

SPOTLIGHT

ADVANCED MANUFACTURING

Learn more



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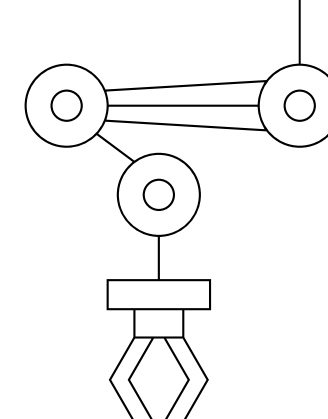
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**INNOVATE
FASTER
TODAY**



P.04

PREFACE INTRODUCTION

P.12

CHAPTER 1 Developing a Hub for Advanced Manufacturing

P.12-13 Chapter 1 Introduction

P.14-15 Chapter 1 Key Takeaways

- P. 16-19 — Israel: Power of Collaboration in Building a Unique Ecosystem
- P. 20-23 — Switzerland and China: Linking Innovation Efforts
- P. 24-27 — Singapore: Advanced Manufacturing is Revolutionising Service Models
- P. 28-31 — International: How Advanced Manufacturing is being Pushed Forward During COVID-19

P.32

CHAPTER 2 Best Practices

P.32-33 Chapter 2 Introduction

P.34-35 Chapter 2 Key Takeaways

- 2.1 Artificial Intelligence
 - P. 36-39 — AI is Driving Advanced Manufacturing to Light Speed
 - P. 40-43 — AI: Pushing the Industry to 4.0
 - P. 44-47 — AI-Based 3D Printing: Potential to Instigate Change
- 2.2 Robotics
 - P. 48-53 — An Era of Modularised Tech Solutions
 - P. 54-57 — Modular Machines: Robotocising Small Businesses
 - P. 58-61 — Robotics: Making a Sizeable Impact on Automation
- 2.3 Integration & Connectivity
 - P. 62-65 — Palletising: The Perfect Match for Advanced Manufacturing
 - P. 66-69 — Adoption: Smart Manufacturing Still Has Many Hurdles
 - P. 70-73 — 5G: The Need for Speed
- 2.4 Organisational Strategy
 - P. 74-77 — From Germany to Asia Pacific: Advanced Manufacturing in the Age of Digitisation
 - P. 78-81 — Testing & Certification: Key to the Manufacturing Revolution

P.82

CHAPTER 3 Future of Hong Kong

P.82-83 Chapter 3 Introduction

P.84-85 Chapter 3 Key Takeaways

- 3.1 Transforming the Traditions
 - P. 86-91 — Back to the Future - History of Industrialisation
 - P. 92-95 — Organisational Transformation: Meeting the Digital Era
 - P. 96-99 — Focus on the China Synergy for Success in the New World

3.2 Redesigning the Future of HK

- P. 100-103 — Hometown Heroes: Pushing Hong Kong Forward
- P. 104-107 — International Collaboration: Empowering Hong Kong
- P. 108-111 — Hong Kong Faces a Question of Its Identity and Asking What Are My Strengths?
- P. 112-115 — Building an Ecosystem for Manufacturing
- P. 116-119 — Hong Kong's Synergy with Mainland China Remains Strong but Is Shifting
- P. 120-123 — Paving Way for Hong Kong's Manufacturing Industry in the Global Paradigm Shift

P.124

CONCLUSION

P.126

SURVEY RESULTS FUNDING & RESOURCES



PREFACE

DR. SUNNY CHAI, BBS

CHAIRMAN

HONG KONG SCIENCE AND TECHNOLOGY PARKS CORPORATION

After a decade where business and technology leaders have continually pushed the theme of digital transformation, we have reached a defining moment.

I believe we have a genuine answer for what digital transformation really means, for what it can do for us today, but most importantly for what it will do for us in Hong Kong in the future.

The pandemic has fueled the flames of technology and as Microsoft CEO, Satya Nadella, remarked in 2020, that the world has experienced two years of digital transformation in mere months.

Digital has truly changed the normal for everyone and digitalisation has impacted all walks of life, business and notably in traditional industries.



The following series of stories and insight from around the world will highlight this paradigm shift and the generational change that is occurring before our eyes. Digitalisation is taking sectors like manufacturing, finance, retail, health and logistics by storm. This Spotlight report will show how emerging technologies including IoT, Addictive Manufacturing, 3D printing, AI, Robotics, and 5G, are having a profound impact on our future economy

These technologies are core foundations for the 4th industrial revolution. And Hong Kong is embarking on a re-industrialisation vision and mission to revive and transform pillar industries such as manufacturing into modern sectors of high-value digital business to drive

economic diversity and spark new growth for the city.

The Government first highlighted the idea of re-industrialisation in the 2016 Policy Address and has been supporting the development with various initiatives.

HKSTP is already making this a reality by driving programs that revitalise industry through building new and advanced infrastructure, nurturing new talent and skills to spur new and innovative industries. Today, we are recreating and extending the HKSTP innovation and technology ecosystem effect to Hong Kong's industrial estates in Tseung Kwan O, Yuen Long and Tai Po.





HKSAR government officials, HKSTP board members and management visited the new facilities at Tseung Kwan O Industrial Estate.

06

The goal is to transform these iconic hubs of industry with core R&D and innovation capabilities to spur a wave of new businesses as well as transform existing ones.

Manufacturing has emerged as a sector of huge opportunity. With Hong Kong's heritage in world class manufacturing process and end products, "Made in Hong Kong" remains an internationally recognised brand perceived as a guarantee of trusted confidence and quality. At Science Park we aim to give aspiring innovators and "technopreneurs" access to a complete end-to-end "Innovated, Designed and Made in Hong Kong" ecosystem to realise their innovations and ideas.

On this goal, Hong Kong is leading the charge into a new era of advanced manufacturing. The transformation of the industrial estates

has created base camps for new ventures and evolving businesses in smart manufacturing, data centres, pharmaceutical processing, recycling and media services.

A shining example is HKSTP's flagship smart manufacturing project, the Advanced Manufacturing Center (AMC). Designed to provide rapid on-demand high-end manufacturing, smart health devices, advanced IoT sensors and advanced IP-intense manufacturing processes are just some of the high potential growth areas. AMC is Asia's first multi-industry advanced manufacturing facility, integrated with automated and smart logistics solutions, which is set for completion in 2022 and designed to support high value-added and on-demand manufacturing in Hong Kong.

The goal is to help innovators bridge the critical gap from R&D to industry-grade development and market commercialisation. Rapid and scalable advanced manufacturing process excellence will be key to the successful mass production of new technologies.

AMC is where innovators can take their ideas, test, develop, pilot and produce their high-end components or products at scale, but also seamlessly distribute to their target market or onward to the next-stage of the manufacturing process.

I believe this foundation can fully realise Hong Kong's potential for world-class smart manufacturing with our core R&D, industry-leading processes and huge market opportunity being at the nexus of the GBA and fast-growing SEA region.

We are entering our 20th anniversary of unswerving pursuit of innovation with HKSTP established as one of the largest R&D hubs in Asia that has turned many innovative

ideas and research efforts into market-ready solutions. At HKSTP, we continue to leverage our world-class infrastructure, growing community of international talent and deep partner network expertise to grow Hong Kong's I&T ecosystem.

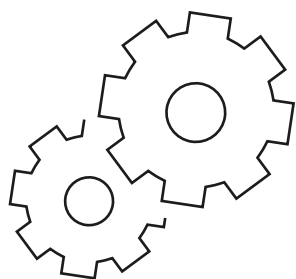
Only through tight collaboration across this whole ecosystem and combining our collective strengths of innovators, scientists, technologists, world class corporations and investors, can we deliver successful innovation. By drawing insights from experts across manufacturing operations in different domains, I hope this publication can help us to start an industry-wide discussion and inspire more industrialists in the region to join the bandwagon.

As an ancient Chinese saying goes, "A journey of a thousand miles begins with a single step". Any journey, however long, must begin with a discrete action. Despite the longevity of this journey, you are not alone.

Welcome to Hong Kong.

07

“With Hong Kong's heritage in world class manufacturing process and end products, 'Made in Hong Kong' remains an internationally recognised brand perceived as a guarantee of trusted confidence and quality.”



INDUSTRY INSIGHTS

We would like to sincerely thank the following business leaders and industry experts for their valuable time and insights.



INTRODUCTION

Advanced manufacturing is moving into the mainstream. Data, robotics, the internet of things (IoT), and the rise of 5G are driving a fundamental shift in the cost, accessibility and hence ubiquity of innovation. Meanwhile analytics is driving analysis from less of a reactive stance of past events to a look into the future. These offer new insights, and an era for the likes of predictive maintenance, industrial robotics, and 3D printing that have the potential to deliver a revolution not only in production, but also how we live as individuals.

WHAT IS ADVANCED MANUFACTURING?

The concept of advanced manufacturing developed to modernise traditional operations with enhanced outputs, quality, responsiveness and flexibility, as well as reducing the time to market and inventory levels. Developed during the late 20th and early 21st centuries, advanced manufacturing rose with the growth of high tech, green and flexible operations.

While there is no true definition of what advanced manufacturing actually means, innovation is at the centre of it all with the maximisation of products and processes and new business management techniques to underpin everything in a more market savvy way. Specifically, traditional manufacturing involves dedicated and fixed plant and production lines where flexibility is not maximised at all. Advanced manufacturing on the other hand, offers efficient production methods, moving with requirements of customisation and specialisation, which minimises an excess of capital investment.

Combined with technologies from the information and communication technology (ICT) field, including leveraging the likes of data, AI, and robotics, the result is efficiency

in production, with effective organisation in every area from design, to modelling, materials and more. Simultaneous engineering, using the likes of digital twins and rapid prototyping, combined with data driven modelling and maintenance strategies.

WHY WE WROTE THIS REPORT

Hong Kong has undergone an intriguing shift from manufacturing powerhouse in the post WW2 era to a services centre, and now a hybrid economy that is seeing reindustrialisation through the rise of tech. This is a fascinating dichotomy that provides value to the workforce, business owners and consumers. Rather than invoking the image of industry as dirty and dangerous, advanced manufacturing is the key to providing goods quickly to a new generation of consumers who want things “now” and in a bespoke, personalised manner.

The world is waking up to the new revolution, but many observers are saying that Asia is leading the way in digitisation. Advanced manufacturing is well established in East Asia for a while, but now this change is coming to Southeast Asia as well. Indeed, as we witness later on in this report, many industry leaders

are seeing the potential of ASEAN to be one of the next leaders in the likes of advanced manufacturing.

The new era of advanced manufacturing is an environment where operators need to be savvy to the trends around them, to leverage and take advantage of all that is happening. Advanced manufacturing is not about making goods per se, but creating an ecosystem for goods and services. In this age, mass production is bespoke – the likes of personalised manufacturing offers a combination of sensors, 3D printing and just-in-time manufacturing.

2020 was the year that placed digitisation into hyper speed mode – as one of our interviewees put it – “putting a few years of innovation into several months”. There will certainly be the winners and losers, those that had the infrastructure in place and contingency plans are reaping rewards.

Yet what is unmistakably clear is that the pandemic will have a huge long-term impact on consumer behaviour, along with the reliability of supply chains. Goods will need to be made closer to home and in a more agile manner, meanwhile consumers might start shying away from big ticket items that include the likes of cars – put it this way, if people can Uber somewhere and can’t really afford a car or predict my income – why would buy a car in the first place?

The tech powerhouses of our time – Uber, Apple, and Tencent – are shying further away from making “stuff”. Essentially they are selling services, and enabling the financing of

those services. This model is seen across the airplane industry where airlines lease engines or planes but never pay for them.

With sensors and connectivity – production can be powered across the cloud to make for a machine for business model – customers are increasingly able to subscribe but not pay for equipment. And why bother buying something outright? This is also applicable when the geo-political environment is assessed – a pandemic or trade war could absolutely obliterate your operations.

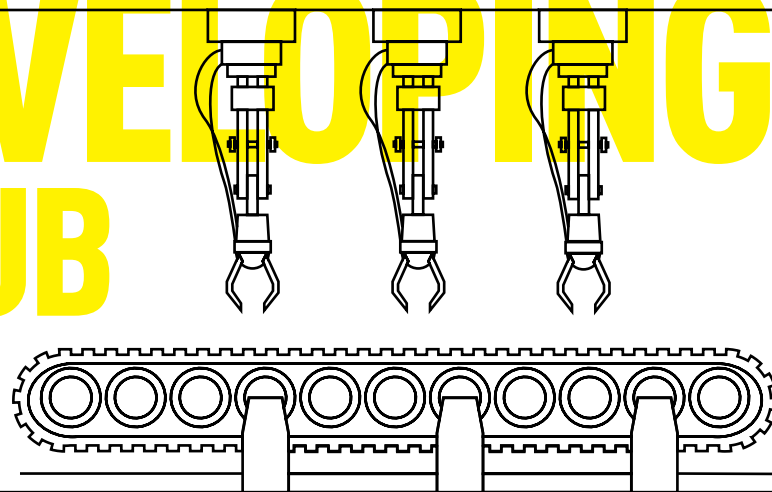
Advanced manufacturing is a catalyst for transformation in society involving people, services, business strategy, marketing, CSR and sustainability.

HOW TO USE THIS REPORT

Our report surveys a number of innovators in their fields and is divided into three parts. The first looks at the new paradigm we face as industrial development intensifies across the globe. It asks how countries and companies can develop a hub for innovation to thrive. The second chapter looks at Industry 4.0 accelerating operational improvement by connecting machines, people, data and value chains. Through this chapter, we look at favourable conditions, considerations, and strategy, in order to encourage the adoption of the technology. Finally, we examine how advanced manufacturing plays a part in re-industrialisation in the final chapter, which has the surprising effect of reinvigorating local communities with high value and convenience. In this chapter, readers will learn Hong Kong is a major part of this trend.

CHAPTER 1

DEVELOPING A HUB FOR



ADVANCED MANUFACTURING

SIZE DOES NOT MATTER



Best practice comes from all corners of the globe - and powerhouses can emerge from small places. In the world of advanced manufacturing, jurisdictions with small geographic areas including Switzerland, Israel and Singapore are now able to leverage their own talents and fill the rest that they don't possess with partnership and collaboration. Digitisation offers huge opportunities to make production smarter, from consuming less energy, to optimising productivity using big data and analytics. While digitisation is accelerating, manufacturing is being localised, creating both jobs and value.

In Israel for example, there is a massive innovation culture with the government acting as facilitator and regulator. Public-private partnership speeds up commercialisation, filling the “go-to-market” gap, and a small internal market fosters global expansion and outreach to other European countries. Switzerland is much the same, in the era of tech, cooperation is the new normal. Working with more than 300 startups, swissnex China helps these Swiss entrepreneurs connect with ecosystems in Mainland China and Hong Kong, in addition to supporting hundreds of university partnerships.

For Singapore, key advanced manufacturing capabilities have been made with government policy support and subsidies, along with a prime location in Southeast Asia. In the Lion City, people have raised awareness of digitalising and automating processes and focused on more self-reliance and not just outsourcing everything.

Across the world, **robotics is also becoming key to the success of advanced manufacturing. For smaller countries, the lowered cost of adopting advanced robotics allows corporations to explore more technology in operations, and industries as diverse as food processing and light manufacturing can explore technology adoption, while modularised technologies can offset concerns of high setup and maintenance costs.** All of these processes mean that developing an advanced manufacturing hub is possible in any country, and size does not matter.

CHAPTER 1

KEY TAKEAWAYS

INTERVIEWEES

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HEAD, LET-LAB

ADAM ZAWEL

HEAD, I14 COMMUNITY

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CHRIS HOLMES

MANAGING DIRECTOR,
IDC INSIGHTS ASIA-PACIFIC

Digitisation offers more opportunity to make production smarter, from consuming less energy, to making things more reliable and optimised using big data and analytics

A small geographic area can be enhanced with cooperation and partnership, creating advantages where once there were none

Technology is not just a shiny object to be shown off, but must be implemented and used correctly within the entire ecosystem of your operations

Spreading risk with strategies such as “China Plus One” are becoming more popular, and this trend is set to get stronger as risk is shared across different jurisdictions

Innovation with digital must be in your DNA to succeed now, there is no turning back, especially in the age of COVID-19

With digital change in across many countries, the gap needs to be addressed with adaptive education, and building up research capacities, along with a full implementation into manufacturing capabilities

Digital transformation is a journey which takes time to move step by step, start earlier to achieve success

Robots are replacing labour and avoid putting humans into adverse working conditions, while at the same time help improve quality, ensure high standards and guarantee efficiency

Asia as a whole, as the global manufacturing hub of the world, needs to increase its yields and eliminate inefficiencies, and this can be achieved with the help of digital processes in the manufacturing system

People are becoming the weakest link in manufacturing while physical and data automation became bigger – humans are being removed from the system

AI technology enables companies to constantly monitor and analyse their production lines and tweak the processes to enable a more efficient work environment

Aside from improving print quality, 3D printing has the power to democratise the distribution of manufacturing power

Open innovation can accelerate the transfer of knowledge by allowing people to share expertise and experience

ISRAEL:

POWER OF COLLABORATION IN BUILDING A UNIQUE ECOSYSTEM

AGMON DAVID PORAT

HEAD
LET-LAB

ADAM ZAWEL

HEAD
II4 COMMUNITY

Over the last few decades, Israel has developed itself as a centre of innovation in tech, and much of this has been focused on advanced manufacturing. How has the country developed its expertise? Agmon David Porat, Head of Let-Lab is leading the corporate open innovation strategy responsible for leap-frog product offerings and factory processes using innovation. The Spotlight team spoke with Adam Zawel, Head of the Israel Industry 4.0 Community (II4), initiated by Start-Up Nation Central, a non-profit organisation to help their members (Israeli and non-Israeli) deliver disruptive solutions to global manufacturing challenges.

The government has a systematic approach to push forward the development of I4.0 technologies. The Advanced Manufacturing Division of Israel Innovation Authority focuses

on promoting the implementation of R&D and innovation processes in companies from the manufacturing sector, in order to strengthen their competitiveness in the global arena and improve productivity across a variety of industrial sectors. The incentive programs offered by this division boost manufacturing oriented industries and encourage the owners of mainly small and medium-sized factories and plants to develop innovative products, technologies and manufacturing processes to realise these goals.

According to the SNC report on Industry 4.0, there are 260 active Industry 4.0 startups in Israel today. The

figure is 70 percent greater than what it was in 2014. Funding in 2014 stood at US\$112M and at US\$650M by the end of 2019. Israel has strengths in categories including sensing and imaging, inspection and testing, operations optimisation, cybersecurity, IoT platforms and connectivity, additive manufacturing, supply chain, robotics, and maintenance.

In July 2019, the World Economic Forum (WEF)'s Centre for the Fourth Industrial Revolution (C4IR) program added Israel as its newest member. Moreover, a look at MNCs in town — Dow

Chemical Company, Honda Engineering, Schneider Electric, Rockwell Automation, Siemens, AB InBev, ABB, PepsiCo and others — indicates Israel is a center for smart manufacturing innovation. The 'Start-Up Nation' has already proven itself as a global leader in technology innovation, now extending this leadership to the global governance of key emerging technologies in advanced manufacturing.

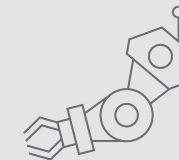
GOVERNMENT-LED OPEN INNOVATION

"The government has shown it can successfully support the tech industry and inspire it. This means producers and manufacturers are able to collaborate with innovators," says Agmon David Porat, Head of Let-Lab. A crucial step in helping Israel succeed with its tech has been the advent of open innovation, which allows sharing access to processes and patents between companies, and spurs innovation.

Startups interact with domain experts, develop solutions for industries, and implement their pilot projects. In the process, they have access to component fabrication, quality control, and functional testing facilities, surface treatment process lines, quality assurance equipment, high pressure testing



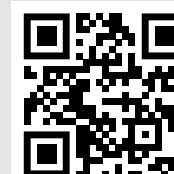
ABOUT



The II4 community delivers disruptive solutions to global manufacturing challenges with 250 start-ups in their community, matchmaking solutions and global manufacturers, acting as a network to gather top Israeli innovators and industry leaders, to foster connection and partnership and share ideas with the ecosystem.



Let-Lab is an Industry 4.0 Innovation lab, operating under the license of the Israel Innovation Authority and fosters a startup ecosystem to empower industrial innovators, offering Israeli startups a rigorous 12-month program that is designed to fast-track their growth and launch new ventures. Startups have the opportunity to implement their pilot at Ham-Let, one of the world's leading companies in the development, manufacturing, and sale of industrial flow systems — connectors, fittings, and valves for media control and transmission systems (gases and liquids) in high pressure and high temperature pipelines. Founded in 1950, the group serves customers in a wide range of segments: power generation, chemical, oil & gas, petrochemical, semiconductor, high purity, and more.



labs, automated warehousing tools, clean rooms and product assembly lines.

The partnerships of Let-Lab have included working with Japan and Taiwan in electronic manufacturing, particularly the IP2 LaunchPad with the Taiwanese ecosystem, which is a 14 days programme for Israeli startups to explore market potential in Asia. Let-lab also focuses on public-private partnerships that help Israeli companies to scale out, sell their solutions to European and Asian markets, speed up the timeline for production and products going-to-market.

"I'm a huge believer that open innovation can accelerate the transferring of knowledge by allowing people to share their expertise and experience and spread that into different areas.

We have seen this concept allowing us to develop an ecosystem where everyone knows one another, and progress can be accelerated rapidly," says Porat.

From electronics to cybersecurity, medical devices and more, innovation within advanced manufacturing is seeing no bounds in Israel, and it is coming to the point where for Porat, old school players are in essentially a 'do or die' situation. "Lots of companies are still stuck in the past, many will be dead soon, and they are failing to see the long term potential of things like AI that can revolutionise their business. **If you want to make change in your company, find the champions that can help, and remember that change is gradual, but you can build**

the people, incentives and ecosystem to make it," Porat says.

INNOVATION IN ISRAEL'S DNA

In Israel, a government driven model allowing players to flourish independently has done wonders in helping develop a sustainable picture. Adam Zewel - Head of I14 Community, is championing digital transformation gathering top Israeli innovators and financiers into a thriving community, together with passionate industry leaders. A veteran in the scene, Adam Zewel is also the Vice President of Strategy with Leader Networks, a research and consulting firm that helps companies use digital and social technologies to gain competitive advantage.

With Israel having established itself as one of the world's leading innovation hubs behind Silicon Valley, global manufacturing companies are constantly on the lookout for talent, something that I14 Community provides. **"We are finding our place in this revolution, Israel is not a huge manufacturing country. We are playing the innovator, creating disruptive solutions to manufacturing challenges,"** says Zewel. So how is Israel developing its reputation as a world leading hub?

