OMNI programme, SIMTech helped to train 13 "Technovation Managers" at Teckwah to champion productivity-improvement initiatives across the organisation.

A SIMTech researcher was also seconded to the company to help set up a framework for the monitoring and execution of productivity initiatives, under the

LEFT: Ms Mai Ah Ngo, Executive Director, Teckwah Industrial Corporation Limited

Technology for Enterprise Capability Upgrading (T-Up) initiative. T-Up gives companies access to SIMTech's researchers and expertise.

"OMNI was developed to improve processes and focus on material flow. But we are now moving beyond that. We are looking to improve the company's digital flow to integrate all its information systems to improve productivity," said Dr Lim.

Digitalisation and Transformation to Industry 4.0

Teckwah is collaborating with SIMTech to improve the information flow within the organisation and adopt the next generation, or Industry 4.0, of manufacturing solutions.

It is one of the first companies to participate in SIMTech's recently launched Digital Transformation & Innovation (DTI) programme, which helps organisations to develop into "smart factories". Eight of its senior management staff are involved in the programme.

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The knowledge and know-how acquired through engaging with SIMTech will be expanded to group level for overall effectiveness.

MS MAI AH NGO, EXECUTIVE DIRECTOR,
TECKWAH INDUSTRIAL CORPORATION LIMITED

With the assistance of SIMTech, Ms Mai is confident that Teckwah can make the leap to realise its goals in digital transformation and become an innovative manufacturing company, spreading the acquired knowledge and technology to the rest of the group.

She said: "Process improvement is deeply ingrained in our work culture. The knowledge and know-how acquired through engaging with SIMTech will be expanded to group level for overall effectiveness. We will continuously explore opportunities for collaboration with other organisations to enhance our competitiveness."

LEFT TO RIGHT: (Teckwah) Mr Lim Ming Shiang, Assistant HR Executive; Mr Kew Kee Hing, Senior Business Operations Director; Mr Calvin Ong, Sourcing and Purchasing Manager; Ms Sherlin Lee, General Manager; Ms Mai, Executive Director; Dr Roland Lim, Principal Research Engineer, SIMTech; Mr Ma Bin, Principal Research Engineer, SIMTech

DID YOU KNOW?

Teckwah rolled out the OMNI programme from 2011 to 2014 and achieved the following results:

Trained 13 Technovation Managers to champion enterprise-wide productivity improvement initiatives

Carried out 18 productivity-improvement projects

Accumulated about $560,000 in total cost savings

Deployed nine staff to other departments

Re-engineered and migrated its logistics system

Company
Tunity Technologies Pte Ltd

On The Fast Track To Success With RFID

With SIMTech's support, RFID specialist Tunity Technologies has grown from being a solutions provider to a solutions developer

When Ms Lim Peck Hui left ST Electronics in 2003 to found her start-up offering radio-frequency identification (RFID) solutions, she and her partners had a mission – to give companies in Singapore and countries in the Association of Southeast Asian Nations (Asean) greater access to the tracking technology.

Named Tunity Technologies, the company specialised in using RFID to track personnel, library materials and other assets. After 10 years, however, the company found it challenging to grow the business as each solution had to be customised to the specific needs of the client, making it difficult to keep costs down.

"We didn't really have a strategy to grow in the long-term. We just did projects with whoever knocked on our door. For 10 years, we were trying to find the right path, but it was very haphazard," said Ms Lim, Tunity's Co-Founder and Managing Director.

However, its fortunes began to shift in 2013 when it became one of the first companies to adopt SIMTech's RFID Item Management Tracking System (IMTS) technology. The plug-and-play system made deployment of RFID systems more efficient and lowered the cost of adopting such a solution.

"The plug-and-play system meant that we had to tweak the software only a little, but did not have to change the whole solution for each customer. This made it easier for smaller companies to adopt it," said Ms Lim.

Mr He Wei, the SIMTech researcher who worked with Tunity on IMTS, explained that the programme was part of the Government's broader effort to help SMEs adopt productivity solutions. "We wanted to encourage mass

LEFT: Ms Lim Peck Hui, Co-Founder & Managing Director, Tunity Technologies

adoption of such technologies, so we packaged it in an easy-to-use system," he said.

