

Taiwan Tech Arena strives through the integration of various resources to boost innovative startups by linking them with international accelerators and expanding global reach to create more business opportunities.

TAIWAN TECH ARENA

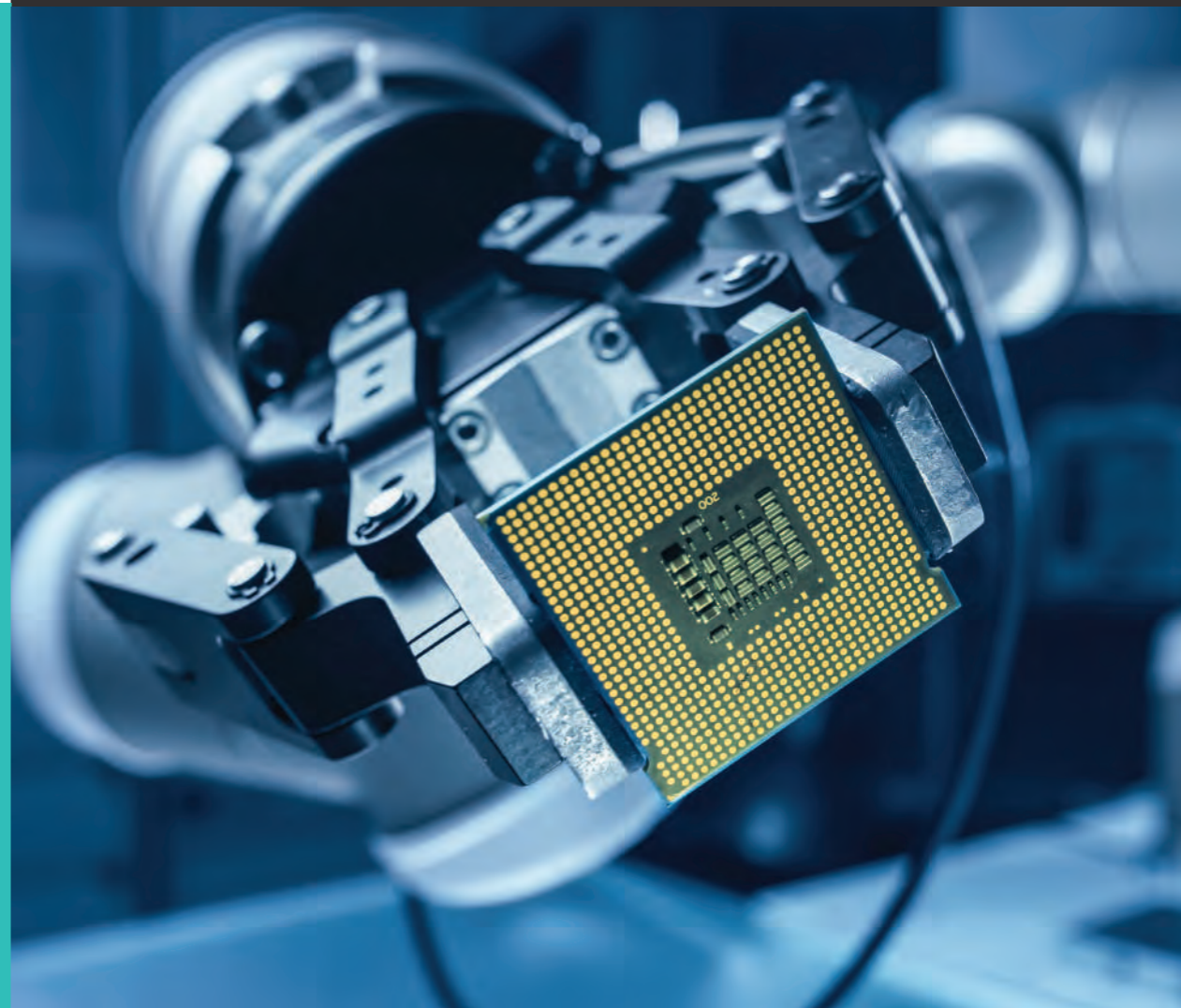
CHALLENGES OF THE AIOT REVOLUTION IN TAIWAN

Artificial intelligence will one day be ubiquitous. Taiwan's semiconductor sector is now devising strategies to overcome challenges and explore opportunities related to the emergence of the AIoT market.