"Many global manufacturers already see Israel as an innovation leader in cyber and mobility, and now they are looking at the 260 startups

here focused on Industry 4.0. But it's often hard to articulate the challenges posed by global manufacturers. Our startups are cutting-edge, and often far ahead of the curve in the likes of AI and sensors," says Zewel. **"In the I14 community, we bring together the global manufacturers and startups to identify the needed innovation."**

It's the reason why companies like Toyota are suited to the country, as they are able to immediately access the solutions due to their already advanced tech. Another reason why Israel is a leader is its mentality and history of innovation. "We are a small country, and that means that the leading innovators from different fields often know each other, and collaborate quickly to develop solutions in the area such as materials, data and more," says Zewel.

COLLABORATION IS THE NEW INNOVATION

"COVID-19 has slowed down relationship building, but opened up a willingness to do business over the phone and Zoom. There has also been some acceleration, in projects related to remote monitoring in factories and automation. But trust is definitely slower to build during a pandemic." Zewel says.

And this extends to corporate culture as well. "The big manufacturers themselves are trying to innovate internally. They may have an innovation team that identifies the pain points of the business units and clarifies if this can be solved internally or with external help." The Israel startups often work with these innovation leaders. There are in fact many innovation scouts in Israel representing the large multinational manufacturers. This makes it easier for the startups to find the anchor and understand the market needs.

"When you get to the mass manufacturing of companies who don't have someone charged with innovation, and it is hard to know who to call on, you might even have to go to the plant manager. This can be good to get to what the

real needs are, but if you have something truly cutting edge that needs proof-of-concept it's more challenging. Many companies are not ready to work with startups, and it can be a risk," says Zewel.

Government support and ventures that bridge public and private help to build trust. Whatever happens, Israeli startups are ready to keep pushing tech forward. "One of the interesting Industry 4.0 areas is the additive manufacturing space. With all the changes in the supply chain, additive manufacturing gives manufacturers flexibility and resilience where they can print their own parts," Zewel says. "The real change is in the business model, in terms of supply chain flexibility and smaller production runs, customers are able to make custom products and have it delivered the very next day."

Open innovation processes have the potential to revolutionise advanced manufacturing and while an ecosystem should thrive on its own, the government can be at hand to kick-start the process. Manufacturers who want to make change should find champions that can help and start slowly.





SWITZERLAND AND CHINA: LINKING INNOVATION EFFORTS

DR. FELIX MOESNER
SCIENCE CONSUL & CEO
SWISSNEX CHINA

In the era of tech, cooperation is the new normal. Working with more than 300 startups, swissnex China helps these Swiss entrepreneurs connect with ecosystems in China and Hong Kong, in addition to supporting hundreds of university partnerships. Dr. Felix Moesner, Science Consul & CEO of swissnex China, discusses how linking up markets, cultures and economies is key to fostering an atmosphere of innovation.

Connecting the dots between Switzerland and China in education, research, and innovation, swissnex China works together with the Science, Technology and Education Section of the Embassy of Switzerland in China and regional consulates in Hong Kong, Chengdu,

Guangzhou, and Shanghai. As part of the swissnex Network, the organisation provides outreach and engagement in the global exchange of knowledge, ideas, and talent. The network's mission also extends to the promotion of Swiss research and universities, offering open innovation and benchmarking in Brazil (Rio de Janeiro), China (Shanghai), India (Bangalore) and the US (Boston, San Francisco).

Collaboration and cooperation are essential to tech development, and swissnex China is at the forefront of these endeavours with its three flagship start-up programmes: #Swisstech Pavilion @CES ASIA, the Innosuisse China Camps and Venture Leaders China/ Fintech. For institutions and Swiss tech companies, swissnex

China also provides trend and innovation scouting, from arranging innovation tours to providing industry insights and reports.

In addition to this, the Sino-Swiss Science and Technology Cooperation (SSSTC) program provides funding and workshops that set a base for collaboration between Swiss and Chinese research teams. This governmental framework between China and Switzerland aims to encourage and strengthen bilateral contact by building multi-level research cooperation between institutions, research groups as well as individuals.

BELIEVE IN KNOWLEDGE

For the past ten years, Switzerland has consistently ranked at the top of the Global Innovation Index (GII), published by the World Intellectual Property Organisation (WIPO), French business school INSEAD and Cornell University. The Index ranks the performance of 130 countries, examining both the necessary conditions for innovation and the new creations that result from innovation. Switzerland is a world leader in several key innovation indicators, especially in the quality of its public higher education and research institutions.

Think of swissnex as a talent and tech enabler, managing exchange and partnerships, bridging tech-industry and ecosystems, exploring ways for startups to scale up, and offering training to high-level professionals from Swiss institutes.

ABOUT

swissnex China is an initiative of Switzerland's State Secretariat for Education, Research and Innovation (SERI), managed in cooperation with the Department of Foreign Affairs. Working together with the Science, Education, and Technology Section in the Embassy of Switzerland in China and regional consulates in Shanghai and Guangzhou, connect Switzerland and China in science, education, and innovation. Their mission is to support the outreach and active engagement of partners in the global exchange of knowledge, ideas, and talent.



“Switzerland has no natural resources, this is why we have to heavily invest in brain power; solid education and research. This enables us to embrace the coming changes brought on by advanced manufacturing, among many other fields,” says Moesner.

Education in Switzerland is broad, and highly-ranked universities are the engine of innovation providing talent for advanced manufacturing and digital transformation. Change is a constant driver, so how does swissnex promote the smooth adoption of tech that meets industry needs?

“You have a digital change and the gap needs to be addressed. You do this by adaptive education, and building up your research capacity. Switzerland has ranked

number one for the past ten years in the renowned Global Innovation Index. **We have strong interaction between universities and industry who react quickly to societal needs. Often demands can also be covered by our startups, which have an amazing survival rate of over 80% on average in the first 5 years,”** says Moesner.

swissnex China also serves as a handy platform, where manufacturers and startups can find academic partners to work with, or seek out new technologies and Industry 4.0 solutions. This offers a good base to begin discussions and start projects. “We are strong in most verticals, but especially in life and material sciences, mobility and enabling technologies, and these are fields where we can make strong contributions.” says Moesner.



TURN OPPORTUNITY INTO **REALITY**

Advanced manufacturing uses innovative technology to improve products or processes. “Robotics are a huge part of this, paired with artificial intelligence and big data, and interaction with the environment using IoT and 5G to bring all the components together. You have a combination of both smart and advanced manufacturing, where all the elements talk to each other,” says Moesner.

Development will certainly not be without challenges, while education and talent are an essential part of the equation. **“You have to possess digital skills and build them up, and invest in research capacity.”**

The swissnex China CEO sees the possibility of advancements through synergy of technologies, where Switzerland is certainly well-positioned among global players. “The opportunities for us are many, China has seen exponential growth in its R&D investment, which has already reached 90% of that in the US. This will certainly continue to attract more players from all over the world,” he says.

SWISS-SINO INNOVATIVE STRATEGIC PARTNERSHIP

China and Switzerland signed a free trade agreement (CSFTA) in 2013, and Switzerland has become China’s first FTA partner in Europe. In 2016, China and Switzerland established the “innovative strategic partnership”, the first of its kind between China and a foreign country.

“In China, we see a broad group of people seeking to collaborate, and this has gone across agriculture, pharmaceuticals, biotech, medical, instruments, food and more, so we want to be able to stay closely connected with these fields,” says Moesner. “Being flexible and agile can help us do this. We have a high quality of output, top placements in international rankings, free trade agreement with China, and other advantages that make us flexible and ready to move forward.”

This fruitful partnership shows the benefits of a focus on solid education and research in the knowledge economy. The evidence is there for all to see, small countries are more than ever able to provide powerful capabilities in the era of advanced manufacturing. Organisations are able to turn challenges into opportunities by leveraging their unique advantages.



SINGAPORE:

ADVANCED MANUFACTURING IS REVOLUTIONISING SERVICE MODELS

BENJAMIN MOEY

VICE PRESIDENT
(ADVANCE MANUFACTURING TRANSFORMATION CENTRE)
SIEMENS PTE LTD

Asia is the leading hub of manufacturing and has a great potential in the era of automation, the pandemic has offered a wake-up call to manufacturers who are not ready, as they cannot rely on outsourcing, and need a greater degree of self-reliance. The Advance Manufacturing Transformation Centre (AMTC) combines Digital Enterprise Experience Centre (DEX), the Additive Manufacturing Experience Centre (AMEC) and rental labs, changing the game.

With this, Siemens provides plug and play modules allowing machines of different generations to communicate and operate collaboratively, while the government and subsidies help push development forward. With more emphasis on 3D printing, Siemens is establishing a key presence for its advanced manufacturing centre in Singapore.

This initiative is backed by the Singapore government which has committed S\$3.2 billion in R&D to build up the innovation capacity of companies. Siemens AG is a global technology powerhouse headquartered in Munich, Germany and a major industrial manufacturing company partnering Singapore's National Additive Manufacturing Innovation Cluster (NAMIC) for its Industry Transition Programme, that offers hands-on training to help companies bridge the gap between R&D and implementation of additive manufacturing.

It is little wonder many observers see 3D printing as transforming manufacturing, and nowhere has this been more obvious than in Singapore. The government has offered financial incentives and policy support that has enabled open source platform models that let owners test out and improve step by step. For prototyping R&D, one-stop solutions are just the thing for buyers

and sellers, along with their channel partners. This, combined with Singapore's geographic location, opens up strong markets in Vietnam, Indonesia and other Southeast Asian locations, a veritable powerhouse for manufacturing that has indeed arisen.

A leading hub of innovation in Asia, Singapore is impressing with its lead in the advanced manufacturing sector. Benjamin Moey, Vice President (Additive Manufacturing) at Siemens, stresses it is important for both the Lion City and Asia as a whole does not rest on its laurels and continues to improve.

"It is important that Asia as a whole, which is the global manufacturing hub of the world, increases its yields and eliminates inefficiencies. The growth potential is there in the era of automation, especially in the time of COVID-19, and this helps the production process in the time of the pandemic," says Moey.

WAKE UP TO THE PANDEMIC REALITY

The pandemic is what Moey calls a "wake up call... we have been trying to convince people for years about the need for automation and many

ABOUT

Siemens AG (Berlin and Munich) is a global technology powerhouse that has stood for engineering excellence, innovation, quality, reliability and internationality for more than 170 years. Active around the world, the company focuses on intelligent infrastructure for buildings and distributed energy systems and on automation and digitalisation in the process and manufacturing industries. Siemens brings together the digital and physical worlds to benefit customers and society. Through Mobility, a leading supplier of intelligent mobility solutions for rail and road transport, Siemens is helping to shape the world market for passenger and freight services. Via its majority stake in the publicly listed company Siemens Healthineers, Siemens is also a world-leading supplier of medical technology and digital health services. In addition, Siemens holds a minority stake in Siemens Energy, a global leader in the transmission and generation of electrical power that has been listed on the stock exchange since September 28, 2020.

In fiscal 2020, which ended on September 30, 2020, the Siemens Group generated revenue of €57.1 billion and net income of €4.2 billion. As of September 30, 2020, the company had around 293,000 employees worldwide. Further information is available on the Internet at www.siemens.com



replies have been to the effect of: 'we are not ready and we still have time'. With COVID-19, this mindset has just been turned on its head completely, many companies have been calling and asking for our help, and the search for interest has been going up, and **people know they need to be more self-reliant and should not just outsource everything**," says Moey.

The Advance Manufacturing Transformation Centre developed by Siemens was essentially born from the idea of boosting 3D printing. In recent years, the Singapore government has spent a significant amount of money in research and development in advanced manufacturing, trying to translate product prototypes and R&D into commercial products. While many prototypes look good, they are almost impossible to replicate on an industrial scale, and the gap between design and industrial implementation is just not possible to bridge. As a result, many manufacturers are not able to carry out 3D printing capabilities on an industrial scale on their own.

The AMTC is there to provide access to manufacturers to test products in an advanced factory environment, which has a digitised, optimised platform to easily help them adopt technology and provide hands-on training for their operators. The idea is after a period of working in this environment, they will be able to set up their own lines using the same tech, transitioning from using the likes of Excel on a daily basis to using AI, tablets and 3D printing. "We set this out with the view to bringing people systematically through the journey of transformation. Many facilities attempting to

help companies embark on this journey, go head on into roll-out, have not been successful purely because there is a huge jump between technologies, and these facilities are unable to help companies make the smooth transition and adopt new practices," says Moey.

BRING CUSTOMERS ALONG ON THE JOURNEY

AMTC is essentially an operational plug and play manufacturing environment, offering an ecosystem of advance technology OEMs and access to integrated manufacturing platforms, so "that all the machines are interacting with each other, our unique platform is able to connect and integrate different generations of machines to enable true connectivity," Moey says. The idea is this facility is ahead of the curve, and provides value for money in terms of being able to integrate old and new together, helping manufacturers squeeze ROI from old machines and embark on its digital transformation journey.

Singapore offered incentives to 150 local and multinational companies, while providing grants to incentivise research as well. Siemens has seen successful case studies across a range of industries that include a fish farm agricultural project that needed to be optimised using artificial intelligence (AI) and cloud computing.

Putting in sensors and cameras along with AI, they analysed fish patterns to understand feeding

times, removing contaminated livestock, and putting analytics for a year to rollout the whole programme. "We have increased the production yield of fish and minimised contamination. Everything is controlled and managed by the system to optimise fish health and production yield," Moey says.

The other project Siemens worked on recently was Vietnam's first in-country car manufacturing facility, designing and building the factory in a manner of months. **"This has become the I4.0 model company for the country now. We don't need to wait weeks or months to mock up a factory, but can carry**

out a virtual mock-up of the whole plant, a digital twin of the factory, for company management to walk-in virtually and approve the factory design; and based on past operational experience identify production flow issues and potential bottlenecks. Subsequently, the company is able to virtually commission the design and commence construction, confident that it will be right the first time," says Moey.

IT'S MANUFACTURING... DEMOCRATISED

The process is a democratisation of production, with faster data analysis, and products being produced instantaneously, and nowhere is this more true than in Asia. "We see Vietnam, Philippines and Indonesia coming to us asking for help for their SMEs and manufacturing sectors. Although they are struggling with COVID-19, this transformation trend will continue," says Moey.

Digital transformation has been crucial in the era of the pandemic, but it also needs to be sustainable as well, according to Moey. **"It is not just a one-time measure, it's like going to the gym, it's a gradual journey**

for digital transformation. Government backing and subsidies help change the environment, while the ecosystem needs to be adaptive to support changes and provide the right conditions for companies to take this bold step."

The key to success? Never resting on laurels and continuing to innovate; helping customers along the digital transformation journey and seeking innovation from all sectors of the economy – high value can be found everywhere.

INTERNATIONAL:

HOW ADVANCED MANUFACTURING IS BEING PUSHED FORWARD DURING COVID-19

CHRIS HOLMES
MANAGING DIRECTOR
IDC INSIGHTS ASIA-PACIFIC

Digitisation is accelerating, manufacturing is being localised, and custom manufacturing is creating both jobs and value. In this environment, manufacturers, companies and indeed governments need to rethink their business models. Data is shifting to the cloud, and manufacturers will have to choose vendors when transforming with the likes of automation and robotics.

COVID-19 has indeed shifted more of an onus towards localised supply chains and the importance of diversification, working and selling locally, and how to be sustainable as government funds are drained by the pandemic.

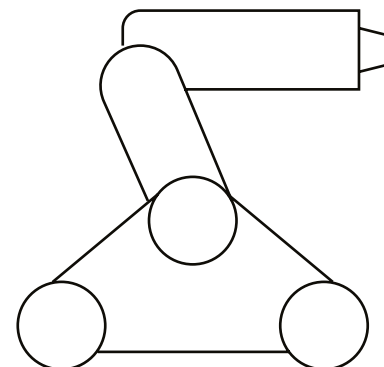
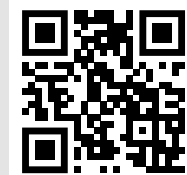
The onset of COVID-19 has also seen the divide of the digital world into “haves and have nots”. Chris Holmes, Managing Director for IDC Insights Asia-Pacific has led his organisation into looking at digital maturity in sectors, and why areas such as aerospace and automotive were heavily hit, whereas consumer products have done well. These were the type of organisations able to pivot with the foresight and a roadmap in place and all COVID did was to accelerate the process.

For those that lost out during the period, decision making was a huge part of the problem, in terms of knowing how to act and who to work with when the whole world was disconnected and cut off.

“Without maturity there were lots of decisions to be made, whether it was visibility across the supply chain, reconfiguring the factory for distancing, changing the products that were being produced. You need the skills in the factory to make that shift, and if you don’t have the skills it can be quite a shock to the system in general.”

ABOUT

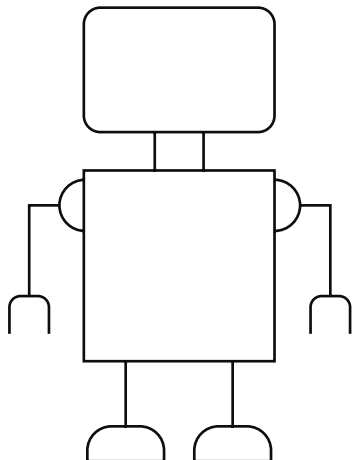
International Data Corporation (IDC) is the premier global provider of market intelligence, advisory services, and events for the information technology, telecommunications, and consumer technology markets. With more than 1,100 analysts worldwide, IDC offers global, regional, and local expertise on technology and industry opportunities and trends in over 110 countries. IDC’s analysis and insight helps IT professionals, business executives, and the investment community to make fact-based technology decisions and to achieve their key business objectives. Founded in 1964, IDC is a wholly-owned subsidiary of International Data Group (IDG), the world’s leading tech media, data and marketing services company. To learn more about IDC, please visit www.idc.com. Follow IDC on Twitter at @IDC and LinkedIn. Subscribe to the IDC Blog for industry news and insights. http://bit.ly/IDCBlog_Subscribe



DIGITAL TRANSFORMATION ON STEROIDS

Some organisations have seen two years of digital transformation in two months, with the impact of COVID-19 speeding everything up. But this process is not universal across Asia - IDC Insights Asia-Pacific has seen China being bullish and moving towards innovation and the 'next normal', compared to India which has lagged behind on advanced manufacturing, and Southeast Asia somewhere in the middle.

With factories across Asia seeing the supply chain completely disrupted, having issues implementing social distancing in factories, and dealing with lockdown models, interest in operating through the cloud and using robots and artificial intelligence (AI) has skyrocketed. "The epidemic showed that people were indeed becoming the weakest link in manufacturing while physical and data automation became bigger - humans are being removed from the system," says Holmes.



RISE OF THE 'COBOTS'

While the so-called 'lights out factory' has been talked about for a long time, there are still not many examples of it, Holmes says, citing the rise of 'cobot' operations powered by AI, robotics and human ingenuity all together. "There might be some discussion on taxing robots, when it comes to automation. It's still cheaper to employ humans however, but robots are going in because the automation is better. The longer COVID-19 goes on you will have to reconfigure the lines. Humans will be the innovators, idea creators, and add value that way, but that's still in the realm of the future," says Holmes.

"It's challenging to see the full impact of COVID-19 because there will also be new opportunities. People are questioning the idea of a single source of manufacturing and then shipping around the world, and there is a shift to multiple manufacturing outlets. Governments realise they want some self-sufficiency from food to drugs and everything else in terms of products being produced," says Holmes.



HAVE A BACK-UP PLAN

Strategies such as "China Plus One" are becoming more popular, with international producers looking increasingly at Vietnam, Malaysia, India and other countries in Southeast Asia. "But you don't put up a factory overnight, you need workers, a supply chain and an ecosystem," Holmes says. While this takes a while, countries all over Asia are looking to advanced manufacturing to bring value and jobs. At the heart of this notion is 'profitable proximity', or putting the production close to consumption, reducing long supply chains, and employing late configuration of products with additive manufacturing powering that process. For example, the higher turnover of female fashion, means production sites need to be located closer to the outlets compared to male fashion production lines that don't have to be as close.

"There is going to be a lot of uncertainty, so be in control of what you can, and

understand your ecosystem. Waves of COVID-19 move one week to the next. We will see business model variation, such as shared services, so be agile, flexible, and always have a plan B," Holmes suggests.

Contrary to what many think, new manufacturing processes offer both job and value creation, whether it is in the Southeast Asian textile industry or pharmaceuticals in Singapore. There is going to be a lot of uncertainty in the next year, and manufacturers need to be in control of what they can, and understand their ecosystem, and think about 'profitable proximity' that puts the production close to consumption, reducing long supply chains. The takeaway: don't put your eggs in one basket; question the idea of a single source of manufacturing, and be part of the shift to multiple sources of manufacturing.

CHAPTER 2



WHAT DO YOU NEED TO BE THE BEST?

This report has set the scene for advanced manufacturing, and now discusses how best practice can be achieved. Slowly but surely, 5G, artificial intelligence (AI), robotics, and other tech are catalysts for the manufacturing industry, assisting the development of the likes of edge computing, and secure networks for mission critical manufacturing. In this chapter we examine four areas of change that are critical to advanced manufacturing - these are Artificial Intelligence, Robotics, Connectivity and Organisational Strategy.

Many hurdles still exist when digitising, but they can be overcome with a mindset change and upskilling. Agile, flexible and replicable production lines models are crucial for advancing manufacturing processes, and Hong Kong is full of potential talent. In the city and across Asia, due to changing demographics of an aging population, there is a need for automated manufacturing that ties up with the supply chain to achieve greater efficacy in order fulfilment.

Much of the growth of automation can be attributed to e-commerce, globalisation of supply chain networks, the rising need for reverse logistics and same-day delivery, which has flourished and grown over the past decade, and has accelerated as COVID-19 takes hold. Online retailing also requires more individual picking and packing and shipping. Automation will continue apace, and companies must adapt or die.

The era of the pandemic has opened up new market segments including in grocery, reverse logistics, apparel, ecommerce, sanitation and more.

SMEs need to be agile, flexible and come up with solutions that can be changed within 3 years – no one has the luxury of long term planning. But one thing is for sure, robotics can help, while AI, 3D printing, certification and automated palletising will in the long term reduce investment and development costs, shortening project cycles, while encouraging business growth. Far from eliminating jobs, automation comes from the need for efficiency, security, and cost control, and is a job and value creator.

To thrive with new technologies, companies should consider several factors: Are the existing sites appropriate for adoption of technology? Is the right budget available both now and in the future? Does your organisation have the talent and resources available to implement change? Finally, a huge driver of change is culture; organisations need to be able to cultivate and implement change with the right attitudes in place.

CHAPTER 2

KEY TAKEAWAYS

In the era of advanced manufacturing, speed of communications both between humans, machines, and in between is absolutely essential

Agile, flexible and replicable production can be achieved with a mindset change and upskilling

Robotics will be accelerated by aging populations. AI and machine learning algorithms enhance systems and give a smarter approach for corporations, while warehousing and distribution have been revolutionised by robotics

Seek to complete virtual and real tasks together, considering the use of AI to manage complexity. It is not a “shiny object” but a value creator across many areas including manufacturing, warehousing, out-bound logistics, technical service, commerce, and marketing

There are many things that must be considered carefully when adopting manufacturing processes. Strategically, will automation and robotics help a business improve and contribute to the company's overall competitiveness?