Finding Success

With SIMTech's support, Tunity was able to find new clients with the IMTS solution.

An early success was the development of a sushi-plate RFID tagging solution for restaurant chain Ichiban Sushi in 2013. The system tracked the freshness of the food on the conveyor belt, allowing Ichiban to improve the standard of food safety. It also increased productivity as staff no longer had to monitor manually how long each plate had been on the conveyor belt. The technology has been deployed at 11 Ichiban outlets, with more outlets in the pipeline.

"Ichiban had approached SIMTech for a solution and we worked with it to come up with a solution that met its needs and budget," said Ms Lim.

In 2015, Tunity used funding from Spring Singapore (now Enterprise Singapore) to create its own Smart Management Tracking System (SMTS) based on SIMTech's IMTS technology. The successful development of SMTS also marked Tunity's transformation from being a solutions provider to a solutions developer and opened up new business opportunities for the company. So far, there are 46 SMTS adoptions by companies.

Another high-profile success for Tunity was in 2016, when it developed and implemented a tray-return system at Timbre+ Food Centre with SIMTech using RFID technology. The system required customers to pay an extra dollar when they order food and the amount would be reimbursed when they bring their RFID-tagged tray to the return station.

"The challenge for this project was predicting how the RFID would perform when there are changes to ambience in an open space like a hawker centre. In the laboratory, you will get 100 per cent detection, but you may not get the same results on the ground," said Ms Lim.

"We were very anxious on the day we launched as the project had received a lot of media attention. We didn't get any sleep the night before."

Thankfully, the system worked with minor hiccups. With the tray-return system in place, Timbre+ Food Centre was able to improve its labour productivity by 63 per cent as the number of cleaners required was more than halved. The system has since been rolled out at two other food centres.

Leveraging on these successes in Singapore, Tunity is now looking to offer its solutions to customers abroad, including those in Brunei, Hong Kong and Australia. After its experience working with SIMTech, it is also looking to expand its in-house research and development (R&D) capabilities.

"R&D is a way of life and I want to integrate it into our company culture. This means fostering an attitude of being inquisitive and finding better ways to do things," said Ms Lim. "We have learnt a lot about R&D from SIMTech and we have a better idea of how to position and benchmark ourselves in this area."

"

R&D is a way of life and I want to integrate it into our company culture. This means fostering an attitude of being inquisitive and finding better ways to do things.

MS LIM PECK HUI, CO-FOUNDER & MANAGING DIRECTOR, TUNITY TECHNOLOGIES

Ms Lim with Mr He Wei (right), Principal Research Engineer, SIMTech

DID YOU KNOW?

Tunity's R&D collaboration with SIMTech has had the following impact on the company and its customers:

The company has transformed from being a RFID solutions provider to a RFID solutions developer, and increasing its bottom-line with this new capability

The automated tray-return system developed for Timbre+ Food Centre has helped improve labour productivity by 63 per cent

As a SIMTech Technology Extension Parther, Tunity has completed over 50 projects worth around $550,000 in revenue since 2014

Company
Film Screen Pte Ltd

Lighting A New Way For Advertising

Film Screen is transforming outdoor advertising with world-first largest Roll-to-Roll printed lighting technology developed by SIMTech

One evening in 2015, an SMRT double-deck bus lit up Orchard Road with a 12-metre-long illuminated panel advertisement, the first of its kind in the world. The ground-breaking printed lighting film technology behind the advertisement was the result of a collaboration among The X Collective (XCO) - a wholly-owned subsidiary of SMRT Commercial - homegrown printing company Film Screen and SIMTech.

Never before had a printed lighting film been produced in one continuous roll of that length. Previously, to achieve the same effect, a series of smaller panels had to be placed side by side. But armed with this capability, Film Screen became a first-mover in the untapped market for large-sized illuminated advertising.

Film Screen started in 1983 as an analogue printer for everything from T-shirts and posters to outdoor posters and panels. Over the years, it moved into digital printing, offering its services to media owners such as XCO. In 2013, it was approached by SIMTech to explore the use of the new printed lighting technology the latter had developed.

"We are constantly looking for new solutions that can capture attention and help us stay relevant. So, when SIMTech approached us with the technology, we thought it was an interesting solution we could try," said Mr Lee Chee Yong, Managing Director, Film Screen.