VENTURE CAPITAL, 5G AND A PARADIGM SHIFT

Acorn Campus Chairman Wufu Chen, renowned as "the Germinator," whose passion for entrepreneurship has only grown stronger as he went from startup to venture capital financing, from the U.S. to Taiwan, and from 3G to 5G

TAIWAN
TECH
ARENA



MAR. 2020

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TTA SETS TWO NEW RECORDS FOR TAIWAN AT CES 2020

Startups under TTA achieved new highs in the number of the CES Innovation Awards and in the value of business opportunities captured

TAIWANESE STARTUPS MAKE A SPLASH AT CES 2020, BOOSTING TAIWAN'S GLOBAL PRESENCE

The high-tech clusters on the west coast of the U.S., with Silicon Valley and San Francisco as the center, provide all the ingredients needed for innovation and business growth such as technology, creativity, openness, and diversity. Each of the elements plays an indispensable role in innovation. Over the years, the U.S. has managed to maintain its leadership in technology amid competition from other powerful economies, and the key lies in the success of Silicon Valley. The example of the U.S. has encouraged governments worldwide, including Taiwan, to follow suit. However, to build their own Silicon Valley, a lot of work must be done and some cultures must be developed in advance.

Thanks to the efforts by Taiwan's Ministry of Science and Technology (MoST) and Taiwan-based businesses, the atmosphere and culture of innovation has taken shape in Taiwan. In recent years, Taiwanese startups have made remarkable achievements. Their vigorous innovative spirit has been especially evident at CES 2020. The products and technology presented by a delegation of startups organized by Taiwan Tech Arena (TTA) and led by professors have earned wide attention and high recognition.

The TTA delegation, which consisted of 82 Taiwanese startups, ranked the third largest among the other countries participating in the event and broke the CES' record for the number of participants. More importantly, the delegation won 13 Innovation Awards at CES 2020 in different areas including agricultural IoT systems, smart home, AI, big data, and healthcare. These technology areas were consistent with the predictions made by CES before the event kicked off.

Compared to the startups in other countries, Taiwanese startups have laid a solid foundation in basic science. With robust technological competences, Taiwanese startups can conduct research and dig into issues in their domains at a deeper level than other countries. Therefore, Taiwanese startups are able to tap into overseas markets in the blink of an eye once they can locate and connect with the right target markets, market their technology adequately, and beef up their oral presentation capabilities.

Since 2018, MoST has been organizing Taiwanese companies to participate in CES annually. This event enables Taiwanese teams to engage in hands-on practice, which has contributed to Taiwanese teams' significant growth in the past two years. The Taiwanese teams have made stunning progress in their performance at CES, whether in terms of the team performance as a whole or the maturity of individual teams. These startups' outstanding performance proves the momentum for innovation in Taiwanese businesses has started to pick up on all fronts. Their efforts and achievements deserve a big round of applause because when they are recognized by the world, Taiwan also leaps forward in the global market. ■



Dr. Liang-Gee Chen

Minister, Ministry of Science and Technology,
Taiwan

A handwritten signature in black ink that reads "Liang-Gee Chen". The signature is written in a cursive, flowing style.

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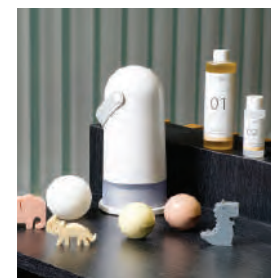
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TAIWAN PREPARES FOR CHALLENGES OF THE AIOT REVOLUTION

There is now a strong push to apply AI to every part of daily life. Taiwan's semiconductor sector is now devising strategies to overcome challenges and explore opportunities related to the emergence of the AIoT market.