Aside from improving print quality, 3D printing has the power to democratise the distribution of manufacturing power

COVID-19 is a once in a lifetime opportunity for organisations to change to digital. Don't miss the boat

Intelligent and modular manufacturing have the potential to transform workflows. Advances in creating systems adaptive enough to handle small batch and personalised manufacturing mean that they can be attractive – and within reach – of even small businesses

There is a realisation that you can bring a product from conception to market at a faster speed than ever before

A major trend for consumers is also the rise of mass personalisation, which in itself also creates other challenges. Manufacturers must adopt high-mix, low-volume production to maximise profitability. They need to be fast and agile to respond to customisation, with more styles, cheaper prices and digital capabilities

INTERVIEWEES

AI

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GENERAL MANAGER,
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– HONG KONG

HAU MAN CHOW

CO-FOUNDER, POWERARENA

ITAMAR YONA

CO-FOUNDER & CEO, PRINTSYST.AI

ROBOTICS

LEO LI

PARTNER, AUTOMOTIVE &
MANUFACTURING INDUSTRIES PRACTICE,
OLIVER WYMAN

JONATHAN CHEUNG

CO-FOUNDER, INOVO ROBOTICS

LIT FUNG

MANAGING DIRECTOR, GEEK+

INTEGRATION & CONNECTIVITY

ALFONSO BALLESTEROS

CCO, ASIA, WEPALL

TETSU HOR

HEAD OF R&D, ASIA, WEPALL

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ALEX CHENG

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ORGANISATIONAL STRATEGY

SEBASTIAN SCHENK

HEAD OF DIGITALISATION OF
BUSINESSES, BASF ASIA PACIFIC

CHRISTY CHAN

DIRECTOR OF CONNECTIVITY &
PRODUCTS, SGS HONG KONG

21

ARTIFICIAL INTELLIGENCE



AI IS DRIVING ADVANCED MANUFACTURING TO LIGHTSPEED

SAMUEL LO
GENERAL MANAGER
NVIDIA AI TECHNOLOGY CENTRE
HONG KONG

Artificial Intelligence (AI) is accelerating the potential of automation to transform manufacturing beyond anything we have ever seen. In Hong Kong, NVIDIA is the vanguard of AI development, and pushes AI even further.

Observers will know NVIDIA is famed for its prowess in everything from gaming to AI and other advanced technologies. More than just creating technology, it is also an enabler and service provider, running the likes of NVIDIA GPU Cloud (NGC), a GPU-optimised software hub simplifying deep learning, machine learning and high performance computing (HPC) that accelerates deployment to development workflows, such that data scientists, developers and researchers can focus on building solutions, gathering insights, and delivering business value.

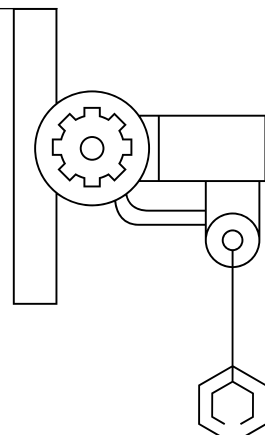
In its partnership with Hong Kong Science & Technology Parks Corporation (HKSTP), NVIDIA inspires local companies to go further and develop more. At the HKSTP AI Plug, which aims to build a strong and well-connected community of AI companies, service providers, industries and talent, Samuel Lo, General Manager of AI Tech Centre, Hong Kong for NVIDIA, discusses the market and where Hong Kong is going with AI and advanced manufacturing.

ABOUT

NVIDIA is the world's leading technology company specialising in artificial intelligence (AI) and high performance computing. Founded in 1993, it engages in the design and manufacture of computer graphics processors, chipsets, and corresponding multimedia software. It invents graphics processing units (GPUs) and Tegra processors, a system on a chip (SoC) comprising CPU, GPU, image, video and sound processing cores in a highly energy efficient package for mobile devices. It is well-known for its "GeForce" series designing for gaming and professional markets. With the strong capabilities power, NVIDIA's GPUs have been widely deployed in gaming, supercomputing, deep learning, and AI.



SMALL PROBLEMS WITH BIG IMPACTS



The AI Plug assists local AI companies in resolving problems with the use of machine learning, data science and statistical methodologies, employing a large volume of real-world data. With a view to enhance company competitiveness and encourage business growth, it offers its members packages of **services, reducing upfront investment and development costs**, shortening project development cycles, and identifying mismatches in resources and information between industries and companies with targeted training for decision-makers.

“We support academia, researchers and startups with training, workshops and more. AI is not new, manufacturing has adopted AI for a while, particularly when it comes to predictive assessment, and using cameras and robots to assemble parts and monitor. But with our HKSTP partnership we are taking everything up a notch, to the next level. It covers many different areas, namely taking the challenges we see, such as cost for example, and helping customers. **Identifying small problems can be very impactful and make a difference. If the outcome is good, they can scale the**

project and commercialise, this is a workable path.” says Lo.

Big data is a flood that can be overwhelming for many, the reason why NVIDIA uses deep learning and neural networks to offer plug-and-play solutions. The NVIDIA GPU Cloud (NGC) catalog provides quick deployment of AI frameworks with containers, pre-trained models, domain-specific SDKs, and Helm charts that helps SMEs adopt automation, fastest AI implementations and time-to-solution, allowing companies to focus on innovation and technology.

“As a tech enabler, we are introducing startups to our corporate partners, and at Science Park, this philosophy in place is a test bed for further development. Combined with Hong Kong government funding, skilled workers, training, and connection with industrial associations, the long last benefits could be fruitful indeed,” Lo adds.

AHEAD OF THE GAME

These types of collaboration offer revolutionary benefits to a wide range of industries. Globally, NVIDIA is renowned for its partnerships with the likes of Mercedes-Benz, which sees them help the company bring vehicles into the autonomous era with intelligent cockpits and redesigned architectures, including powerful computers, system software, and applications for consumers, marking automobiles a turning point into high-performance, updateable computing devices.

The introduction of NVIDIA DRIVE AGX Orin, a software-defined platform featuring multiple processing engines for high-performance, energy efficient computing and AI, and equipped with surround sensors, allows driving regular point-to-point routes autonomously, in addition to safety and convenience applications.

“Think of these developments as relevant for advanced manufacturing, where we could potentially over time integrate the likes of speech recognition, top level computing and interfaces. The potential is endless, it’s like J.A.R.V.I.S in Iron Man,” says Lo. The applications include AI solutions in analysis and predictive maintenance, importing 3D models, collaborative work, training robots on assembly line, and moving tasks from digital

to physical world. “Essentially we are creating optimisation through real life improvement and a ‘digital twin’ that offers **virtual assembly and physical reproduction**, saving costs and preventing mistakes before they happen. Much like a video game, we complete virtual and real tasks together, and AI manages the complexity for final production,” says Lo.

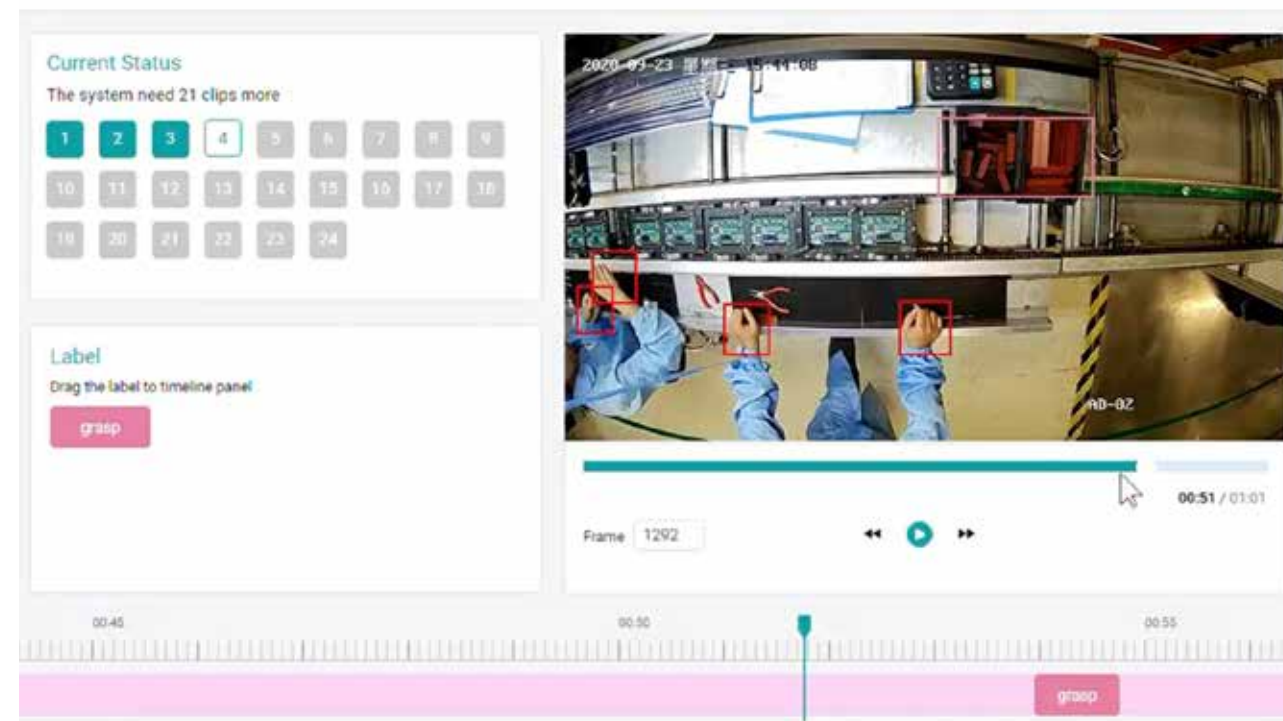
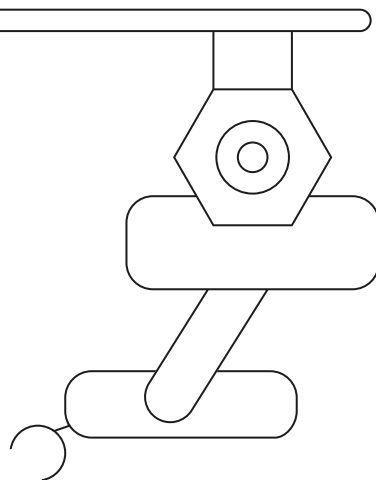
THE FUTURE IS HERE

Far from being a hindrance to development, Lo sees the pandemic as a unique opportunity for Hong Kong. “COVID-19 created opportunity with workers communicating from home, enhancing the digital ecosystem, and the Hong Kong government is the driving arm behind it, providing funds and connecting the supply chain,” says Lo. What do we need urgently for the future of Hong Kong? “Automation is the most important part, and smart automation is the real winner. **IoT is popular – devices collect data and help AI to train better models, to do things and take action, improving processes and creating what we call advanced manufacturing.**” Lo adds.

AI:

PUSHING THE INDUSTRY TO 4.0

HAU MAN CHOW
CO-FOUNDER
POWERARENA



For most companies, factory workers, whether they are production-line workers or engineers and operators, remain an integral part of the manufacturing process. Yet modern automation often leads to a reduced human presence on the factory floor. **For PowerArena, however, the assembly line workers are another component of the overall process that can be monitored and analysed to streamline systems.**

While data harvesting from machine processes is a major component of the push to digitise the modern factory shop floor, PowerArena's focus on using artificial intelligence (AI) in smart manufacturing has settled upon a lesser-explored side of the equation – the factory's human assets. PowerArena was spun out of Motherapp, a leader in digital consulting and transforming emerging technology into practical applications. Motherapp was born in 2008,

inspired by a belief in the positive power of technology. The company specialises in consumer and enterprise app development.

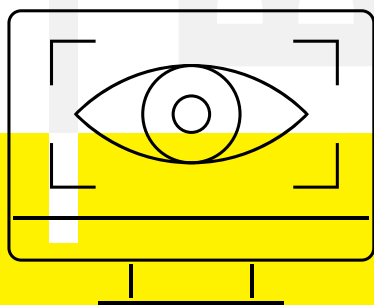
"On the automation side, machines can output data all the time but now we're looking at how we can use data on a heavily human intensive production," says co-founder Hau-man Chow.

With a client base of some of the most prominent and successful players in the electronic manufacturing services (EMS) industry, the company's systems are improving complex, multi-step production lines, and even the smallest tweak can lead to greater efficiencies and cost savings.

By integrating IP cameras with their AI technology, PowerArena enables their clients to constantly monitor and analyse their production lines and tweak the processes to enable a more efficient work environment.

ABOUT

PowerArena is a computer vision platform that turns typical webcams into powerful sensors. By combining deep learning and computer vision, it identifies costly production line bottlenecks, enhances operation compliance and delivers superior quality check. All can be done remotely.



“On the automation side, machines can output data all the time but now we’re looking at how we can use data on a heavily human intensive production”

“It’s not a problem of the workers, they’re not lazy, it’s about the design of the line,” says Chow, adding that the key is the volume of data that their system can digest and analyse. “The old way to help industry engineers do improvement is, they only look at the line for 15 minutes per station, but what we do is look at every single station with a camera and we get 100% detailed data, it’s real time and of course it’s unbiased. Once the data is collected and fed to PowerArena’s AI, it is uploaded to a dashboard for site managers to access in real time.

“I think our solution is, on one hand, to enhance worker experience. If the line is well designed, they don’t have to do a lot of work to produce the end product, but then can get more rewards for it,” Chow mentions. **“PowerArena’s offerings are simply one tool in a toolbox of solutions available to improve a factory’s efficiency and output. Our solution is to help factories to tailor the way that their lines work.”**

As tech improves and costs come down, smart manufacturing is increasingly being employed outside the traditional areas of automation – increased flexibility in robotics hardware, through modularity,

and AI and IoT-enhanced programming, even less standardised industries like food processing, (which deals with uniquely shaped food items every time) will increasingly benefit from the introduction of smart manufacturing.

“In order to achieve 4.0 there are many things involved, our product is one of the things that can help achieve that dream. When we talk about Industry 4.0, I would say 80% are still Industry 2.5 only, they are slowly evolving. We are part of the tools to push it to 4.0.”

Cost-sensitive industries, especially those which operate in batch manufacturing, like shoe and clothes manufacturing, also stand to benefit as **the new generation of robots are flexible enough to be repurposed and reprogrammed easily, allowing for different configurations to be adapted to the new task at hand.**

The future belongs to the ‘cobot,’ or collaborative robot, which combines the adaptability and problem-solving from the human side with the precision, speed and repetitiveness from their machine counterparts.



AI-BASED 3D PRINTING: POTENTIAL TO INSTIGATE CHANGE

ITAMAR YONA
CO-FOUNDER & CEO
PRINTSYST.AI

What are you printing out? Nowadays, the question could be very complex. A car? Or a document? 3D printing, or additive manufacturing, has been moving in leaps and bounds in recent years, and like other examples, Israel is at the heart of the innovation, advancing everything from high precision engineering sector to medical and health applications. In the country, PrintSyst.ai develops and distributes an AI-based perfecter that identifies the intended use of 3D parts and recommends printing parameters to ensure that additive manufacturing works.

By some estimates, Israel manufactures about 40 percent of all 3D printers worldwide, fuelled by the likes of world-class academic research, entrepreneurial spirit, and substantial public-private investments in R&D. Its universities have been busy embracing the technology, including the likes of the The Hebrew University of Jerusalem, which runs Israel's first 3D and Functional Printing Centre.

Itamar Yona, Co-Founder & CEO of PrintSyst.ai, has been a major part of its renaissance in Israel, a country that has quietly been building a reputation as a leader in all areas of technology. "My family was in traditional



printing, and we transitioned to become an expert in 3D printing but it is a means to an end. For my father and grandfather, serving customers was the first goal, and advanced technologies have really advanced this. We are serving customers, but now **we work with the likes of AI manipulating and analysing big data, and serving more low-volume and more customised production,**" says Yona.

AI FUELS THE NEW WAVE

Machine learning and algorithms all have their part to play in this journey. For many, the pandemic has been spelling out a doomsday scenario, but Yona sees only a boon and benefits from the crisis that unfurled itself out across the world. "We have seen big investment even during pandemic, as many companies want to improve their supply chain. I look at aerospace, defence, and automotive, and I see lots of investment, along with the likes of oil and gas and construction. The ecosystem is growing and all the players are complementing each other, eventually you need tailor made solutions, and that's where we come in," says Yona.

Among the technologies driving 3D printing forward is artificial intelligence (AI), **"Using computing power combined with machine learning to monitor the print job as it's happening and**

fix errors in real time that dramatically improves the quality of print," Yona explains, "It avoids supply chain delinks, shortens production lifecycles, is easy to scale and enhances localisation for high-end, precision technology products. Now everything from jet engines to medical devices are on the bill, and new ranges of materials from ceramics, glass, metals and more are available. Ecosystems and collaboration are central to all this development and innovation."

Yona sees his market competitors more as a band of collaborators that are looking painstakingly at every aspect from pre-printing analysis and prediction to make sure the factors are correct, to materials, data, workflows, and quality assurance. In conjunction with AI and machine learning that can be used to correct microscopic errors in the print.

ABOUT

PrintSyst develops and distributes an AI-based perfecter that identifies the intended use of 3D parts and recommends printing parameters. Printsyst enables users with no prior experience to focus on design instead of production. The software, called 3DP AI-Perfecter, is a preprinting evaluation tool based

on artificial intelligence technologies. It enables industries like aerospace, defense and automotive to fully exploit the benefits of additive manufacturing by improving part consistency and reliability while also reducing labor, as well as production time and costs.

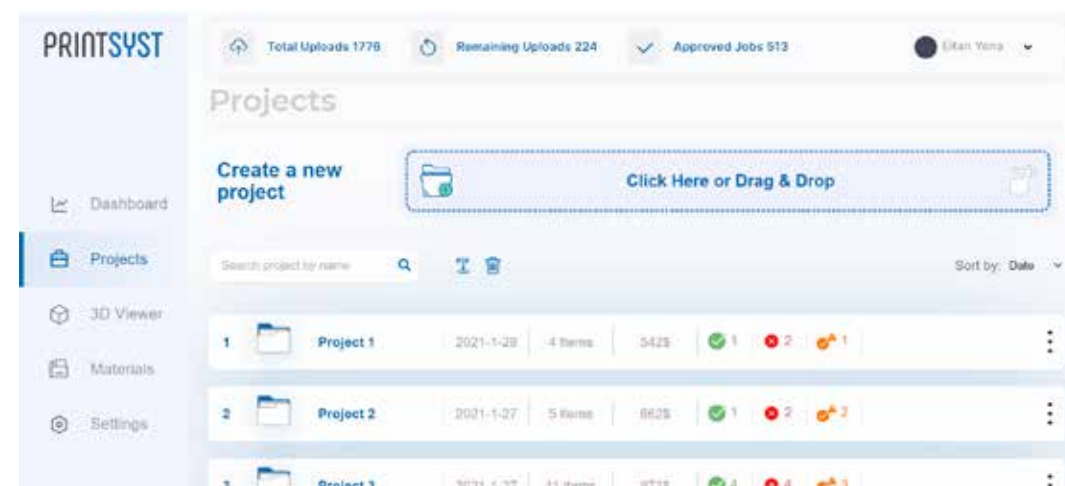


THE FUTURE OF 3D PRINTING

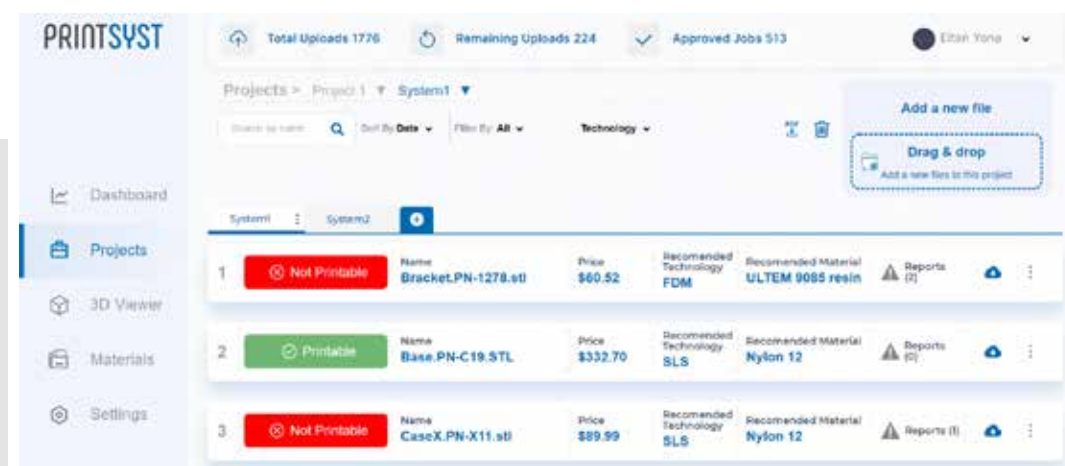
Aside from improving print quality, 3D printing has the power to democratise the distribution of manufacturing power, similar to the way the internet democratised our way of life. The industry is now predicting the next step will be capitalising on advancements in 3D printing with AI, which will have the potential of offering more customised manufacturing solutions with brand new workflows and new materials as well.

“3D printing has seen more applications, with more on demand services, shorter production, integration into the supply chain and a great deal of both expertise and optimisation.

We can say the industry is advancing and evolving,” says Yona. In Asia, the likes of China, Japan and India are propelling interest on the industrial front and in very niche areas, with customised parts built on demand. “Our industry will be playing a huge role when you are producing hundreds of parts, and people will use service bureaus rather than having it on your own, it’s similar to the printing press, there will be more universally adaptable machines,” says Yona.



The excitement comes from all the certified processes reaching a high level of maturity, and workflows being developed from across the globe. Together, data from the entire supply chain will be able to meet more and more requirements, and adapt to various processes and scale. “It’s like growing tomatoes, each one is different, and all various parameters exist. **Data allows smart analytics to scale, but we remain technology agnostic, all you need to do is figure the intent first and work out the solution.**” says Yona.



2-2 ROBOTICS

AN ERA OF MODULARISED TECH SOLUTIONS

LEO LI
PARTNER, AUTOMOTIVE &
MANUFACTURING INDUSTRIES
PRACTICE
OLIVER WYMAN

The ability to produce things has improved dramatically over time – the first major leap came with the industrial revolution

– the era in which manufacturers began to automate, using steam-powered machines. Further advances came with the advent of electricity-powered production lines, and again in the latter half of the 20th century, when the first, simple computers and robots were introduced.

Into this era steps Oliver Wyman, a US based management consulting firm. With offices in 60 cities across 29 countries, Oliver Wyman combines deep industry knowledge with specialised expertise in

strategy, operations, risk management, and organisation transformation. The firm has more than 5,000 professionals around the world who work with clients to optimise their business, improve their operations and risk profile, and accelerate their organisational performance to seize the most attractive opportunities.