Work started at the end of 2013 and was completed with the launch of the first bus carrying a 12-metre-long advertisement for mobile phone brand Huawei in May 2015.

Mr Lee described the experience of working with SIMTech researchers as a positive and enriching one.

"They are definitely my favourite bunch of rocket scientists. The researchers were very hands-on, they loved to get involved. Every time we did an installation on a bus, someone from their team would be there to

LEFT: Mr Lee Chee Yong, Managing Director, Film Screen

support us," he said. "I was impressed by the way they delved deeply into the technology and brought out the best in the solution."

Combining Technology with Commercial Sense

While SIMTech brought technical expertise to the table, Film Screen provided its business experience to make the film lighting solution commercially feasible for their purposes.

For instance, by using Film Screen's selective block-out print methodology, the company was able to keep costs down by amortising the same printed lighting panel over numerous advertising campaigns. The printed lighting panel can be kept as a permanent feature on each bus and there was no longer a need to change the printed lighting panel to match the design of each new advertisement.

Without such a business model, the solution may not have been affordable.

"The partnership is fantastic. We bring the market relevance and SIMTech empowers us by increasing our capabilities with this technology," said Mr Lee.

A Brighter Future

Today, Film Screen's illuminated panel advertisements can be seen on 35 buses and they give XCO's clients an exciting out-of-home canvas that can be used to capture attention, whether it is in the day or night.

The panels have also garnered attention abroad and Film Screen is now exploring opportunities in Asia

> *"They are definitely my favourite bunch of rocket scientists. The researchers were very hands-on, they loved to get involved.*
>
> *MR LEE CHEE YONG, MANAGING DIRECTOR, FILM SCREEN*

and Europe with transport operators and print service providers. At the same time, the company is working with SIMTech on the next generation of the technology, which is designed to be brighter and more energy-efficient.

Mr Lee is also looking to use the solution in other applications beyond bus advertisements. The thinness of the panel (at less than 1mm) will allow lighting panels to be installed on the side of vending machines, for instance.

His goal in the longer term is to eventually take over the manufacturing of the panels from SIMTech. To do this, Film Screen will need to achieve economies of scale by growing its business abroad.

"The panel technology has changed the image of our company. We have always been rather innovative in the realm of traditional printing, but now, we have ventured into functional printing and electronics," he said. "It has set us up for our next 10 to 20 years of growth."

ABOVE: Printed lighting technology

BELOW: Illuminated bus advertisement

DID YOU KNOW?

Following SIMTech's transfer of printed lighting technology to Film Screen, the SME has achieved the following:

Became the first company in Singapore to offer lighted advertisements for buses

Opened up a significant new growth avenue for the company

Acquired a platform for the company's internationalisation

Company
Inzign Pte Ltd

Blazing A New Path In Healthcare Tech

With a shared vision, Inzign and SIMTech are working to develop the value chain in the fledgling microfluidics medical device market

As a leading local contract manufacturer with more than 30 years of experience, Inzign has made its reputation as a specialist in precision plastic injection moulding and assembly of disposable medical devices.

To ensure that it had the capabilities to meet the changing needs of its customers, the company started collaborating with SIMTech in 2013 on small projects to build up its competencies.

In 2014, after having gained confidence in Inzign's manufacturing capabilities, A*STAR's commercialisation arm Exploit Technologies Pte Ltd and SIMTech approached the company to be their mass-scale production partner for a new medical diagnostic solution based on microfluidics technology.

The solution was known informally as "Lab on a Chip". A typical function of such a solution is to conduct blood tests on the spot by putting a drop of the patient's blood on a tiny piece of plastic.

"We saw that this is the future where diagnostics can be conducted at the point of care. Lab on a Chip can detect problems earlier and help with patients' recovery. We felt that this is the direction the industry is moving in, so we decided to work with SIMTech's Microfluidics Manufacturing Programme to build our strength in microfluidics," said Mr Phua Swee Hoe, Inzign's Managing Director.

Dr Wang Zhiping, the lead SIMTech researcher who worked with Inzign on the project, said the research institute had started researching the technology in 2007 as it felt that there was great potential for such solutions in the healthcare and other markets.