AI-built tools are able to collect and analyse vast troves of data to spot patterns and develop insights that humans would be unable to do, taking thousands if not millions of data points to enable significant cost savings and efficiencies, while reducing time and material waste, and **a new generation of modular robots designed for adaptability is allowing even small factories to invest in systems that can**

be accurately programmed for specific tasks, such as in batch manufacturing. As the tech improves and costs come down, smart manufacturing is increasingly being employed outside the traditional automated areas, like car and heavy machinery manufacture.

Although the auto-industry still accounts for more than 50 percent of the robotics technology applications in China, according to Leo Li, Partner, Automotive & Manufacturing Industries Practice, at consulting firm Oliver Wyman, the cost of less advanced robotics technology is dropping, allowing a boost in adoption rates in the world's manufacturing hub. Industries as diverse as food processing and light manufacturing such as the textile industry, are increasingly employing smart tech on their shop floors.

ABOUT

Oliver Wyman is a global leader in management consulting. With offices in 60 cities across 29 countries, Oliver Wyman combines deep industry knowledge with specialised expertise in strategy, operations, risk management, and organisation transformation. The firm has more than 5,000 professionals around the world who work with clients to optimise their business, improve their operations and risk profile, and accelerate their organisational performance to seize the most attractive opportunities. Oliver Wyman is a business of Marsh McLennan [NYSE: MMC].





The advantages are clear – **increased efficiency and productivity while setting or maintaining high standards**, all with a built-in system for monitoring, analysing and improving workflows and processes, often sparing factory workers from dull, dangerous or repetitive tasks. While setup and maintenance costs can be high, Industry 4.0 proponents say that the ROI is such that even small companies can recoup their initial investment quickly.

When manufacturers look into adopting this technology, there are considerations beyond the technical, such as how, strategically, will

automation and robotics help a business improve? Potential adopters, for example in light industry, need to see how an improvement in efficiency will contribute to the company's overall competitiveness.

The question of what technologies to adopt is also highly relevant in this fast-changing tech climate, although modular technologies can help offset this concern. Depreciation is one factor to consider, as is the cost of ownership, and if factories can give the technology a test run to see how it's compatible. And while automation is supposed to make employees' lives easier, those considering a tech upgrade also need to consider if they have the right staff to run it, or if they can afford new hires.

Going forward, says Li, the application of robotics will become less and less about simply replacing manual processes, but "more about collaborating and they will provide brain power on improving decision making." The emergence of 'Cobots' – collaborative robots which work hand-in-hand with humans – provides a perfect balance between **repetitive, or precision, tasks best suited to robots, and flexibility**, which is a human strength.

The barriers to entry for adopting smart tech in factories have been greatly lowered in recent years, and the industry has been nimble in creating solutions to spur greater use.

Intelligent and modular manufacturing have the potential to transform workflows for companies across the spectrum, and advances in creating systems adaptive enough to handle small batch and personalised manufacturing mean that these

systems can be attractive – and within reach – of even small businesses.

Manufacturing robotics is still relatively a vague concept - In the 1960s, the first generation of robotics developed in the US was mainly designed for the moving of objects. The second generation was more advanced and designed to execute programmes. Now, there is the third generation, which promises to offer greater abilities to assess the environment of the manufacturing site and adapt to it by avoiding obstacles.

Robotics is being used widely in countries such as mainland China for the likes of the auto industry, but still largely underserved in areas such as food processing, slaughterhouses, along with light industry including shoe and clothing manufacturing. With cost dropping, these will see an increase in adoption, even among small companies and manufacturers, particularly as technology advances.

“Intelligent and modular manufacturing have the potential to transform workflows for companies across the spectrum, and advances in creating systems adaptive enough to handle small batch and personalised manufacturing”



HURDLES TO OVERCOME

In relation to the China market, management consulting firm Oliver Wyman says the biggest challenges facing manufacturers in implementing robotics are the following:

01

Existing Locations - Is the manufacturing site appropriate for robots? Auto manufacturing sites must be pre-programmed precisely, accurately positioned and, with the specific parts in place. For those seeking to fit into existing manufacturing settings, the process is less standardised, and may take more time and effort

02

Integration - between robotics and manual processes within the same manufacturing site must be unified, meaning a great degree of coordination is needed

03

Money - Is the cost appropriate for the budget available now and in the future?

04

Workforce - Does the manufacturer have the manpower available, in terms of the engineers who can code and make adjustments, and training for front line workers?

If all the right elements are in place, there can be a successful transition. "Robots can replace labour and avoid putting humans into adverse working conditions, while at the same time help improve quality, ensure high standards and guarantee efficiency," says Leo Li.

ROBOTICS IS NOT FOR EVERYONE

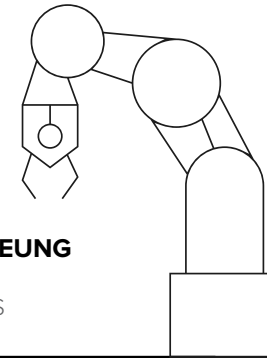
There are many things that must be considered carefully when adopting manufacturing processes. Strategically, will automation and robotics help a business improve? Efficiency may improve but how does that contribute to the company's overall competitiveness? Secondly which technologies should be adopted? There will always be new updates and hence, depreciation is a key factor that needs to be considered.

Can the technologies being adopted can be upgraded modularly or be taken on a trial or contract basis? "You need to ask yourself clearly if you have the right people to do the job and also implement these technologies," says Li. "Computer and numerical control is gaining traction in mainland China. Now a staffer can look after five machines at the same time, as procedures are automated. Companies no longer need to assign one staffer for each of the manufacturing equipment," Li adds.

Yet the challenges, according to Li, are still there in abundance. "Small companies still face stiff challenges in spreading their costs, especially when there will be more and more non-standardised products in smaller quantities. I call for more solutions providers to cater to the needs of small businesses by pooling together the needs of small manufacturers and offer design solutions that can help them address those needs and provide them with the much-needed after-sales support," he adds.

MODULAR MACHINES:

ROBOTICISING SMALL BUSINESSES



JONATHAN CHEUNG
CO-FOUNDER
INOVO ROBOTICS

While major automation has traditionally been the domain of big, heavy industry, tech advances, innovating thinking by Industry 4.0 companies, and dropping costs have put smart manufacturing solutions in the hands of companies big and small.

Modularised robotics have provided flexibility with easy-to-use, affordable robotic arms for different industries,

democratising technology adoption not just for large corporations but SMEs.

This process is absolutely essential in an environment where accuracy and customised manufacturing is the trend. The enduring image of an automated factory is one of large, efficient robot arms doing repetitive tasks on a car or item of heavy machinery on a clean, expansive factory floor.

But as costs have come down and tech has improved, companies like Inovo Robotics are pushing to bring automation to companies across the spectrum. Inovo Robotics makes capable, versatile, robotics accessible to all, addressing the problems growing businesses

ABOUT

Inovo Robotics is a startup which was founded in 2016 which helps small to medium sized manufacturing businesses increase automation and use robots to improve efficiencies. Large companies that manufacture products in high volumes have long been able to justify the significant investment required to set up robotic manufacturing processes. However, SMEs find it hard to justify these costs as their needs change frequently. Current industrial robots are typically very expensive and often a significant investment for an SME. Inovo Robotics are developing an innovative 'Modular Robotics Ecosystem' that is a versatile tool to suit the needs of an SME with frequently changing applications. Using a set of 'plug and play' components, it will enable users to easily configure a robot for their application using basic interfaces, but also to reconfigure it for different applications. Inovo Robotics vision is to democratise robots to do the jobs that are dull, dirty and dangerous.



have in automating repetitive, hazardous or precise tasks, providing intuitive, easy to use interfaces, and simple configuring for specific tasks.

By creating modular, easily reprogrammable and redeployable robot arms that can be adapted for any number of tasks,

co-founder Jonathan Cheung and his colleagues are channeling their passion for automation into a much wider pool.

“Small businesses can absolutely adopt robotics, and where we add value is that we bring them the kind of robotic tools that are a step improvement in terms of their ease of use, their programming interfaces and the flexibility achieved by modularity,” he says.

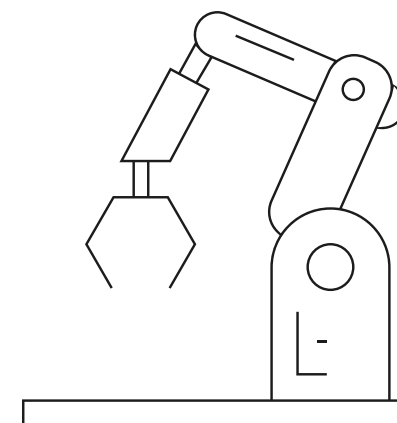
“We really wanted to make the barrier for adoption of automation for those businesses to be much, much lower, to get them much more accessible tools to help them become competitive.” He says the feedback the company gained is that clients really want flexibility, they want ease of use, ease of reuse and affordable robotics.

While the initial customer base was fairly well understood - small-scale manufacturing plants, injection molding plants and CNC manufacturing facilities – the COVID-19 pandemic has enabled Inovo Robotics to think a little more outside the box and offers solutions that help customers increase social distancing while maintaining business operations.

“[While] we’re targeting the batch manufacturing market in Europe, although there’s definitely a very large pull in terms of robotics in general

in the Asian region these traditional areas haven’t been our target market. However, we have seen that market has changed due to the pandemic, and when one market has decreased, we’ve seen a bigger increase in food, medicine and logistics areas, there’s definitely a change in market and strategy where we’ve had to pivot accordingly.” He says that customers now include restaurant kitchens and even bars, where Inovo robot arms are mixing drinks.

He says one of their most exciting collaborations is with an urban, vertical farm, called Farm 66. “Their vision is that they want to make a people-less farm, and what we have is our robot arm to help with seeding, feeding into their automation systems until you get to a point where you have the robots producing food for you, which is a great position, a great future to be in.”



“Small businesses can absolutely adopt robotics, and where we come along is that we bring them the kind of robotic tools that are a step improvement in terms of their ease of use, their programming interfaces and the flexibility achieved by modularity.”



ROBOTICS:

MAKING A SIZEABLE IMPACT ON AUTOMATION

LIT FUNG

MANAGING DIRECTOR
GEEK+

Return on investment is key to business success, and in the new normal, building ecosystems and automation is essential. Robotics is often talked about in industry, but when one is able to witness them up close and personal, there is an immediate buzz of their sophistication and a palpable excitement watching them whirl around and across the room. Geek+ believes robotics means helping companies and manufacturers develop flexible plug and play solutions with advanced artificial intelligence (AI) and ROI in a relatively short period of time.

Much of the growth of robotics can be attributed to e-commerce, which has flourished and grown over the past decade, and has been accelerated as COVID-19 takes hold. One of those beneficiaries has been Geek+, the global technology company specialised in smart logistics, opening Robot as a Service, or RaaS, a shared-robot business model that is attainable and affordable to businesses of all sizes. **The way RaaS works is to help customers effectively reduce initial investment and lower the entry threshold.** Geek+ operates over 300,000 square meters of warehouses and are running a shared network of thousands of robots.

PLUG AND PLAY AUTOMATION FOR ROBUST PRODUCTION

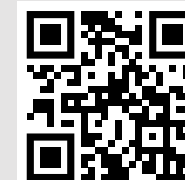
From customers in Hong Kong to Denmark, where a customer recently had a return on investment in nine months, Geek+ has been working with giant corporations. **"We work on robotics-based picking and sorting, and develop smart factories with the help of automation and AI."** With these capabilities, combined with data, we can achieve more efficiency within the supply chain, in warehouse and operations - robots are approximately three times faster than the traditional way of doing things," *Lit Fung, Managing Director at Geek+* says.

Logistics automation has been around for decades, but the modern approach is about offering flexibility. AI algorithms enhance the systems and give a smarter approach for corporations. Decathlon, for example, built a b2b warehouse two years ago and was extended to 35 countries. Meanwhile Nike is operating 200 picking robots that boost its home delivery operations.

"Collaborative robots also boost ROI and efficiency, and are at a very low price in China. Improvements in ROI come when the labour cost is reduced, and we have helped companies like Nike fulfil this in their ecommerce operations," says Fung.

ABOUT

Geek+ is a global technology company specialised in smart logistics. The company applies advanced robotics and artificial intelligence technologies to create solutions for warehouse and factory operations. With the rise of e-commerce and the demand for a faster and more flexible movement of goods, warehouse and manufacturing operators are facing increasingly complex production and logistic challenges today. Speed, product diversification, same-day delivery, volume, safety. These concerns are impacting a wide range of industries, from apparel, retail, automotive, to even electronics, energy and pharmaceutical industries. Geek+ was founded to be the solution to these problems and make logistics affordable, efficient, flexible, safe and agile. Its vision is to establish a fully automated and intelligent supply chain globally.



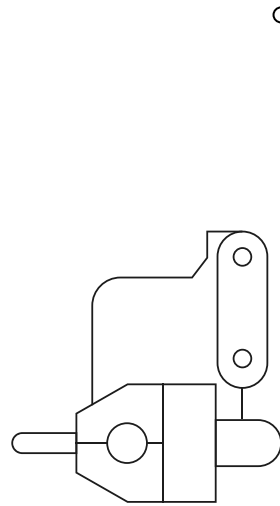
THE NEXT NORMAL:

ROBOT-
AS-A-SERVICE

The era of the pandemic has opened up new market segments including **grocery, reverse logistics, apparel, ecommerce, sanitation** and more. It has meant that SMEs have also had to be agile and flexible and be able to come up with solutions that can be changed within 3 years – no one has the luxury of long term planning. But one thing is for sure, robotics can help.

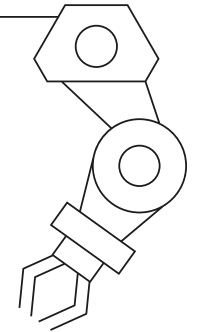
“Automation propelled by demand - we set up robots-as-a-service which addresses some of the pain points these companies are experiencing, avoiding the huge required investment amounts, and offering a model of paying rental every month and charge monthly costs,” says Fung.

From helping with reverse logistics, to partnering the likes of ABB to move cars around in production, Geek+ is having its moment in the sun. “Especially following COVID-19, the market has already gone through a period of education and they are not scared of using our products at all, there is a proven track record and most of our customers



know about that already. Nike used our robots for Black Friday - it was a pressure test for our system which I'm glad to say we have passed. **Before, only top tier companies looked for our solutions, but now it is absolutely everyone, including SMEs, mid-size companies and more.** This is somewhat of a sea change we are witnessing,” says Fung.

“Hong Kong still has its own value in the global market, getting growth from logistics and the traditional ways are transforming, evolution is happening all the time, free returns are happening in the market and this benefits us, with things like reverse logistics that you see from the likes of ASOS, and our solutions are very flexible,” he adds.

THE EVER-CHANGING MARKET FORM
THE **NEW ECOSYSTEM**

Supporting the Asia-Pacific region with reverse logistics increases operational costs, but the benefits of automation are not outweighed, with multinational companies enjoying flexible and agile operations, ease of scale and deployment, and elimination of extra labour costs.

It is all part of a new business model where Geek+ is forming an ecosystem with operations from multiple sectors - Microsoft, NVIDIA, Erickson, ASOS, ABB, Foxconn, Toyota and

more – **this is not a competition but a partnership that offers true value,** according to Fung. “We are growing tech together - and educating the market - smart manufacturing techniques are helping clients be flexible with configurations and models. It's a really big green field. At the end of the day, manufacturing is all about quality, accuracy and so even where labour cost is low you can still use robotics and achieve cost savings as well.”

“We set up robots as a service which addresses some of the pain points these companies are experiencing, avoiding the huge required investment amounts, and offering a model of paying only by rental every month and charge monthly costs.”

2-3 INTEGRATION & CONNECTIVITY

PALLETISING:

THE PERFECT MATCH FOR
ADVANCED MANUFACTURING

ALFONSO BALLESTEROS
CCO OF ASIA
WEPALL

TETSU HOR
HEAD OF R&D OF ASIA
WEPALL

Warehousing and distribution have been revolutionised by robotics. Palletising is an essential element of modern logistics, the end of the manufacturing line. Think of it as the unsung hero of the show. At the forefront of innovation is Wepall, a Spanish automation company specialised in universal robotic palletising software to facilitate, simplify and speed up the installation and configuration of robotic systems.

Palletising is a difficult job, the work is tedious and time-consuming, injuries and absenteeism are frequently higher than average, with turnover rates as high as one in four workers. **Automated palletising solutions save time and eliminate the need for heavy manual activities at the end of the packing line.** In particular, robotic palletising systems have become increasingly popular in recent years, both for their flexibility and easy adaptability to changing needs and products, and offer significant productivity and efficiency improvements to operation while taking up minimal floor space.

With over 20 years of experience and more than 500 lines assembled around the world, Wepall offers a robotic palletising software that can fit all types of requirements and

lowers the barrier to entry into the complex world of collaboration with robots. Its solution delivers the maximum palletising performance at the minimum cost and with total autonomy to integrators and end users, in which they can assemble and run a robotic palletiser without having programming knowledge of any robot brand.

ABOUT

Wepall is a universal software which facilitates, simplifies and speeds up the installation and configuration of robotic systems. Based on API, which allows anyone with basic knowledge of computer programming to program industrial robots of different brands, Wepall has developed the first universal palletising software, an application with which you can design your own pallet formats, generate the code and load it onto the robot of your choice in just a few minutes.



TRANSITION TO AUTOMATED ROBOTICS SYSTEM

“Automation comes from the need for efficiency, security, and cost control.

Human labour is all about risk and effort, and it's hard work. Automation eliminates jobs but creates some, like at Wepall, without robotics in place, we would be without a job,” says Alfonso Ballesteros, CCO of Asia at Wepall.

Yet, these are some challenges for traditional manufacturers, including not having robotic experts on the production line. Wepall provides users with all required elements and specifications to run the robot, akin to what happened with websites as the likes of Wix and Wordpress came along. They

offer all the building blocks to make it happen. “We use AI to carry out tasks including object recognition that can help robots see and analyse like humans, to do more complicated tasks, such as picking up different sizes of pallets, and optimising this application,” says Tetsu Hor, Head of R&D of Asia at Wepall.

For companies that use its services, the advantage of Wepall is being an user friendly software - no need for

programming knowledge and the pallets could be optimised for people who might not be experts in the field. “Programming can be done even by children with our software. The deeper meaning is peace of mind, and not having anxiety, not relying on experts, and no need to provide anything. We are plug and

play and our API can talk to different types of robots, so we offer flexibility to all types of people across different sectors. The value of Wepall is easy to use,” Hor adds.

The results are there for everyone to see. PepsiCo Group is validating Wepall software worldwide, and allowing the installation for any companies in the group; and Pastas Gallo, one of the most famous pasta manufacturers in the world, have integrated the software Wepall into their operations, two plants with a total of 24 robots.

“There is more automation and awareness of it as well, **we are not creating a new trend, we are simply accelerating it.** It will be a symbiosis and that robots will be one more member of the team. The net result is better for society, and where robotic usage is higher, we usually see a lower level of unemployment,” says Ballesteros. Particularly relevant as China poses one of the biggest markets for robotics globally, morphing into an ecosystem with Hong Kong, Asia and the Greater Bay Area, any factory can adopt automation in the production line easily.

“We are plug and play and our API can talk to different types of robots, so we offer flexibility to all types of people across different sectors.”

OPPORTUNITY IN ASIA

Globally there are estimated to be three million automated robots, and this is growing at about 15 percent every year, and with the pandemic this process has accelerated even faster. Industrial automation in **hardware, software, and services** and automation is valued at around 6.5 billion euros per year and the growth is strong.

Across the world, the main markets for robotics and automation are China, Korea, Japan, US, and Germany. For Wepall, being in Hong Kong offers many major advantages that include the robust legal system, rule of law, ease of business, financial services, and being next to Shenzhen and the Greater Bay Area. “It's easy for foreigners, it feels like home, and it's the only city that has all the ingredients,” says Ballesteros.



ADOPTION: SMART MANUFACTURING STILL HAS MANY HURDLES

CK LIM
CEO, BU ICD & CIS,
SEMICONDUCTOR SOLUTIONS
ASM PACIFIC TECHNOLOGY

Advanced manufacturing is frequently associated with technology, but many in the industry know it is more than that. Skills are at the heart of it all - whether that is data, digitisation, social, or personal skills. In essence, the name of the game is leadership. As a leading supplier of semiconductor assembly and packaging equipment, ASMPT is a key player in the industry and enabler for customers wanting to embrace and adopt digital transformation in their manufacturing. They are on the front lines: "Companies need top management

commitment and alignment to re-design manufacturing systems for industrial 4.0. Strong management, leadership skills and changing the core competences and profile of key team members towards software skills set are needed to make adoption successful," says CK Lim CEO, BU ICD & CIS, Semiconductor Solutions for ASM.

For Lim, **automation and advanced manufacturing are becoming more and more critical as societies develop and mature.**

"Due to changing demographics of an aging population and less talent pool of technicians and operators, there is a need for automated manufacturing that ties up with the supply chain to achieve greater efficacy in order fulfilment. We expect to see widespread deployment of smart factory solutions, involving Industry 4.0, lights out factories with end to end closed loop software solutions. Germany and Japan are at the forefront due to their strong automotive industries and aging

population, with emerging China hot on its heels" says Lim.

China, India and Vietnam are emerging in advanced manufacturing, especially in segments such as automotive which are driven by stringent quality and safety standards. In such cases, the gap is slowly closing as MNC overseas factories augment their mother factory. As a case study, Siemens PLC production in China having undergone digitalisation transformation is one the best use cases, which closely augments Siemens Electronic Works Amberg (EWA), a factory that the company runs in Amberg, Germany. "Siemens is one of the best Industry 4.0 company benchmarks, both as a solution

provider for other companies as for its own factories" says Lim.

The challenge in manufacturing is to achieve mass customisation, this means one needs to be agile, flexible and reconfigure like a 'Transformer'. A desired outcome is to create a portable factory, which one can 'copy and paste' somewhere else given the potential decoupling of economies.

ABOUT

ASM Pacific Technology is a leading global supplier of hardware and software solutions for the manufacture of semiconductors and electronics. Listed on the Hong Kong Stock Exchange since 1989, ASMPT's offerings encompass the semiconductor assembly & packaging, and Surface Mount Technology industries, ranging all the way from wafer deposition, through to various solutions that organise, assemble and package delicate electronic components into a vast range of end-user devices across domains such as mobile communications, computing, electronics, automotive, industrial, and LED displays. ASMPT's continuous investment in R&D and close partnership with its customers helps provide cost-effective, industry-shaping solutions that achieve higher productivity, greater reliability and enhanced quality.



CURRENT CHALLENGES

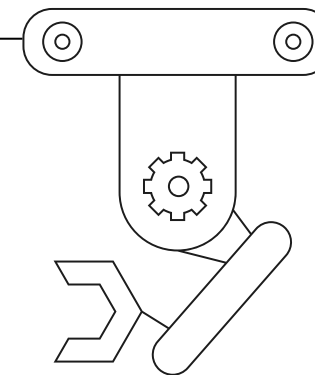
The pandemic has clearly accelerated digitalisation and companies that thrive in a VUCA (volatility, uncertainty, complexity, and ambiguity) world needs to embrace change and transform into a digitalised organisation.

With the confluence of technology storm and geopolitical storm, Lim says **the closest metaphor he can compare it to is the Fujiwhara effect where two storms collide to form a super storm which then creates an upward spiral in semiconductors demand, on the back of ubiquitous digitalisation.**

Significant transformations are happening across the board with increasing traction of 5G, IoT for sensing and low cost computing for data analytics to enhance manufacturing yield, efficiency and utilisation. With many companies offering robust cloud computing infrastructure and data security, this will help to power the digitalisation. "We can expect to see an exponential adoption as we have more successful use cases. Of course there will be challenges that include a limited talent pool of data scientists and software engineers, but optimistic the advent of AI due to lower cost of computing should help to ease this choke point in the long term" says Lim.



BRANDING IN HIGH TECH MANUFACTURING



"Hong Kong has some of the best talent, an excellent infrastructure, reliable utilities, a robust legal system, secure IP framework and a safe and global city with world class universities generating a continuous pipeline of new talent," Lim adds.

Lim believes **Hong Kong is capable of reinventing itself and thriving in the new era of Industrial 4.0.** "The Hong Kong people have a strong fighting spirit and are highly entrepreneurial. However, the lack of branding for high tech manufacturing means few want to be in manufacturing, instead they strive to be investment bankers, accountants and lawyers. Without investing in and leveraging the branding of high tech manufacturing as an exciting and esteemed profession (vis-a-vis Germany and Japan), one would struggle to attract the best talent."

MANUFACTURING AS A SERVICE (MAAS)

Going forward, business models might change as more and more software content is used to reconfigure the hardware, which would make subscription models more feasible. **A possible scenario is traditional manufacturers might elect for a hybrid business model with partial down payment with subscription based on type of software needed and thereafter, pay per use.**

Value is created and added via high tech manufacturing. It is timely for Hong Kong to embark on re-industrialisation and leverage on the world-wide momentum of Industry 4.0 and the Greater Bay Area initiatives to move up the value chain in the new era of digitalisation and shifting demographics.



5G:

THE NEED FOR SPEED

ALEX CHENG
PRINCIPAL ENGINEER NETWORK
NETWORK PLANNING & IMPLEMENTATION
CHINA MOBILE HONG KONG

In the era of advanced manufacturing, speed of communications both between humans, machines, and in between is absolutely essential. China Mobile Hong Kong Company Limited ("CMHK") is the wholly-owned subsidiary of China Mobile Limited. CMHK was the first network provider in Hong Kong to successfully complete end-to-end 5G network testing in March 2018.

5G development has been especially fast in Asia, with the service launch having already been implemented in Hong Kong in April 2020. Indeed, at the heart of this communication transformation is speed.

With 5G, assembly lines, machines and robots in the factory can be connected wirelessly with much lower latency, allowing real time monitoring and analysis, as well as enabling decentralised decision for agile manufacturing.

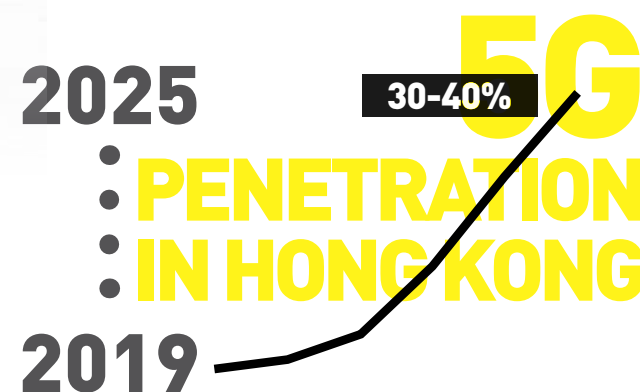
"We are the largest mobile provider in the world, 5G and artificial intelligence (AI) can enhance operation and cost efficiency for fast data,

ultra-reliable and low latency communication, and massive machine communication. For manufacturers, 5G networks with AI analysis will help improve on operational efficiency, IoT, and be a catalyst for digital transformation. This will provide benefits to the manufacturing process, logistics, as well as the supply chain," says Alex Cheng, Principal Engineer Network Planning & Implementation for China Mobile Hong Kong.

Cheng knows that first hand, with his efforts in building the market in Hong Kong and the Greater Bay Area in comprehensive communication services, data centre, ICT consultancy, new business concepts and technologies.

When Cheng talks, people listen; he has more than 30 years' experience in telecoms' in Hong Kong and Vodafone Australia. One could almost call him Hong Kong's very own 5G guru.

"The market will naturally take time to mature and will come into fruition over the next five years. Looking at the market, 5G penetration in Hong Kong will hit about 30 to 40% by 2025, so the development will come gradually but at a slow pace."



Cheng works at the China Mobile 5G Innovation Centre Hong Kong Open Lab, which is spearheading development of the 5G ecosystem. The company's "5G+ Project" is complementing the existing 4G network with 5G infrastructure plus AICDE technologies, promoting new applications and developing more comprehensive 5G ecosystems for the likes of autonomous vehicles, intelligent robots and drones, and smart city applications, all of which have strong applications for advanced manufacturing.

ABOUT China Mobile Hong Kong Company

Limited (CMHK) is the wholly-owned subsidiary of China Mobile Limited (HKEEx: 941) (NYSE: CHL), which ranks 65th on the Fortune Global 500. CMHK was inceptioned in January 1997 and was the first mobile network operator to launch PCS services in Hong Kong. CMHK launched 5G service in Apr 2020, committed to combining 5G with new technologies, such as artificial intelligence, IoT, cloud computing and big data, integrating 5G applications in different industries, and promoting the construction and development of smart city groups in the Greater Bay Area.



THE 5G REVOLUTION IN **ADVANCED MANUFACTURING**

Slowly but surely, 5G is a catalyst for the manufacturing industry.

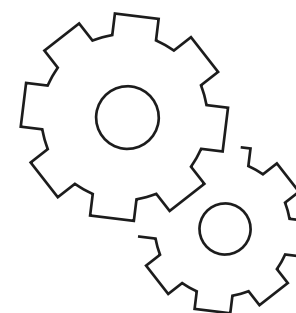
“We will see the use of high definition cameras and sensors to monitor the production line. This enables predictive system alarm alert, real-time machine control adjustment, and product quality assurance. In general, 5G offers real-time monitoring analysis, for cost effectiveness and efficiency on material supply, and minimise warehouse requirements. AR and VR also enables staff to work remotely and receive training in virtual spaces, providing them a safe working environment.” says Cheng.

The development of 5G Standalone (SA) network supporting network slicing is anticipated to assist the development of the likes of edge computing, and secure networks for mission critical manufacturing, essential for high tech industries including aerospace, cars, and nuclear power that require high security networks, monitoring, and sensors enabled by data and video.

“5G offers real-time monitoring analysis, for cost effectiveness and efficiency on material supply, and minimise warehouse requirements.”



A HISTORIC MOMENT FOR **HONG KONG**



For Cheng, COVID-19 presents a historic opportunity for manufacturers to embrace digital transformation. “Factory owners need to look at their operations and consider their business targets, and areas of improvement, and where they can develop new 5G enabled applications or simply keep using existing ones. We hope the Greater Bay Area will become a technology advanced cluster, and a regional showcase bringing technologies to Asia. For historical reasons, Hong Kong is a window between West and China, exporting and bringing in new tech, and bridging culture. **We want Hong Kong to step up digital transformation at this moment because advanced manufacturing has potential but lacks success cases so far. Today it’s not ready, but a few years down the line it will happen.**” Cheng adds.

2-4

ORGANISATIONAL STRATEGY



FROM GERMANY TO ASIA PACIFIC: ADVANCED MANUFACTURING IN THE AGE OF DIGITISATION

SEBASTIAN SCHENK

HEAD OF DIGITALISATION OF BUSINESSES
BASF ASIA PACIFIC

Manufacturing has undergone tremendous changes. From being more reliable, to consuming less energy, to ensuring both cash flow and return-on-investment, while bringing in talent and top-of-the-line R&D. There is plenty to manage, from having unique research abilities, running public-private partnerships, to localising your production. What do they all have in common? Digitisation.

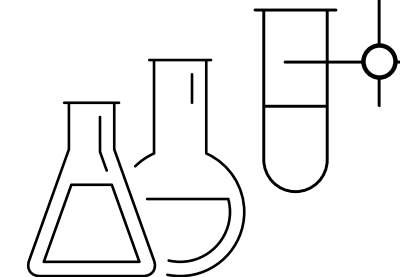
What we often consider to be 'advanced manufacturing' is indeed just manufacturing that has undergone digitisation. Sebastian Schenk, Head of Digitalisation of Businesses at BASF Asia Pacific, has spent the last five years working on the digital transformation for the chemical giant, which has more than 117,000 employees globally, present across sectors and in almost every country in the world. Prior to his current role, he has also worked on business strategy, EBIT improvement, reorganisation and post-merger integration,

and the carve-out in Asia, for the company.

"What we possibly understood earlier than other companies in the industry is that digitisation offers more opportunity to make our production smarter, from consuming less energy, to making things more reliable and optimised using big data and analytics. Chemical companies operate in an asset-heavy industry with substantial investment into production sites, which pays off over time. Unlike tech, software, or service industries, we need fixed assets to make and sell our products.

How can we ensure peak performance in reliability, early problem solving, and the right number of people, making sure we produce more with existing assets? Digitisation helps us with this," says Schenk.

The analysis can feel like somewhat of a surprise for some. Chemicals are one of the world's most lucrative industries that might not seem to have the need to innovate, but data can offer a boon in this regard. For Schenk, companies must focus their digitalisation investment on high pay-back areas. "Chemical plants can last a very long time. The older they get, the easier they break, so predictive maintenance is important. But does the plant create enough data to feed algorithms? We need sensors to collect data, and older assets yield higher returns but need more investment," says Schenk.

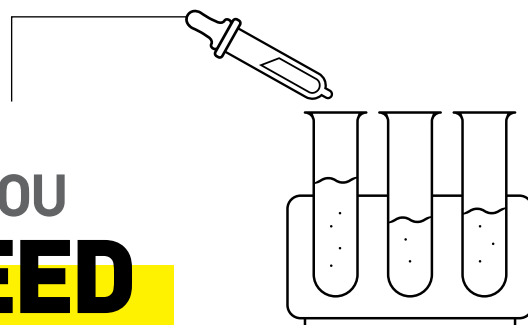


ABOUT

BASF SE is a German multinational chemical company and the largest chemical producer in the world. The BASF Group comprises subsidiaries and joint ventures in more than 80 countries and operates six integrated production sites and 390 other production sites in Europe, Asia, Australia, the Americas and Africa. Their portfolio is organised into six segments: Chemicals, Materials, Industrial Solutions, Surface Technologies, Nutrition & Care and Agricultural Solutions. BASF generated sales of €59 billion in 2020.



FIGURE OUT WHAT YOU NEED TO **SUCCEED**



Many people see “Artificial Intelligence (AI) as a shiny object, such as chatbots which are pretty much useless at times,” says Schenk. The BASF digitalisation expert instead recommends to “understand what the specific elements of the value chain create most value - be it in raw materials procurement, manufacturing, warehousing, outbound logistics, technical service, commerce, and marketing. It is all about building digital capabilities and solutions in production, business and supply chains, forecasting and network optimisation at scale.”

While the company employs a strategy of using its own algorithms and blending that with market solutions, digitisation is simply one more item in our toolkit. The fundamental business remains essentially the same as it always has, according to Schenk. “Making chemicals is and will remain a complicated and complex business, which needs tremendous experience and know-how to keep operations running in an efficient, a safe and reliable manner through continuous monitoring, improvement and error reduction. It simply can’t be done in your backyard. So, we are not disrupted like banks, retail, and cars, but rather gradually transformed.”

A BUSINESS NOT DISRUPTED, BUT **TRANSFORMED**

While chemicals production processes remain largely unchanged, one of the ways, according to Schenk, in which it is rapidly changing is through the use of robotics and AI. “Automation will change everything. The fewer people we bring into contact with machinery, the higher the efficiency. So, we need to rethink how plants get built. If drones or robots can take over maintenance, walkabouts, they need to work in environments built for them. Next level plant automation is all about building and design.”

Aside from design, another key element is higher data connectivity, a reason why BASF applied for a private 5G industrial license to build their own infrastructure and not rely on public services. “To automate, you need data – where does it come from and how does it reach you? If you want to have a driverless transport vehicle on site, it needs to be connected all the time. 5G in this case will be a massive enabler,” says Schenk.

The chemical industry is not a consumer business but primarily caters to selling goods to other industrial companies. For Schenk, manufacturers must consider how their customers learn about products, buy, and take decisions, and how to enable a seamless customer journey through digital marketing, commerce and service solutions. **“We are a non-digitally native company in a more and more digital world. Times are changing, and our customers want a customer experience in B2B, similar to the B2C world. People are used to connectivity, speed and smartphones, and there has been a generational shift,”** Schenk says.

The generational shift is being felt at manufacturers, and digital innovators need to convince internal parties that investment is necessary and will translate to ROI down the road, according to Schenk. “Senior management and CEO sponsorship helps the process. They know the order of magnitude

of the problem and can calculate their needs with funding, support, tax breaks, and more. If they don’t have the relevant in-house capabilities, they can work with external partners.”

Digitisation offers tools to shape identity, but businesses need assessment in a 360-degree way. “We are geared towards products, but not services, aside from technical services. If we look at things holistically, across the whole value chain, we will find more opportunities to create value for our customers through digitisation,” Schenk adds.

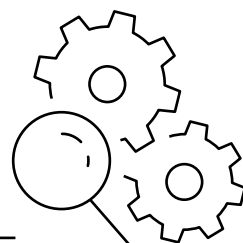
For manufacturers, some key abilities include assessing where they really need investment, and not simply buying ‘shiny new toys’. They need to take a holistic view and see where digital transformation is able to enhance business and production processes. Look after business fundamentals before embarking on the journey; focus on your core processes, start small, build digital capabilities and know-how and scale up when possible. If manufacturers don’t want to have fixed costs, working with external partners or using software-as-a-service solutions to help test the waters.

TESTING & CERTIFICATION:

KEY TO THE MANUFACTURING REVOLUTION

CHRISTY CHAN

DIRECTOR OF CONNECTIVITY & PRODUCTS
SGS HONG KONG



A sea change in science and technology delivered by reindustrialisation is reinventing manufacturing by improving processes and costs, quality, and also the reliability of industries.

To win big, players need to connect to the experts with capabilities in certification and knowledge in global regulatory standards. This helps manufacturers thrive with the right brands in target markets. A central part of this effort has been consultancy for clients that meets international regulatory standards along with local requirements. When manufacturers want to meet global standards when producing new goods, companies such as SGS offer the way forward.

For 140 years (60 in Hong Kong), SGS has been the world's leading inspection, verification, testing and certification

company, and these qualities are even more important today as we witness a boon in manufacturing that is sweeping the world.

Hong Kong has a historical precedence as a trading hub, and with that comes a thorough understanding regarding regulations and requirements in different countries that helps manufacturers develop new products and markets. From prototyping to commercialised products and the supply chain, SGS has the capabilities to provide consultancy to clients with its global presence.

"SGS has always helped manufacturers move products across the region to a full range of places, US and Europe, but the pandemic has definitely brought in new trends. **Many manufacturers are thinking about how they can innovate, and considering building their own new brands and tapping into new markets** such as China and ASEAN," says Christy Chan, Director of Connectivity & Products at SGS Hong Kong.

While Hong Kong has a shortage of land, new facilities for advanced manufacturing

ABOUT

SGS is the world's leading inspection, verification, testing and certification company. SGS is recognised as the global benchmark for quality and integrity. With more than 89,000 employees, SGS operates a network of over 2,600 offices and laboratories around the world. For over 60 years of local experience, SGS Hong Kong has been known as the pioneer in quality assurance services.



in many different areas have been popping up, leading to the need for consultancy in everything from dangerous goods to environmental management, and even how to reduce spend. “We help people starting with their R&D process, with new materials and product prototypes, and give them advice on materials, components, markets, regulatory environments, and explain how their products will be subject to various requirements,” says Chan.

As manufacturers scramble to meet the trend of local supply chains, SGS helps with specifications, the manufacturing process and quality levels in different market segments. A prime example has been the boom in manufacturing surgical masks that has been sweeping across Hong Kong.

“There have been many challenges because they don’t know anything about masks as a product, requirements and more. So our Hong Kong team completely ramped up the testing capabilities within three months, got accreditation to support the supply chain fully. We helped them to carry out tests and modified buying, materials, supply chain decisions, and prototypes,” says Chan.

HOW TO OPTIMISE YOUR R&D

With reindustrialisation in full effect, Hong Kong as a whole is trying to consider its own style, and how it can benefit consumers.

Tailor made solutions are necessary, capabilities in software and tech, and also in building the right culture of collaboration, talent, innovation and offering added value both to the economy as a whole but also individual companies.

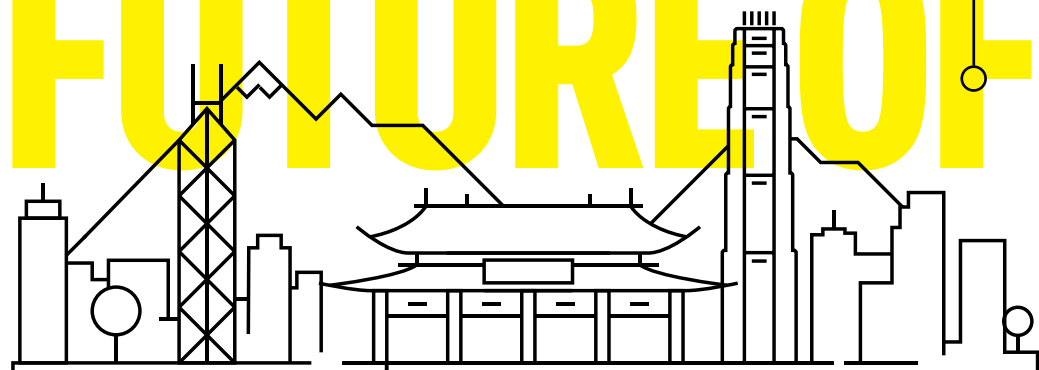
“All these skills are not new, Hong Kong has always had it, other people like our culture and trust us, and that’s what keeps us ahead. We can’t just sit around to predict what is going on, but focus on doing something new, anticipate new challenges, trends and solutions. We are the invisible player assessing the market and helping manufactures catch trends” Chan says.

So what would Chan say is the key to success in the current market? “You need to focus on your core identity, and this can be like a brand or product or retail channels. Be collaborative, find people and partners, learn, and transform.”

“You need to focus on your core identity, and this can be like a brand or product or retail channels. Be collaborative, find people and partners, learn, and transform.”

CHAPTER 3

FUTURE OF



HONG KONG

WHERE DOES HONG KONG STAND?

Hong Kong is being transformed with high valued, innovation driven, sustainable industrial development, combined with a new wave of environmentalism - where innovation enables sustainable operations. COVID-19 is accelerating transformation and digitisation through innovation in the likes of raw materials and localisation; synthetic biology to create new processes and sustainable higher quality raw materials; while digitalised production including automated additive manufacturing, inventory management and forecasting is playing its own unique role.

Hong Kong retains several advantages as a platform for sustainability and innovation in Asia. These include doors to quality assurance, innovation labs and sophisticated consumer and retail markets, also the ability to test products and promote new technology in retail and production.

Open innovation processes have the potential to revolutionise advanced manufacturing, and Hong Kong needs to embrace that. Still, the city has many advantages - finance, legal, copyright enforcement and strong IP protection, along with top tier universities with strong research capabilities. With government support in research, talent acquisition and I&T funding, Hong Kong's role is thus critical as a technology hub pulling all the pieces together and bringing in talent and high level production from across Asia.

The city needs to now leverage the ability to navigate free-trade agreements, whereby manufacturers can split production into different parts and do assembly in separate jurisdictions across ASEAN, China and Hong Kong depending on the tariffs, labour needs

and technology in each region. Hong Kong is at the heart of it all - science, technology, innovation driven manufacturing, and creativity in connecting researchers and manufacturers.

As always, identifying the right timing to market is important. Is your organisation lagging behind?

The time to invest is now: COVID-19 has created opportunities with workers communicating from home, enhancing the digital ecosystem, and the Hong Kong government is driving hard behind the scenes, providing funds and connecting the supply chain.

To be competitive and be a world leader in advanced manufacturing, investment must continue apace in research and development, along with talent. The right moves at this critical time will help the city be a leader of this brave new world.