"After we reached the point where we thought we were ready to build a supply chain for mass production, we spoke to several companies who could potentially be our mass production partner. We chose Inzign eventually because of its long experience in the medical products area and its ISO certification," said Dr Wang.

"Most importantly, after speaking to Mr Phua, we felt we formed a good team as there was mutual synergy and understanding," he added.

As the market was still in its infancy, SIMTech developed a model that would see it license the technology to Inzign for mass production. At the same time, the two parties would seek globally device owners who would be interested in adopting the solution.

"We are speaking to several potential device owners and we are confident that at least one will place an order

LEFT: Mr Phua Swee Hoe, Managing Director, Inzign

for the mass production of microfluidics devices by the end of the year, and they have shown some interest in working with us," said Dr Wang.

Mr Phua said that the collaboration with SIMTech is helping Inzign move up the value chain, from being a contract manufacturer to a solutions provider. The potential of its microfluidics device-manufacturing business was also the catalyst for the company's listing on Hong Kong's Growth Enterprise Market (GEM) stock exchange in January 2018, under the name IAG Holdings. This is in addition to its other new promising capabilities such as medical device packaging and sterilisation.

"This collaboration has allowed us to penetrate the medical diagnostics industry and we aim to expand our core business into microfluidics device manufacturing," said Mr Phua. "SIMTech has been very positive throughout this experience. It helps that it is very close to the industry, compared with other agencies, and its strong engagement benefits us greatly. This makes it easier to work with SIMTech."

Since the technology transfer was successfully completed in 2015, Inzign has expanded its production space with a new clean room specifically for microfluidics device manufacturing. The company is now competent in producing devices with feature size down to 50µm.

Microfluidics technology is a game-changer for the medical devices industry

"

Our collaboration with SIMTech has allowed us to penetrate the medical diagnostics industry and expand into microfluidics device manufacturing.

MR PHUA SWEE HOE, MANAGING DIRECTOR, INZIGN

Spiral microfluidic chip

Going to Market Together

SIMTech's partnership with Inzign is unique in that both parties are working together to develop the microfluidics device value chain. To that end, Mr Phua and Dr Wang have been travelling the globe to attend exhibitions and speak with potential customers over the past two years.

"Going to market together is a new model with SIMTech. We have not done this with other companies. But we are confident the market is really there," said Dr Wang.

Added Mr Phua: "I believe that if this thing kicks off, it will have a tremendous impact on us and totally transform Inzign."

Inzign's clean room

DID YOU KNOW?

Attracting Global Investors With New Technology

Inzign has leveraged the potential of its new microfluidics device-manufacturing capabilities to list part of its business on Hong Kong's GEM stock exchange under IAG Holdings

IAG Holdings debuted on GEM on January 19, 2018 and had a market capitalisation of about HK$146 million as of May 2018

Moving Forward: Value Capture Through Technology Extension Partnership

SIMTech's Technology Extension Partnership Programme leverages technology partners to multiply its capacities to impact more end-users

SIMTech has made great strides over the past 25 years assisting companies in the manufacturing industry to develop and adopt new technologies and capabilities. The Institute has also helped businesses groom talents and develop their own in-house R&D expertise.

"While we are happy with the progress we have made in recent years, we believe we can do more to reach out to more companies and support their transformation amid a fast-changing environment," said Dr Lim Ser Yong, SIMTech's Executive Director.