CHAPTER 3

KEY TAKEAWAYS

Innovation is not a luxury, it should be front and centre

COVID-19 has made international supply chains be reconsidered, and resilient supply chains will be the next concept as logistics and trade have been broken down

Effective collaboration across borders begins by understanding other' cultures

Trade issues can be overcome with skillful negotiation and soft skills

Hong Kong should optimise its existing strengths such as research on quality control and design, and focus on the China synergy to be successful in the new world

Innovation can come from adopting leading-edge technologies from across the world to solve key challenges. Investments can be quite high, but pilot projects can identify elements to get return on investment

Personalisation is moving the revolution in advanced manufacturing and companies need to act accordingly

The digital revolution is also being driven by a generational change of business owners, with the young vanguard taking over, and while capabilities are important, build up slowly and become trusted – that are essential elements to achieve success in this digital era

A combination of education and training can help raise the level of talent in Hong Kong, when it comes to building a pipeline for advanced manufacturing

The opportunities are clear for Hong Kong in product design, testing, and engineering development, all of which will meet the new world of intelligent and precise production

High mix and customised design is what the market needs, as well as flexible and smaller volume solutions that allow for lower cost and waste

INTERVIEWEES

TRANSFORMING THE TRADITIONS

ALEXANDER CHAN

CO-DIRECTOR, THE MILLS FABRICA

STEPHEN CHAN

COO, WISE ALLY

DR VINCENT FUNG

EXECUTIVE DIRECTOR,
KIN YAT HOLDINGS LIMITED

REDESIGNING THE FUTURE OF HK

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GENERAL MANAGER,
SMART MANUFACTURING DIVISION,
HONG KONG PRODUCTIVITY COUNCIL

RAYMOND SHAN

PRINCIPAL CONSULTANT, INDUSTRY 4.0
AND ADDITIVE MANUFACTURING,
SMART MANUFACTURING DIVISION,
HONG KONG PRODUCTIVITY COUNCIL

TONI DRESCHER

HEAD OF TECHNOLOGY MANAGEMENT,
FRAUNHOFER IPT & EXECUTIVE DIRECTOR,
INC INVENTION CENTER

DR YIU-CHUNG CHAU

ADJUNCT PROFESSOR, CITY UNIVERSITY
OF HONG KONG AND EXPERT ON
ORGANISATIONAL LEARNING AND
LEARNING ORGANISATION DEVELOPMENT

IR HL YIU

HEAD OF REINDUSTRIALISATION,
HONG KONG SCIENCE & TECHNOLOGY
PARKS CORPORATION

DR ALLEN SHI LOP-TAK

PRESIDENT, THE CHINESE
MANUFACTURERS' ASSOCIATION
OF HONG KONG (CMA)

STEVE CHUANG

DEPUTY CHAIRMAN, FEDERATION
OF HONG KONG INDUSTRIES (FHKI)

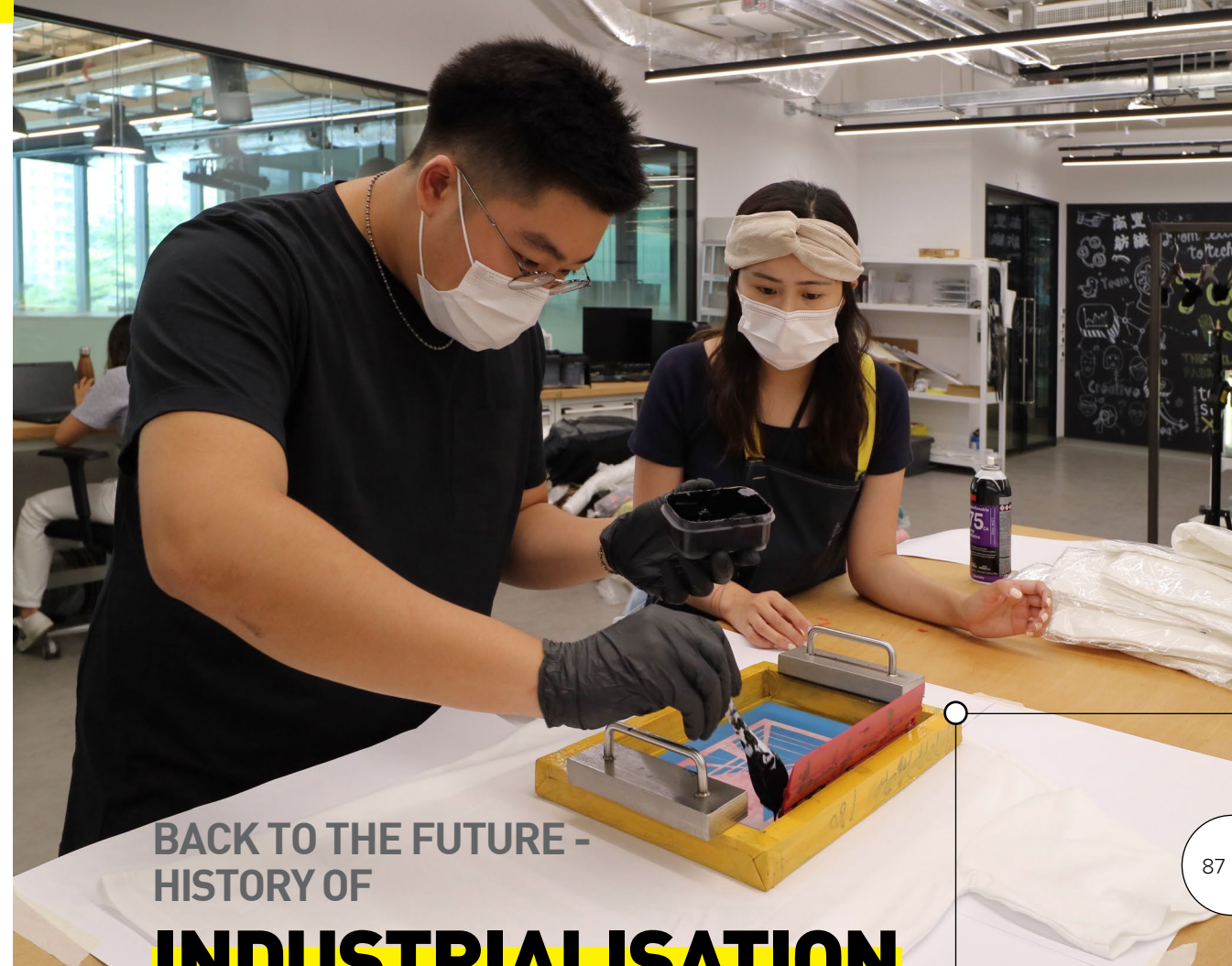
3.1 TRANSFORMING THE TRADITIONS

86



ABOUT

The Mills Fabrica is the innovation arm of The Mills – dedicated to creating techstyle startup success stories and building a global techstyle community, an open platform for innovation, facilitating collaboration between startups, brands, retailers, manufacturers, academic and research institutions and more. They run a cross-border incubation programme both in Hong Kong and the UK, bridging the east and the west to support techstyle startups through exposure, connections and advisory. They also have an investment fund that supports and invests in techstyle globally.



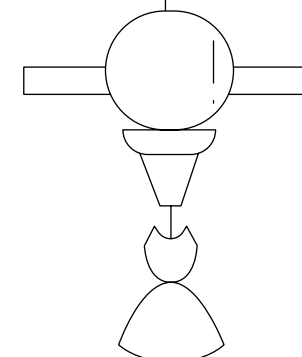
BACK TO THE FUTURE -
HISTORY OF

INDUSTRIALISATION

ALEXANDER CHAN
CO-DIRECTOR
THE MILLS FABRICA

In Hong Kong, many blue chip corporations have industrial histories. Nan Fung Textiles was part of the city's textiles & fashion industry, witnessing the manufacturing heyday in the 1950s. What was more simplistic then has now morphed into something advanced as data and technology offer digital transformation possibilities. The result blending innovation and textiles and apparel has been called 'techstyle' by Nan Fung, where they come together in a supply chain covering new materials, wearables, and new retail experiences.

87



“Hong Kong was a huge base for textiles, and Nan Fung Group took their last factory and transformed into a modern advanced manufacturing hub. This centre (‘The Mills’) pays heritage to the past and also provides a vision of Hong Kong as a hub for new innovations in textiles to digitise and make fashion more sustainable as well,” says Alexander Chan, Co-Director, The Mills Fabrica.

The Mills, Nan Fung Group’s landmark revitalisation project combining incubator, experiential retail, and a non-profit cultural institution, promotes collaboration between startups, brands, retailers, manufacturers, academic and research institutions. To promote ‘techstyle’, Fabrica - innovation arm of The Mills, is dedicated to creating startup success stories and building a community as an open platform for innovation.

The Mills Fabrica is driving innovation by bringing leading-edge technologies from across the world to solve key challenges in the fashion industry. They offer a cross-border incubation programme both in Hong Kong and the UK, and runs an investment fund that supports and invests in ‘techstyle’ globally. Meanwhile a flexible co-working space facilitates collaboration amongst entrepreneurs, with an additional Fabrica Lab allowing for experimentation and prototyping with state-of-the-art equipment.

“Hong Kong saw the first generation of entrepreneurs in the post-war miracle, and we are working to support new innovations getting commercialised and going to market, along with knowledge sharing and industry engagement.”

PANDEMIC A BOON

FOR TECHNOLOGY

The pandemic has left many industries in a state of uncertainty, as one of the most affected industries – textiles & apparel is being transformed and prepping for a reboot. “COVID-19 is accelerating transformation and digitisation through supply chain breakdown and factory closures. There is innovation in the likes of raw materials and localisation; synthetic biology to create new processes and sustainable higher quality raw materials; and digitised production including automated additive manufacturing, 3D design, inventory management and forecasting,” says Chan.

However, SMEs need to survive, and cannot invest just in long-term strategies when times are tough during a pandemic. The Mills Fabrica helps startups and SMEs with near-term solutions such as software, digital

design, and things that require lower cost and show more immediate results. They also support the Good Fashion Fund that provides green financing loans to help SME manufacturers with new technology and promote sustainability.

“Innovation is not a luxury, it should be front and centre, consumers want brands to be sustainable; to survive and to thrive we need to adopt new technologies” says Chan. “However, manufacturers must realise that innovations take time to be cost-competitive and also adopted whole scale by the market. Yet they are necessary to adopt in the long run for companies that want to stay competitive. Capital and patience is required to invest in tech, and for exploring environmental solutions that are not just window dressing.”



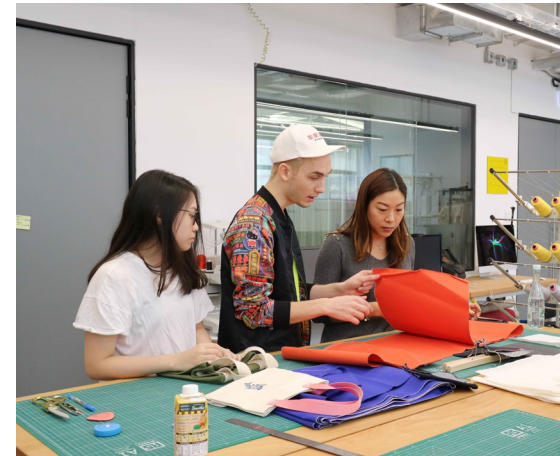
ENVIRONMENTALISM AND TECHNOLOGY OF TOMORROW

The fashion industry accounts for around 10% of carbon emissions from human activity, and is the second-largest consumer of the world's water supply. Fast fashion makes shopping for clothes more affordable, but it comes at an environmental cost. Taking denim as an example, the United Nations estimates that a single pair of jeans requires a kilogram of cotton, and producing about 7,500–10,000 litres of water. That's about 10 years' worth of drinking water for one person. Can fashion ever be sustainable? It's clear that innovations and emerging technologies provide an unprecedented opportunity to fully align business and environmental goals.

The Mills Fabrica is conducting research in new areas such as synthetic biology materials, functional materials, 3D weaving, chemical recycling, circular business models and more. "Hong Kong has a growing biotech ecosystem, and the likes of that creates

opportunities for innovation. Cotton and polyester are the main materials in fashion but they both have major problems and affect the environment with waste, chemicals and water pollution in their production and consumption. So we need biodegradable alternatives to replace polyester, and more sustainable forms of cotton supply. Waste and pollution are other reasons why the fashion needs alternatives like sustainable dyes or water reduction technologies," says Chan.

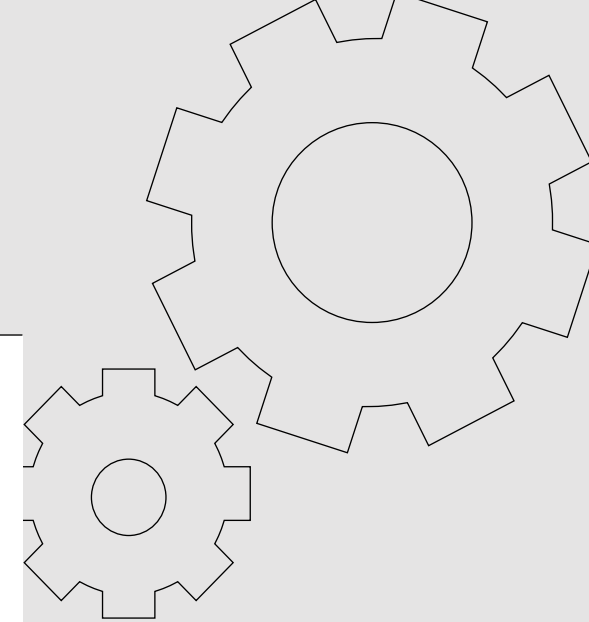
While many sourcing bases are moving across Southeast Asia to countries such as Vietnam, where labour is cheaper, Hong Kong retains several advantages as a platform for sustainability and innovation in Asia. These include proximity to quality assurance, innovation labs and sophisticated consumer retail markets, the ability to test products, and promote new technology in retail and production.



"COVID-19 shows that supply chains can break down, so if there is a way for fashion to be locally sourced that makes much more sense. These principles also apply to the other markets such as locally produced food items. There are opportunities for Hong Kong to innovate in healthcare, wellness and food in the era of reindustrialisation, by boosting efficiency within the supply chain," says Chan.

"Hong Kong's advantages have been two fold as a large base for manufacturing headquarters and sourcing bases for large brands & retailers. **The key players are here and this gives Hong Kong the opportunity to bridge innovations from other countries; in particular connecting leading innovations from US/ Europe into the heart of the supply chain in the likes of China and Southeast Asia.**"

It is in these ways that Nan Fung Group is paying homage to an industrial past, while paving the way to a future of advanced tech driven manufacturing.



ORGANISATIONAL TRANSFORMATION: MEETING THE DIGITAL ERA

STEPHEN CHAN
COO
WISE ALLY



ABOUT

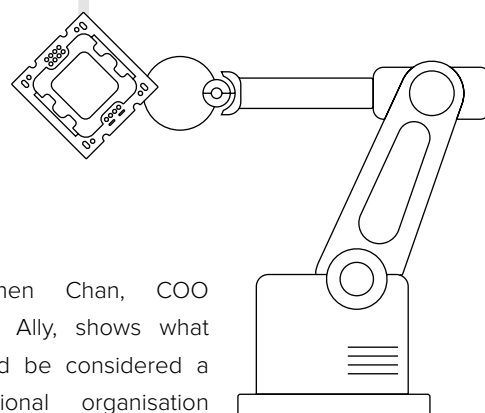
Wise Ally is a Hong Kong listed company with 10+ years' experience in electronic product design and manufacturing. Wise Ally offers a one-stop integrated and collaborative development model transforming your product from ideation stage to value-added and marketable reality by its expert engineering, global vendor network and world class manufacturing operations. Not only Wise Ally offers a wide range of EMS services to companies from medical, healthcare, HVAC, industrial and appliances segments but it aspires to go further. The company provides innovative IoT end device solutions to corporations helping them to achieve business and operational objectives. Its designers and engineers have the knowledge and expertise to create a secure and user-friendly end device solution to maximise customer value.



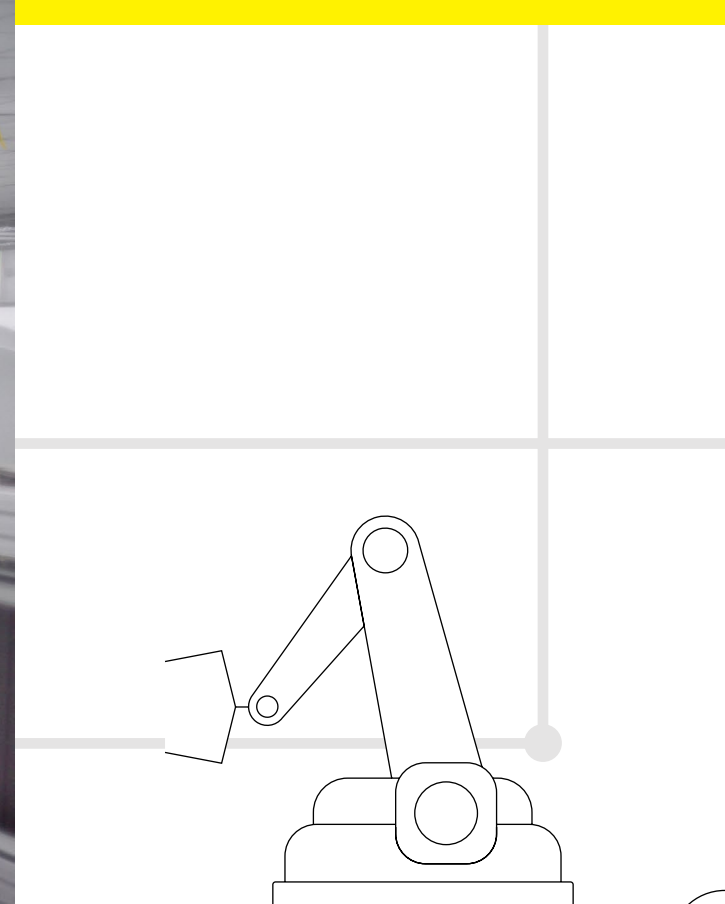
While many discuss making a change, companies such as Wise Ally, with more than 10 years' experience in electronic product design and manufacturing, are able to walk the walk.

As a Hong Kong listed company, Wise Ally offers a one-stop integrated and collaborative development model, expert engineering, global vendor network and world class manufacturing operations. The company provides a wide range of EMS services to companies from medical, healthcare, HVAC, industrial and appliances segments, innovative IoT end device solutions to corporations helping them to achieve business and operational objectives.

Stephen Chan, COO Wise Ally, shows what would be considered a traditional organisation was able to undergo such strong transformation, not only adopting advanced technologies such as RFID, but adding on a whole raft of advanced IT solutions, and listing on the Hong Kong Stock Exchange in the process.



"We were lucky to list before COVID-19 hit, and are able to make rapid changes by adapting our processes, and aggressively pursuing automation to replace most of the manual processes that had been existing, by reducing our reliance on labour," says Chan. "In general, production can be quite a stressful thing, because we have to ensure that quality and safety remain as high as they can be. We have developed more surrounding our traceability, so customers can go online to monitor productivity and quality," Chan adds.



With the strategy to lower costs and increase capacity, Wise Ally has looked at expansion into the Southeast Asian market for better manufacturing costs. “We follow stringent demands in quality, safety, and our clients are often hard to satisfy. It made us think that the real way to go is to develop capabilities in automation, but it also depends on what kind of automation, what level of processes that you would like to enter into automation. Every manufacturer must adapt according to customers and businesses, seasonal fluctuations, and changing models, products and reconfigured lines and it mainly depends on the business that you serve,” says Chan.

The pressure to change was always there, but one of the silver linings that COVID-19 served up was helping people accept the need to adopt digital solutions, and

transform to focus more safety, reliability, productivity, and more. **Companies need to remember that digital transformation is not just about the product but also developing customer management processes too and making cultural changes. “People need to learn to walk before one can run, you can’t avoid it, but we see advancements, customers can now go online to view productivity yield and trace products, and all these processes are being integrated for better functionality”** says Chan.



Wise Ally is not resting at all, with ambitious expansion plans to North America and Europe, with markets such as IoT on the cards to be the next big thing. “We can see much potential in automation for smart home controls, medical products and devices, and playing a key role in supervising and creating products, tech transformation, thought leadership, new ideas and innovation,” says Chan.



FOCUS ON THE CHINA SYNERGY FOR SUCCESS IN THE NEW WORLD

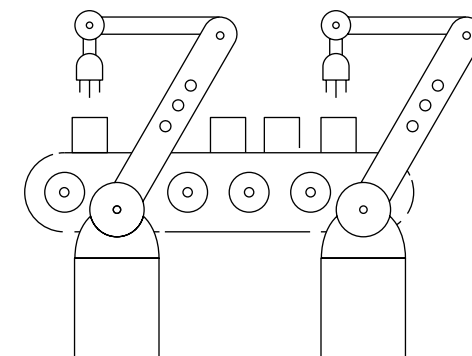
DR VINCENT FUNG

EXECUTIVE DIRECTOR
KIN YAT HOLDINGS LIMITED

Hong Kong has many strengths as an international export hub for Mainland China manufacturing, and in the age of industrialisation, it needs to reinforce the synergy by being efficient, agile and integrated. "We are the international test bed for Mainland China - a crucial market and resource for Hong Kong manufacturers," says Dr Vincent Fung, Executive Director of Kin Yat Holdings Limited.



With more than three decades of history, Kin Yat specialises in electrical and electronic products. In its early years, Kin Yat was a traditional toy manufacturing company. As with the technology development and market push, they had embarked on the digital transformation journey. Dr Fung led a series of innovative projects, and successfully transformed the company into a smart device manufacturing company. The product range has expanded from traditional toys to smart devices including AI robotic cleaners, electronic toys, and medical and health products.



Dr Fung elaborates on his vision for Hong Kong in the era of advanced manufacturing. "For over 30 years we have focused outside of Mainland China, now we need to focus on the China market. For our company, we started with a simple product, now we have moved into AI and IoT, and we have kept meeting the needs of the market. **We have to keep innovative, and embrace new ideas and innovations in the production. We can implement the smart factor and eliminate the need for manpower. China has the technology and the integration with Hong Kong to fill the gap when needed,**" he says.

ABOUT

Kin Yat Holdings Limited (00638.HK) is an industrial enterprise specialising in the technology-driven production of electrical and electronic products, including robotics, juvenile products and smart products, along with a diverse portfolio of motor drives and related products. The Group is also engaged in certain real estate development projects in Guizhou Province, the People's Republic of China.





Kin Yat is among the first-movers of setting up factories in the Mainland. By the mid-1980s, Kin Yat had set up the first factory in Shenzhen. With over a decade of development, the product lines have expanded from toys to small home appliances. Starting from the 2000s, the manufacturer has upgraded its operation with highly automated production. It thus has the capacity to engage in micro-motors and AI robotic cleaners production. In the following decade, Kin Yat transformed from automation to smart manufacturing, expanding its products to IoT devices. In the 2020s, they develop their own brand of health products, as well as planning for products leveraging on 5G. Dr Fung shares that **indeed “market push” and “cost” are key factors that drive their manufacturing business for digital transformation.**

Fung also believes that leveraging the skills of Mainland China is key. He says, “There has been so much opportunity in China, and we need to create more jobs here and make some pilot programmes- to help young people to excel in areas from product design, testing to engineering development. Like law and IP, we have very good systems and advantages here and we can leverage on those,” he says. **“Hong Kong can focus on the software and interfaces while leveraging hardware production from China. We need to upgrade the production line to meet high mix low volume and also a high mix in design as well, so Hong Kong needs to be flexible,”** adds Fung.

With Hong Kong focused on software, interfaces, distribution, marketing, financing and all its other strengths, it can leverage the potential of China's space, technology and resources to great effect for the perfect synergy. The city's manufacturers should work together to train and develop the new generation of talents with university programmes and manufacturer experience initiatives.



REDESIGNING THE FUTURE OF HONG KONG

HOMETOWN HEROES:

PUSHING HONG KONG FORWARD

SAMSON SUEN

GENERAL MANAGER
SMART MANUFACTURING DIVISION, HONG KONG PRODUCTIVITY COUNCIL

RAYMOND SHAN

PRINCIPAL CONSULTANT, INDUSTRY 4.0 AND ADDITIVE MANUFACTURING
SMART MANUFACTURING DIVISION, HONG KONG PRODUCTIVITY COUNCIL



The Hong Kong Productivity Council (HKPC) is a statutory body established in 1967 to promote productivity excellence through integrated advanced technologies and innovative service offerings. It specialises in facilitating Hong Kong's reindustrialisation empowered by Industry 4.0 (I4.0), with focus on R&D, Internet of Things (IoT), smart data analytics, AI and robotic technology development, as well as digital manufacturing. Working on everything from electric vehicles to degradable plastics, food processing and 3D printing, HKPC is driving value for manufacturers across the region by combining soft skills and hardware together, to bring products and services to market in the fastest time possible.