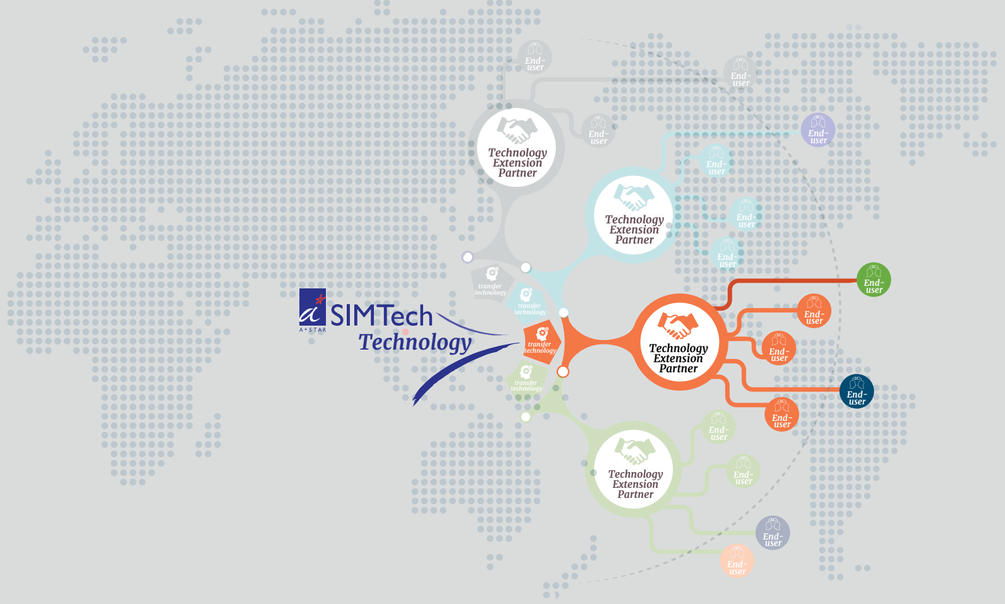
Moving forward, Dr Lim said that SIMTech will be accelerating an initiative known as the Technology Extension Partnership (TEP) Programme which it has embarked on a few years ago. "In the TEP Programme, we work with technology partners who adopt SIMTech's technology to develop products, solutions and services for the end-users in different industries and domains. The TEP partners help to spread our R&D outcomes to benefit many more companies in the industry," he said.

By using the TEP partners as intermediaries, SIMTech will be able to multiply the rate of technology adoption across many domains, extending its reach far quicker than if it did the outreach on its own. This collaborative approach allows SIMTech R&D outcomes to benefit more companies with its existing resources, and brings its mission of creating partnerships for impact to another level. TEP also frees up SIMTech researchers to devote more time in developing new technologies.

Developing TEP Collaborations

The TEP partners are companies which are familiar with the industry domains and have shown the ability and willingness to develop new products, solutions and services for the end-users. SIMTech provides the industry partners with technologies for the products and solutions which are market defined and industry-driven. The partners will be responsible for business development and work closely with their customers to address their needs.

> "
>
> *In the TEP Programme, we work with technology partners who adopt SIMTech's technology to develop products, solutions and services for the end-users in different industries and domains.*
>
> *DR LIM SER YONG, EXECUTIVE DIRECTOR, SIMTECH*



SIMTech Technology Extension Partnership

To ensure success of the TEP partners, SIMTech will work closely with the companies to fine tune and customise its technologies for the end-users. It will also help to transfer technical knowledge and support the partners to develop their own engineering and R&D capabilities.

A good example of TEP is SIMTech's partnership with Component Technology which has been in the semiconductor equipment sector for many years and is familiar with the needs of the industry. Working closely with SIMTech's scientists, Component Technology adopted SIMTech's Computer Vision and Image Processing technology to develop the first-of-its-kind fully automated 3D wire bond inspection equipment for the semiconductor industry and has sold more than 400 systems since 2011. The company has expanded its manufacturing capabilities and established its R&D team with more than 20 staff in Singapore. Component Technology not only delivered good value to its customers but also created strong impact to the economy. Today, Component Technology has internationalised their business and established offices in many countries.

Another example is Tunity Technologies which has been working with SIMTech to spread RFID technology and solutions across a broad range of SMEs. As a TEP partner, Tunity has worked closely with SIMTech's scientists to develop many innovative RFID solutions for their customers to improve productivity, grow their operations, and contributed positively to the economy. They are helping SIMTech to reach out to and serve more companies than otherwise possible by SIMTech alone.

Going International with TEP

With many manufacturing activities shifting overseas, SIMTech will support its TEP partners to internationalise their business and serve their customers wherever they are globally. "We will ensure the products and services offered by our partners are globally competitive with our technologies," said Dr Lim. SIMTech scientists will travel with the partners for business development and to work with the customers overseas.

"Looking ahead, we are committed to developing more TEP partners to serve more companies and further enhance our capacity to deliver impact to the industry and the economy. We welcome our industry partners to join us in this exciting journey ahead," said Dr Lim.

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