ABOUT

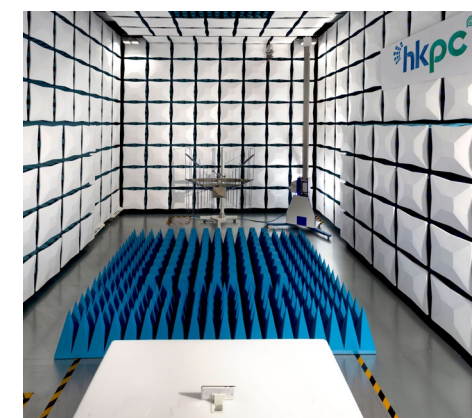
The Hong Kong Productivity Council (HKPC) is a multi-disciplinary organisation established by statute in 1967, to promote productivity excellence through integrated advanced technologies and innovative service offerings to support Hong Kong enterprises.



FROM FOUNDATIONS TO FUTURE

"Hong Kong has a strong foundation in manufacturing and we are always leading the way with connections between factory owners and overseas partners to explore what is new. With sufficient capital available, they conduct upgrades on a constant basis, so I'm optimistic to say they will be competitive to serve various markets," says Samson Suen, General Manager, Smart Manufacturing Division at HKPC.

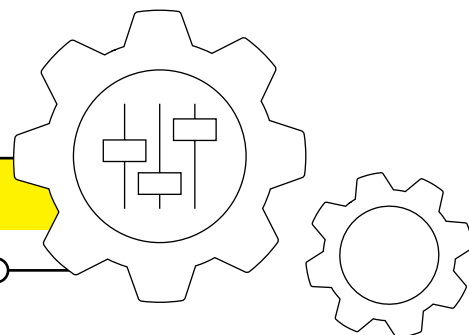
While the world changes all around us, there are certain fundamentals that will not go away from the city. "Hong Kong has a great legal system and IP protection. As I have learnt from factory owners and buyers, they like Hong Kong for the reason that they are able



to protect IP rights," says Suen. HKPC also provides independent testing and certification services, creating customer confidence, ensuring safety and reliability, which are crucial to providing quality service.

DIGITAL

IS WHERE THE VALUE IS



“We have to move fast and digital will make us responsive, and technology can place us into an area that is high-value-added.”

Suen says.

“I hope that every manufacturer can move into I4.0, and use sensors, data, and IoT to enhance interfaces, make decisions based on real time data, and be more agile. We know that investments can be quite high, but pilot projects can identify elements they can work with to get return on investment while need not spend too much initially,” according to Raymond Shan, Principal Consultant, i4.0 and Additive Manufacturing, Smart Manufacturing Division at HKPC.

The initiatives HKPC has undertaken include overseeing the likes of smart production lines with consultants trained and certified by the Fraunhofer Institute for Production Technology in Germany. With professional training, they are able to undertake integration of sensors, robots and Internet of Things for

data and artificial intelligence, assisting in HK industry upgrade and transformation towards I4.0 smart & innovative enterprises.

For companies in Hong Kong and across Asia, there is a realisation that you can bring a product from conception to market at a faster speed than ever before. “Prototyping is fast, as design can be done in Hong Kong and tested quickly, ensuring that we can meet demands of a fast lead time. Hong Kong still has an advantage from marketing to testing. We believe people buy ‘Made in Hong Kong’ because they trust the brand name, the credibility, and the independent testing and certification. It comes down to trust. You can have the money, but it is hard to get people to trust you, and this is where Hong Kong can excel,” says Suen.

A major trend for consumers is also the rise of mass personalisation, which in itself also creates other challenges. “Personalisation is driving many things forward, people want their own things, and manufacturers must adopt high-mix, low-volume production to maximise profitability. **They need to be fast and agile to respond to customisation, with more styles, cheaper prices and digital capabilities.** There is a competitive advantage as well if you can seamlessly connect offline and online allowing customers to make bespoke items on site or in store,” says Suen.



CHANGES ON THE HORIZON

The ongoing trade tension between China and the US is affecting outcomes in the advanced manufacturing industry, but Shan believes that industry leaders will find a way through the uncertainties. “With the trade tension some technologies might become restricted, but we will see people developing their own solutions. People need talent and R&D, and you can’t purely rely on things from overseas. You need to do things yourself. That’s why the HKPC will work with universities to transfer technology and partners to apply technology.”

Although COVID-19 has been a challenge, the upswing for advanced manufacturers has been on the rise adapting to the digital environment. “We are now adopting digital systems in factories, including meetings, allowing us to conduct training remotely.

People are now more willing to use virtual means, and can use dashboards to access shop floors in Mainland China, and see KPIs and take action. So challenges are now turning into business opportunities,” says Shan.

Personalisation is moving the revolution in advanced manufacturing and companies need to act accordingly. The digital revolution is

also being driven by a generational change of business owners, with the young vanguard taking over, and while capabilities are important, building up slowly and becoming trusted are essential elements to achieve success in this digital era.



“Hong Kong is a good place for innovation, whether it is pioneering technology or digitisation.”

INTERNATIONAL COLLABORATION: EMPOWERING HONG KONG

TONI DRESCHER

HEAD OF TECHNOLOGY MANAGEMENT
FRAUNHOFER IPT

EXECUTIVE DIRECTOR
INC INVENTION CENTER

The Fraunhofer Institute for Production Technology (IPT) and INC Invention Center have been working with the likes of the Hong Kong Productivity Council (HKPC) to help Hong Kong companies carry out industry upgrades and transformation towards i4.0 Smart & Innovative Enterprises. Toni Drescher, Head of Technology Management of Fraunhofer IPT, discusses how companies can adapt to the digital services environment and survive the onslaught of COVID-19, and what makes Hong Kong so special.

Fraunhofer IPT is part of the Fraunhofer-Gesellschaft, a world leading applied research

organisation headquartered in Germany with 74 institutes and research institutions throughout the country. As a member of the group, Fraunhofer IPT has the mission to transfer know-hows from scientific research into economically viable and unique innovations in the field of production, and to help companies achieve efficient and costeffective development processes. It focuses on process technology, production machines, production quality, metrology, as well as technology management. Fraunhofer IPT has a vast network of cooperation partners from all fields of industry to develop flexible and adaptive production processes and systems beyond the scope of a single institute.

For the past few years, Fraunhofer IPT has partnered with the HKPC to provide I4.0 training and consultancy services for companies in Hong Kong to evaluate and transform their operations. In 2018, the INC Invention Center, a spin-off of Fraunhofer IPT and RWTH Aachen

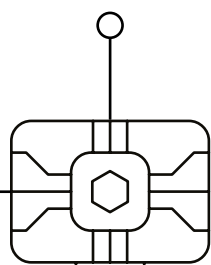
ABOUT



The Fraunhofer IPT develops technologies and supports companies in optimising their products, manufacturing processes and services. Its clients and cooperation partners come from a wide range of industries: from the automotive industry to biotechnology, food and pharmaceuticals, energy and aerospace or medical technology, optics and electronics to classic mechanical engineering, plant engineering and toolmaking.



The INC Invention Center helps companies rethink technology and innovation management and meet the challenges of a digitalised, rapidly changing world. It supports companies in finding solutions that improve innovation productivity and ensure sustainability.



University, have opened a joint office together with HKPC in Hong Kong, at the Hatch in HKPC's building. It was set up to provide local companies with HKPC's, Fraunhofer IPT's and INC's expertise, technology networks and facilities to accelerate the adoption of innovative technology and promote digital manufacturing. Located at the HKPC building, The Hatch is Asia's first systematic design thinking workshops venue.

The challenges faced by companies at present are coping with a huge number of variants in products, and ramping up production or adapting very fast to these orders with small lot

sizes. Fraunhofer IPT and HKPC have come in with help on additive manufacturing, as "most companies are controlling manufacturing in what we consider to be a classical way, with workers who know what to do to ensure a good high-quality production, but perhaps not some of the cutting-edge techniques," says Drescher.

It is essential for companies to have capabilities to adopt new technologies, in the likes of 3D printing, digitisation of machines, soft systems and a workflow that matches the new reality. "The next big thing is AI, used in very specific use cases to be more productive," Drescher points out.



OPEN INNOVATION: SMALL STEPS TO BIG PROGRESS

Artificial Intelligence (AI), robotics and additive manufacturing are all important, but it is true that not all companies have the appetite for such a big step. **"You don't have to make everything artificial intelligence, but you could for example start with small steps and this helps teach you how to innovate, learn from that cycle, and make it work for other products,"** Drescher says.

COVID-19 has made international supply chains be reconsidered, and resilient supply chains will be the next concept as logistics and trade have been broken down. Having manufacturing based in different locations, combined with emergency local supplies, will allow manufacturers to have a more reliable production base. "It's an opportunity to start new. Traditional structures can be rethought, with new innovations in the market as customer priorities change. Manufacturers need some unique selling points to set yourself apart in the market," Drescher adds.

While an ecosystem should thrive on its own, the government can be at hand to kick-start the process. Fraunhofer IPT's spin-off INC Invention Center identifies HKPC's characteristics and

helps create the same innovation eye level for top-down implementation to transform Hong Kong into a global innovation and technology hub. "Hong Kong is a great place with an international community, large sample market size, and a wonderful place to test solutions," says Drescher. It is a springboard for more cooperation with the GBA and mainland China.

Another unique aspect of the Hong Kong-German collaboration is the cross cultural work between countries and cultures. **"Good collaboration begins by understanding each other, it won't work if you come to Hong Kong and work with a German attitude to get things done. It's the other way around, both sides need to figure out how to act and communicate** – It took us several years to get this right."

Open innovation processes have the potential to revolutionise advanced manufacturing, but it is a challenge, so find the champions that have the know-how to make things happen and start slow. Sometimes, these champions come from outside sources, as in the case of the Hong Kong Productivity Council (HKPC).

HONG KONG FACES A QUESTION OF ITS IDENTITY AND ASKING ITSELF:

WHAT ARE MY STRENGTHS?

The Greater Bay Area will focus on mass production with an advanced manufacturing spin, and “we should position ourselves as developing total solutions, R&D, project management and quality assurance,” says YC Chau, Adjunct Professor, The City University of Hong Kong.

Synergy is Hong Kong’s strength. Yet the traditional manufacturing in the city is a sunset industry, while the industrial professionals are commonly perceived as blue collar or ‘dirty workers’ by the younger generation. “Building a talent supply chain is key - industrial professionals are reaching retirement age, and it has been difficult to find new replacements with the talent development being so slow,” Chau says.

With technology development, the advanced manufacturing industry is growing at the same time, with more jobs created. The skill sets required are shifting with the introduction of advanced technologies and automation, but the connection of manufacturing talents and suitable employees have to be enhanced.

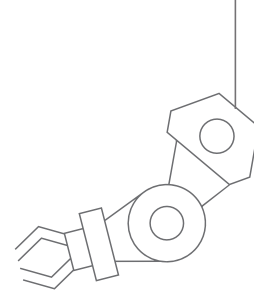
“Universities are starting to train people with relevant degrees.”

Hong Kong talents in the manufacturing industry have been known for their expertise in project management with cost efficiency and short delivery time. With the growth of technology, the critical question we should ask is at what level of intelligent manufacturing can be set up here and in which aspect can talents in Hong Kong add value to the industry?” says Chau.

DR YIU-CHUNG CHAU

ADJUNCT PROFESSOR
CITY UNIVERSITY OF HONG KONG AND
EXPERT ON ORGANISATIONAL LEARNING AND
LEARNING ORGANISATION DEVELOPMENT





Chau has had nearly three decades of experience working in a global technology company focusing on management of high technology products operations especially in product life cycle management as well as productivity quality innovation. He brought his expertise to academia, and now commits to the research on organisational learning and learning organisation development. Recently he has been focusing on research on Industry 4.0 implementation.

Talent is crucial to the expansion and sustainable development of advanced manufacturing. Professional training and

tertiary education for industrial talents can be fundamental in changing the negative perception, and attract the young generation to join the seemingly sunset, which is, indeed a growing industry. Local universities such as The City University of Hong Kong are offering undergraduate courses such as "Intelligent Manufacturing Engineering". Similar programmes provide students an understanding of rapid product development, reverse engineering, 3D printing and additive manufacturing, physical model prototyping, rapid tooling, rapid prototyping, model reconstruction through digitising and surface fitting, other additive manufacturing technologies, and quick batch production.

“To me, the opportunities are clear for Hong Kong students in soft skills: product design, testing, and engineering development, all of which will meet the new world of intelligent and precise production; high mix and customised design responding to market needs, as well as flexible and smaller volume solutions that allow for lower cost and waste.”



In general, Hong Kong can meet the shifting landscape by leveraging and developing automated hybrid or co-bot solutions; IoT and connected factory solutions providing intercommunication across devices; real-time monitoring and big data driven decision making; and finally AI and full automation.

But transformation takes time, says Chau. Patience will be required: "To clearly define what your manufacturing business needs, you need to have the budget for and understand what your team can manage, and this area can be a total disaster if you are not careful; it needs to be seriously considered. Hybrid is the best approach, between labour and automation. Still we are seeing a major advancement in digitalisation and this can speed up the process in general. In this sense, COVID-19 has provided opportunities to be focused on data integrity, value creation for products, and making applicable solutions to bottlenecks. The winning formula can almost certainly be there," Chau adds.





BUILDING

AN ECOSYSTEM FOR MANUFACTURING

Traditional manufacturing and labour intensive manufacturing are no longer central to Hong Kong. In this era, 'innovation' and 'new value added technology industry' are the new catchwords. New industries of innovation and technology are bridging the

gap between research and industry. As Hong Kong takes up this role, more effort should be made to avoid what is known as 'the valley of death' between research and market.

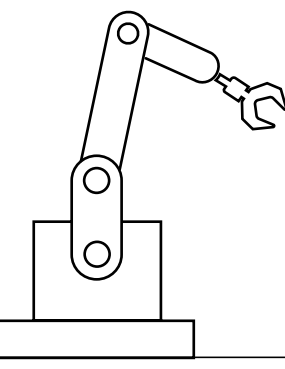
IR HL YIU

HEAD OF REINDUSTRIALISATION
HONG KONG SCIENCE & TECHNOLOGY PARKS CORPORATION

The impact of innovation and technology (I&T) driven re-industrialisation in Hong Kong is clear: "It represents a recovery of our lost ground; it offers us an opportunity to bring a new glorious era when 'Made in Hong Kong' was an internationally recognised brand which was perceived as a guarantee of trust and confidence in quality, reliability and safety," says Ir HL Yiu, Head of Re-industrialisation of Hong Kong Science & Technology Parks Corporation (HKSTP).

"Scarcity of suitable space makes re-industrialisation more challenging. We need to increase the supply of spaces with specialised specifications to I&T companies who may want to develop the advanced manufacturing process to make a difference.

The existing three industrial estates managed by HKSTP are insufficient; they should be upgraded intelligently to fulfil needs," Yiu says.



“Re-industrialisation in Hong Kong represents upgrade and transformation of local pillar industries and more importantly, it means forging new industries through the commercialisation of I&T research.”

BOOSTING RE-INDUSTRIALISATION

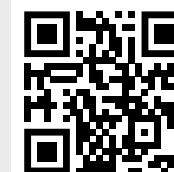
The whole process has been gaining momentum since the establishment of the Innovation and Technology Bureau (ITB) in 2015. The HKSAR Government has been supporting HKSTP to establish new industrial buildings and upgrade existing factories to attract new I&T and high value-added production. These include the Precision Manufacturing Centre (PMC) being transformed from an existing factory in Tai Po in 2017 to support smart manufacturing; the MARS Centre commencing later this year to support medical, accessory resilience supplies manufacturing; the Advanced Manufacturing Centre (AMC) commencing in 2022 in Tseung Kwan O for smart manufacturing of high value-added industries; and the Microelectronics Centre (MEC) in Yuen Long launching in 2023/4 for microchip fabrications.

The lack of specialised space is now being addressed. "We are powering business innovators and industrialists by offering specialised facilities

ABOUT



Comprising Science Park, InnoCentre and Industrial Estates, Hong Kong Science & Technology Parks Corporation (HKSTP) is a statutory body dedicated to building a vibrant innovation and technology ecosystem to connect stakeholders, nurture technology talents, facilitate collaboration, and catalyse innovations to deliver social and economic benefits to Hong Kong and the region. Established in May 2001, HKSTP has been driving the development of Hong Kong into a regional hub for innovation and growth in several focused clusters including Electronics, Information Communications Technology, Green Technology, Biomedical Technology, Materials and Precision Engineering. HKSTP enables science and technology companies to nurture ideas, innovate and grow, supported by its R&D facilities, infrastructure, and marketled laboratories and technical centres with professional support services. It also offers value added services and comprehensive incubation programmes for technology start-ups to accelerate their growth.



with suitable specifications with the needed provisions for advanced machinery. For example, the MEC will be offering resources such as dangerous goods storage and handling, and environmental compliance management which are the major pain-points for chip startups to develop their production process,” says Yiu. Another example is the ProShop facility offered at the AMC for small volume manufacturing. Smart manufacturers can leverage the ProShop and set up pilot production for their original designs in Hong Kong before moving to larger bases in the Greater Bay Area or other regions.

“All these go in line with HKSTP’s goal in pursuing R&D and process development for start-ups and other technology companies. The companies bring their own manufacturing equipment, while we take care of the crucial building provisions for manufacturing such as cleanroom, anti-vibration building, communal laboratories, communal prototyping, communal logistics and warehousing, dangerous goods storages, to name but a few. This will largely reduce their CAPEX, set-up time, and operating costs.” Yiu says.

Another crucial element coming into play now is building resilience to supply chain disruption that results from evolving crises across the globe. It is the reason why the MARS Centre is being established to provide specialised space to make medical products quickly in times of crisis.

A further challenge to re-industrialisation is gaining support from society. Compared to Shenzhen,

Singapore and Taiwan, the amount of money support rendered by the government is nowhere near, but Hong Kong has upped its game in talent development, according to Yiu. “To get an industrial operation going, you need talents, especially technical people who can set up and operate machines. The old mindset is hard to change; people still perceive factories as a messy and dangerous place with blue-collar workers thus many people are unwilling to work in factories. In fact, with the industry 4.0 automation technology drive, factories are clean and safe. Manufacturing jobs nowadays focus more on advanced processes or programming of machines and robots.”

Advanced manufacturing requires specialised knowledge and skills. Through the Innovation and Technology Fund (ITF), the Hong Kong Government is providing financial support for local R&D projects through various schemes including the “Innovation and Technology Support Programme”, “Partnership Research Programme”, “Enterprise Support Scheme”, and many more. To attract more people to enter into manufacturing industry, the Government launched “Re-industrialisation and Technology Training Programme” in August 2018 for subsidising local enterprises on a 2 (Government) : 1 (Enterprise) matching basis to train their staff in advanced technologies, especially those related to “Industry 4.0”. In addition, another new programme “Re-industrialisation Funding Scheme” launched in 2020, subsidises local enterprises on a 1 (Government) : 2 (Enterprise) matching basis to set up smart manufacturing plant in Hong Kong.

BACK TO THE FUTURE

Yiu says the pandemic and the international geopolitical issues offered the opportunity to resilient thinking. “Hong Kong economy needs to be more diverse, and we see golden chance to develop innovation and technology. Back in 2000, few people in Hong Kong believe in R&D but now we all see the importance of I&T. Hong Kong people are known for resilience and responsiveness. This can be demonstrated by how we have risen to the challenge of the unprecedented outbreak of pandemic in 2020.”

There was a huge demand for face masks in society, yet production of medical-grade face masks must comply with the strict standards using an ISO 8 cleanroom with a maximum limit of 100,000 particles in a cubic foot of air. While it was challenging to find such an environment in the city, in less than 4 weeks, HKSTP was able to quickly create a new, purpose-built cleanroom at the PMC in Tai Po Industrial Estate to support the mass production of face masks.

With a free and open economy, sound legal system, robust intellectual property protection

regime and abundance of scientific innovation expertise, coupled with the professional knowledge and quality standards of traditional industries, Hong Kong is an ideal place for industrialists who are interested to engage in high value-added and high-tech production.

“I have high hopes for our future. **We have a strong research advantage because our universities rank among the top globally. This can be considered as one of the crown jewels of Hong Kong and will facilitate collaboration with the Greater Bay Area.** The question is how. If we do well in commercialising the local R&D and bridging the research to industry, bringing new pride back for Hong Kong is soon to come. This is my resolution in 2021 to continue driving re-industrialisation. I am sure this is also the heartfelt wish for everybody in Hong Kong,” adds Yiu.



“We are powering business innovators and industrialists by offering specialised facilities with suitable specifications with the needed provisions for advanced machinery.”

HONG KONG'S

SYNERGY WITH MAINLAND CHINA REMAINS STRONG, BUT IS SHIFTING

DR. ALLEN SHI LOP-TAK

PRESIDENT

THE CHINESE MANUFACTURERS' ASSOCIATION OF HONG KONG (CMA)

Hong Kong has a robust manufacturing tradition, but the increasingly complex business environment is forcing change. The Chinese Manufacturers' Association of Hong Kong (CMA) President Dr. Allen Shi Lop-tak is a veteran in the industry, bringing his wealth of business experience and passion to the association, to create a more high tech business environment for the industry.

Shi is a recognised leader and forms CMA strategy and recommendations to the government. The challenges for Hong Kong companies, particularly with the effects of COVID-19, include dealing with sophisticated procedures and handling an uncertain number of orders, all while keeping up a high standard of craftsmanship across a wide array of production systems.

Hong Kong should optimise its upstream supply chain functions, such as research, product design and quality control testing.

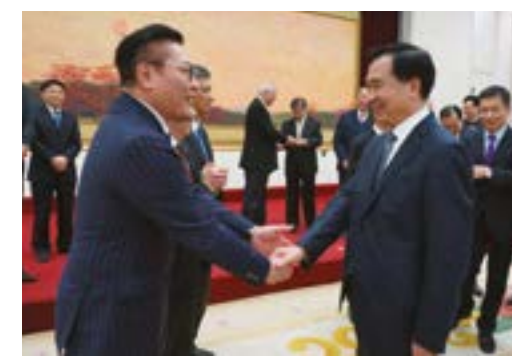
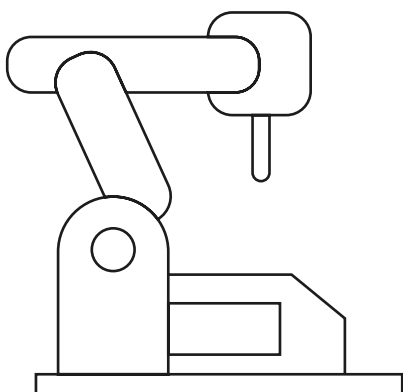
"It's still the beginning for Hong Kong. Transforming from a traditional plant to an intelligent facility is never easy, which involves, among others, commercialisation of R&D results, and Hong Kong is relatively falling behind. One of the main reasons is many local corporations have a long history with thousands of employees serving for decades. To replace a labour intensive industry with smart technology would cause quite a shock," he says.

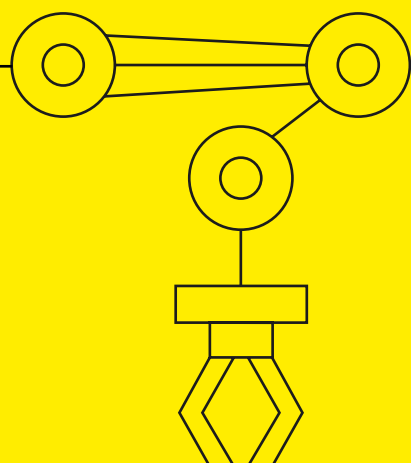
CHANGE OR DIE

Changing consumption patterns are another source of pressure. Organisations must be able to adapt to the times. While modifying their business models to fit new needs, businesses are also re-evaluating their supply chain with uncertainty from rising nationalism and heightened geopolitics.

ABOUT

Established in 1934, the Chinese Manufacturers' Association of Hong Kong (CMA) is a non-profit making industrial organisation. In the past eight decades, CMA has grown significantly and is now one of the most representative industrial associations in Hong Kong. With some 3,000 member companies, CMA is committed to promoting Hong Kong's industrial and commercial development. CMA closely monitors developments in the international market and domestic and external conditions that may affect Hong Kong's trade and industry. CMA's activities and services are aimed at promoting the well-being of Hong Kong as a whole. It also attaches great importance to fostering international understanding and cooperation.





Some Hong Kong manufacturers are looking to add new operations to ASEAN or even Belt-and-Road countries such as African and Central Asian countries to supplement current production in Mainland China. “China-Plus-One is a viable alternative for companies to protect themselves against a wide range of risk. Without the need of giving up the strong supply chain networks, infrastructure, and knowledge base in China, companies can continue production even if the principal site of business is facing disruptions. The two sites are certainly not mutually exclusive but are working in tandem,” says Shi.

Free-trade agreements can be of great assistance in these cases, allowing manufacturers to separate different parts and assemble in separate jurisdictions across different bases depending on their comparative advantages in tariffs, labour supplies, market needs, and technological capabilities. Aside from creating synergies, a geographically diverse supply base can also offer greater access to new markets. With a population of 70 million that is the wealthiest in China, the Greater Bay Area (GBA) is a

consumer market with huge potential. The consumption power of many ASEAN countries also cannot be neglected.

While the manufacturing process can take place in the Greater Bay Area or ASEAN, Hong Kong remains the home of many headquarters and is critical as a technology hub pulling all the pieces together, bringing in talent and high-level production from across Asia.

The city has not been an industrial hub for decades, but can use technology to energise traditional industry.

“In Hong Kong, the government has been promoting reindustrialisation in recent years, nurturing local talents and attracting overseas professionals. It would be difficult for Hong Kong to develop a large scale or labour-intensive production industry due to the shortage of land and labour, but it can develop advanced manufacturing,” says Shi.

THE ROADMAP **FORWARD**

In order to do this, the government should offer tax concessions to create favourable conditions to attract high-end manufacturing to Hong Kong, according to Shi. Cross-border cooperation is also important. He suggests that the city to fully leverage its unique and globally recognised advantages such as its capabilities in certification and testing, branding, intellectual property protection, and status as an internationally recognised arbitration centre, and integrate these into the strong manufacturing base in the GBA.

So how can traditional manufacturers in Hong Kong embrace advanced manufacturing? “One of the main features of this era is intellectualisation and automation of the traditional plants. But it can’t be achieved overnight with the wave of a wand. Many technical and IT engineers are needed, and we need to make them proud of being the leading talents in engineering and

manufacturing. Automation and innovation are definitely the future of the industry. Although no one knows for sure how long it will take to develop, corporations shouldn’t be afraid of failure and should be willing to invest into it.”

“The government should proactively support the traditional industries, including those operating in the GBA, to upgrade their productivity and quality, and improve their understanding on the positive impacts brought by technology,” he says. “This can help reinforce their determination and confidence in upgrading, so as to unleash their inherent advantage, and tap into the ‘dual circulation’ opportunities,” Shi adds.

The outbreak of the COVID-19 pandemic has brought an unprecedented challenge to manufacturing, but it also forces the companies to use technology to overcome the crisis. Shi believes that the transition to higher tech will accelerate in the post-pandemic era.

UNLEASH THEIR
INHERENT
ADVANTAGE





PAVING WAY

FOR HONG KONG'S MANUFACTURING INDUSTRY IN THE GLOBAL PARADIGM SHIFT

STEVE CHUANG

DEPUTY CHAIRMAN
FEDERATION OF HONG KONG INDUSTRIES (FHKI)

Business in Hong Kong, much like all over the world, has undergone a dramatic reset following the pandemic. Geopolitical challenges have also in tandem required businesses to adapt and respond, looking at new markets and modes of services. A new way of thinking, or indeed, a new business proposition, is required for companies in Hong Kong to move forward in the spirit of reinvention.

"COVID-19 has absolutely changed all the business models out there. The pandemic has irreversibly transformed consumer behaviors, and how businesses have to operate to meet new demands. Companies need to rethink their business positioning, invest into R&D and speed up technology adoption to catch what

people are looking for," says Steve Chuang, Deputy Chairman of Federation of Hong Kong Industries (FHKI).

The Federation of Hong Kong Industries (FHKI) Interim Research Report 2020 of "Made by Hong Kong – The Way Forward for HK Industries" found that 57% of the surveyed Hong Kong manufacturers are looking to strengthen technology R&D to enhance competitiveness, which the ratio is almost a double of that in the 2015 survey. It was also observed that originally production-focused manufacturers have started off expanding their businesses along the production value chain, for instance to produce services like product design, manufacturing management and brand building.

The advocate for Hong Kong industries sees challenges and opportunities all wrapped together, taking advantage of the growing interconnectivity in the region. The research found that 23% of the respondents are adopting or considering to adopt this 'China plus One' strategy, which most of them are more sizable manufacturers, to reduce supply chain risks brought by COVID-19 and US-Sino tension. An overwhelming 80% of them are looking at ASEAN economies with strong GDP growth potential and increasing spending power.

Chuang is one of these pioneers who moved a portion of his manufacturing business to the Philippines around two years ago. "After all, our main considerations are the return on investment, the merging and management of old manufacturing systems and new technology, daily operations and supply chain. The cost of business might be cheaper in less developed regions, but you have to consider the talent pool, whether there is sufficient supply of engineers and middle management," says Chuang. Besides the brain drain, logistic infrastructure in such regions is yet to mature and hinders transportation efficiency. It takes time for the manufacturing ecosystem there to develop.

Under the pandemic, businesses are going digital at an unprecedented pace in response to consumer demands. **"The rules and requirements are changing rapidly around us. In technology, for example, business must be flexible, offer small volume production and look at fast delivery - these are the real issues we all face,"** says Chuang.

ABOUT

Federation of Hong Kong Industries (FHKI) was established in 1960 to promote and foster the interests of Hong Kong's industrial and business communities. Representing manufacturing and associated businesses from 32 industry groups, FHKI brings together like-minded entrepreneurs to spearhead the advancement of Hong Kong's industry. Through policy advocacy, professional business support services and cross-sector collaboration, FHKI strives to build a dynamic industrial ecosystem to take forward transformation and re-industrialisation of Hong Kong's economy, sparking new business opportunities and charting diverse paths for the younger generation.



Despite the global trends and changing business environments, stepping up for technological upgrade and transformation has never been an easy step to take forward, especially for traditional manufacturers.

“In Hong Kong, businesses are highly aware of the latest technology trends. 5G, AI, big data and IoT are the key drivers at the frontier of business transformation. The majority of decision makers and business owners, according to a recent survey by HSBC, are holding the same beliefs and are preparing for change which is a very good sign as well. But yet, if manufacturers hope to adopt these technologies into their businesses, they still have to deploy a considerable amount of resources on R&D and infrastructure to make things happen,” says Chuang.

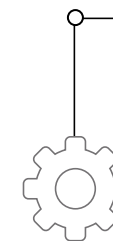
“Talent from across the globe could be employed to conduct R&D at their homeland with the support of technology. We don’t even need a big office in the future. The challenge becomes how we manage

the risks of deploying staff in different locations, to adaptation to different cultures and regulations. These are essential skills in our new era,” says Chuang.

Identifying the right timing to market is important, while fundamentally it is essential for manufacturers in Hong Kong to leverage technology and talent to build up the capabilities for digital transformation. Chuang is also the founder and CEO of ProVista Group, who offers one-stop services from R&D, manufacturing to marketing of electronics and technologies products and systems for a range of industries, with notable success in Recreation Vehicle (RV) electronics, monitoring systems and power solutions.

In 2020, the business experienced a 50 percent growth. “People can’t travel overseas, and RVs are booming in popularity as a result,” he says. The pandemic has changed the way people travel. RV offers people an option to get away from home, and explore the outside in a safe and secure environment that they can control. The demand for RV electronics accelerates with the growth of RV.

STRENGTH AND WEAKNESS IN HONG KONG



FHKI has been supporting the industries towards “re-industrialisation”, with specific focus on helping manufacturers advance in production technology and tap into high value-add manufacturing businesses with Hong Kong’s competitive R&D advantages.

According to FHKI’s study in 2020, the majority of Hong Kong manufacturers (despite the location of manufacturing plants) are operating in traditional mode (22%) and the mix of traditional and automation modes (65%). Manufacturers in more advanced production phases are more eager to invest into technology R&D for their products and manufacturing systems. Despite this, the major obstacle for businesses looking into technological upgrade is the hiring and retaining of right talents, no matter in Hong Kong or China. In this regard, FHKI advocates for closer collaboration amongst Hong Kong manufacturers, local research institutes and high technology companies for R&D commercialisation, and advocates that Hong Kong must bolster both basic education and vocational training to build a resourceful supply of industrial talent in the long run.

Although most of the Hong Kong manufacturers have their production plants in China or overseas, some of them are seriously looking into the possibility of setting up advanced manufacturing production lines in Hong Kong. In FHKI’s study, 26.8% of the respondents have already set up production lines in Hong Kong, and around 10% in addition are interested in relocating part of their production back to Hong Kong.

Manufacturers in more advanced production phases are more eager to set up in Hong Kong, taking Hong Kong’s advantages include finance, legal, copyright enforcement, strong IP protection, quality assurance, along with top tier universities with strong research capabilities.

Respondents pointed out that some of the major considerations for setting up local production lines are the supply of manufacturing-related suppliers and service providers, scarcity of suitable industrial land and high labour costs. Nevertheless, with government support in research, finding talent and I&T funding, the excitement is there, and combined with the laboratory, research resources offered by HKSTP and the soon-to-be-completed Advanced Manufacturing Centre, the future is bright. “Unfortunately, the general public are fancy toward financial or legal services, so it’s important to have innovation and tech to be seen as something exciting,” Chuang adds.

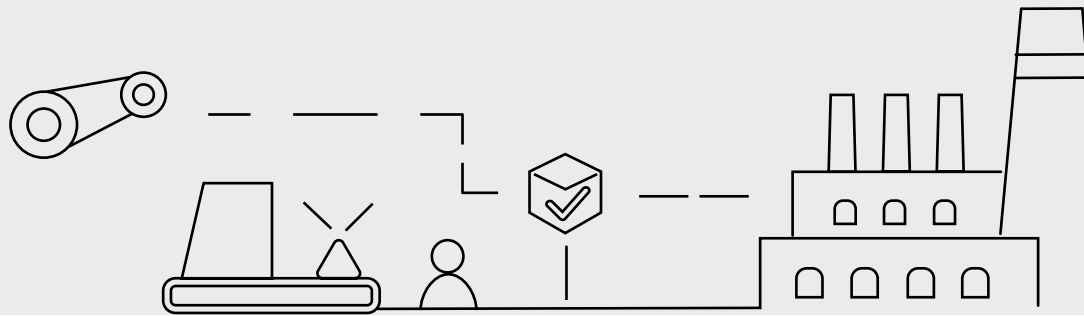
This excitement comes when I4.0 is combined with high value-add production. Customisation and small volume production is the way forward in this market, and manufacturers will need to stay nimble to the likes of AI, 5G, IoT, while all nurturing their talent, and honing abilities in areas as diverse as legal to design.

The result will be the ability to meet future developments, likely to be in high value, high tech manufacturing that is not labour intensive, but driven by the likes of AI and robotics. The future of manufacturing is to build an ecosystem by leveraging technology and resources cost effectively to fit the market.

“Advanced manufacturing is not a standalone business, but an ecosystem,” says Chuang.



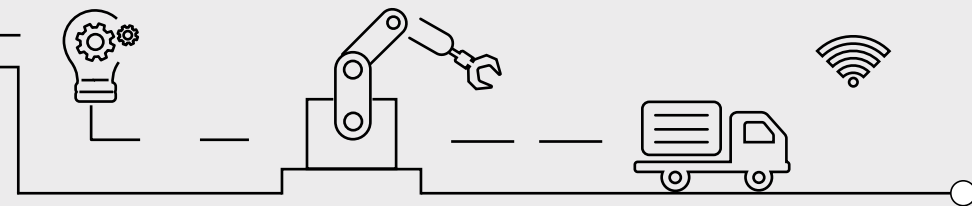
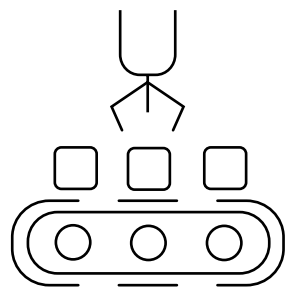
CONCLUSION



HONG KONG IS READY TO BRING ITS 'A GAME'

Once renowned as a major high tech manufacturing hub, Hong Kong has the opportunity for a substantial reinvention in the area of advanced manufacturing. At the centre of the Greater Bay Area project, Hong Kong is moving itself up the value chain and taking advantage of its history as a base for large brands in manufacturing and sourcing.

To succeed in this new era, mindset change and reskilling is the biggest challenge, with manufacturers having to possess both soft and hard skills to achieve agile, replicable and high value added scalable production. Hong Kong is at the centre of the US, Europe, ASEAN and Southeast Asia, and is well positioned



to do excellent in the era of advanced manufacturing, with its people demonstrating through numerous crises and challenges that they can both adapt and change their mindset to fit the new paradigm.

While a shift to advanced manufacturing would create jobs, there is the chance that because it is such a labour intensive industry that jobs could be lost as well, particularly as technology replaces lower-skilled workers. **Talent and training must thus be number one on the priority list to help workers transition, and encourage young people to enter the industry.** Again, Hong Kong is incredibly well placed to succeed with its strong base in education and as a world leader in tertiary education.

This means reskilling to teach data analytics, digitisation business models, project management, creative thinking, service, manufacturing models, and using advanced

technologies in manufacturing. New jobs should be seen as both fulfilling and lucrative as well, and appeal particularly to the younger generation as cool, fun and worth pursuing.

Here is the soft side of transformation: Young people in general should have the chance to become acquainted with leadership skills, emotional intelligence, with the ability to think creatively, act in multidisciplinary ways, and learn on the job. More than ever, adaptability is a must, along with teamwork, communications, networking, linguistics and cross cultural thinking.

The ability to actively work with those mindsets will propel Hong Kong's prospects, and place the city's workers into high level processes and value added creation. With additional infrastructure and R&D, tax concessions and financial support, favourable conditions for reindustrialisation have been created in Hong Kong. It's an exciting time to be in advanced manufacturing in the city. What will the future bring? That answer is exciting and brimming with promise.

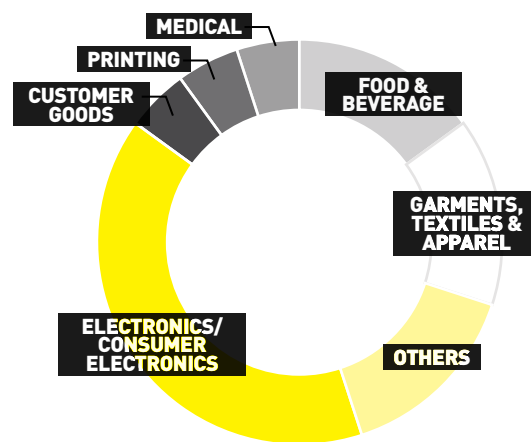
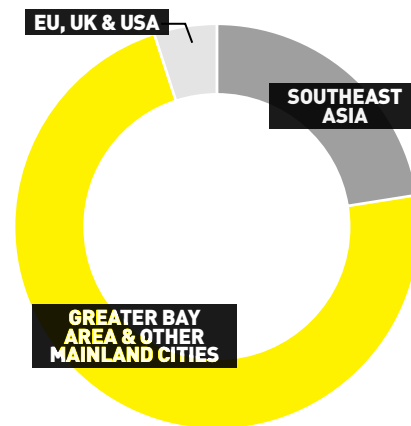
APPENDIX:

SURVEY RESULTS ON ADVANCED MANUFACTURING IN HONG KONG

A recent survey conducted by HKSTP of industrialists in various business sectors in a variety of international locations shows Hong Kong has many advantages but also much to improve. HKSTP invited manufacturers who have engaged in corporate innovation programmes and collected their views on advanced manufacturing.

The majority of respondents (about 80%) are SMEs employing less than 500 employees, while 15% of them employ over 5,000 people; 75% of them have operations in the Greater Bay Area and other Mainland cities; 25% in Southeast Asia; with others in the EU, UK and the US. Meanwhile, 40% of the manufacturers are in Electronics/Consumer Electronics, while the rest are spread across Garments, Textiles and Apparel, as well as Food and Beverage, Medical, Printing and Consumer Goods.

SMALL & MEDIUM-SIZED ENTERPRISES



UNIQUE ADVANTAGE OF HONG KONG IN MANUFACTURING INDUSTRY OVER OTHER GEOGRAPHICAL MARKETS

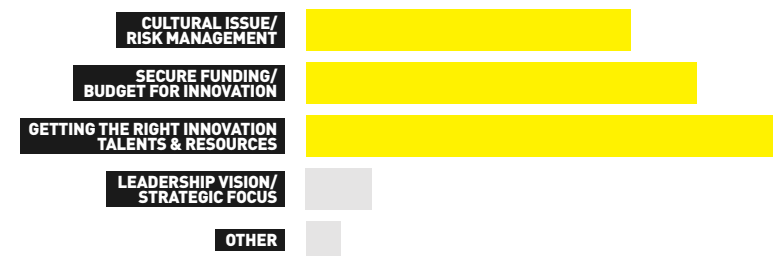
Most manufacturers in Hong Kong say bringing innovation is important for business transformation, and a survival skill. Respondents showed that superior project management, branding (made in Hong Kong) and R&D capabilities are unique advantages and reasons why business setup in the city.

The survey also demonstrated that more than 95% of respondents are ready to adopt new technologies, while sourcing for this tech comes from referrals and trade shows.

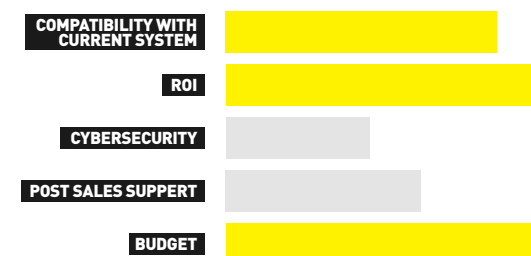
Their motivations include improving operational efficiency, business results and enhancing branding and customer acquisitions. Yet, challenges are talent, funding and budgets, along with risk issues and internal culture.

Overall, 60% of respondents said support from the HKSAR government is not adequate, and needed help with funding, talent and professional training, as budget and ROI are major business issues.

Please see more in the full results below:



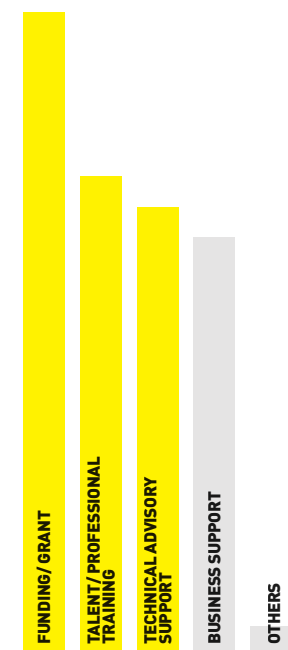
KEY CHALLENGES (MULTIPLE SELECTIONS)



MAJOR ASSESSMENT(S) FOR TECH ADOPTION



MOTIVATIONS FOR CHANGE (MULTIPLE SELECTIONS)



TYPE(S) OF SUPPORT YOU NEED (MULTIPLE SELECTIONS)

APPENDIX:

A QUICK LOOK AT FUNDING AND RESOURCES FOR MANUFACTURERS COMING TO HONG KONG

RE-INDUSTRIALISATION FUNDING SCHEME (RFS)

This aims to subsidise manufacturers setting up smart production lines in Hong Kong

- Should fulfil the "smart manufacturing" criteria
- Funding offered on a 1 (Government) : 2 (Enterprise) matching basis
- Maximum funding support is one-third of the project cost or HK\$15 million per project, whichever is lower
- Funding scope is related to the establishment of the new production line in Hong Kong
- Project duration of 24 months

REINDUSTRIALISATION AND TECHNOLOGY TRAINING PROGRAMME (RTTP)

Subsidises local enterprises on a 2 (Government): 1 (Enterprise) matching basis for training in advanced technologies

- Maximum funding support of HK\$500,000 in each financial year
- Reimbursement with an option for 50% partial advance payment
- Local and non-local training courses supported, along with both public and tailor made courses

ADVANCED MANUFACTURING CENTRE (AMC)

Our flagship AMC project, slated to open in 2022, is designed to provide agile and lowcost production facilities to meet ever-changing on-demand customer needs. The AMC will offer a scalable, efficient and serviced manufacturing space of 1.1 million sq feet for industries of any scale to embark on technological innovation, high value-added and low volume but highly customised production with the application of advanced manufacturing or testing processes. Enjoy comprehensive services for logistics, warehousing, prototyping, low-volume assembly and clean-room-enabled space so the advanced manufacturing companies can focus their valuable resources on the core propositions. For its pioneering design, the AMC has been awarded Third Award in the category of Institutional (Concept) in the Rethinking The Future Awards 2020.

SHENZHEN-HONG KONG INNOVATION AND TECHNOLOGY COOPERATION ZONE

A HK\$60 billion Hong Kong-Shenzhen co-operative effort will see the development of the Shenzhen-Hong Kong Innovation and Technology Cooperation Zone (SITZ). This features the Hong Kong-Shenzhen Innovation and Technology Park in the Lok Ma Chau Loop, and the Shenzhen Futian Innovation and Technology Zone, which will formulate supporting policies to facilitate the flow of talent, capital, goods and information in the area.

PROJECT TEAM MEMBERS

130

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