THE DEVELOPMENT OF QUANTUM COMPUTING

Quantum computing has been attracting a lot of attention during recent years. The design methods, alternative materials and computing architectures should also continue to change and evolve. At the annual conference organized by Industrial Technology Research Institute (ITRI) and Stanford University in June 2018, three experts from Silicon Valley came to Taiwan to share their thoughts about research and development of silicon photonics and quantum computing.

Yi-Ling Wei, ISTI

Is quantum computing going to put an end to computing as we know it today? When will quantum computing be prevalent in our society? Stanford University Professor Chuck Eesley presented his analysis on the history of artificial intelligence, robotics and electric vehicles. These emerging technologies can be dated back as early as the 1950s but commercialization only started a few years ago. Whilst these significant inventions were not widely adopted in a short period of time, they inspired major R&D and investment programs of existing technologies in the business world. For instance, the development of electric vehicles had

stimulated the efficiency of internal combustion engines and the creation of hybrid vehicles.

Rigetti Computing, a startup founded in 2013 in Silicon Valley, has attracted the largest investments from quantum computing sector venture capitalists to date. The company's vision is to create the world's most powerful computers.

Dr. Matthew Reagor, the director of engineering at Rigetti, shared their research status in quantum computing. He indicated that quantum computing is not the end of conventional computing. Rather, it has its own niches, particularly

in machine learning, logistics route optimization, robotics, computational chemistry and clean energy. Currently, the company's major clients are the labs in academic and research institutions.

In terms of computing architecture, Rigetti Computing adopted a hybrid quantum computing strategy by combining the best of conventional computing and quantum computing. The goal is to come up with the optimal computing model and develop a comprehensive suite of quantum computing solutions, including chips, hardware, operating systems and a plethora of applications.

Professor Jelena Vuckovic of Stanford University is an authority on photonics. She indicated that the movement speed of photonics is faster than electronics.

Photonics can enable greater computing capacity and more efficient use of energy, and its applications include optical communication, conventional and quantum computing, sensing and imaging. In a nutshell, photonics is a rising star in the world of technology. However, the characteristics of the photon generated from current light sources are bulky, inefficient and very sensitive to fabrication and temperature.

Based on the theory of infrared light refraction through silicon, Professor Vuckovic's research team is working to develop miniature optical connecting structures to replace electric wires for the emission of photons and transmission of data. Currently, the design of optical devices requires multiple manual procedures for fine-tuning, and this affects the practicality of optical data transmission. The solution of inverse design algorithms was developed by the team to seek breakthroughs. Meanwhile, this photon structure design method can also be applied to diamond lattices to create high-efficiency SiV color centers to capture more photons. This approach enhances the practicality of quantum computing and quantum communication.

Matthew Reagor made some predictions about the commercialization of quantum computing. Currently, the biggest quantum computer has a capacity of fewer than 50 qubits at an

error rate of 1%. Over the following five years, this may extend to 1,000 qubits at an error rate of 0.1%. Over the next 15 to 20 years, computers may be possible with a capacity of 1 million qubits at an error rate of <0.0001%. At this juncture, quantum computing will be commercialized at scale.

Jelena Vuckovic engaged in discussions with domestic academic and research teams in Taiwan during her stay. She also visited the Center for Quantum Technology in National Tsing Hua University. She felt that despite limited funding and resources, the senior scholars and young talents in quantum technology in Taiwan boast research quality comparable to leading international labs.

Continued investment will surely enhance Taiwan's R&D strength and influence in the area of quantum and photonics. With over four decades of experience in semiconductor manufacturing and years of corporate

effort in the manufacturing process and equipment for nanodevices, the integration of resources from academia, industries and research institutions will allow Taiwan to punch above its weight in the quantum repeaters required for quantum memory and quantum communication.

Why Taiwan Should Focus on Systems, Components and Software for the Development of Quantum Technology

With Moore's Law approaching its limit, quantum computing will rewrite the rulebook of the industry and accelerate the adoption of new applications. Governments around the world are investing in quantum communication and quantum computing.

In May 2016, IBM published the Quantum Experience, an online platform to access IBM's prototype quantum processors for applications in artificial intelligence, machine learning, security coding/decoding and material dimensionality. Google purchased quantum computers from D-WAVE in Canada for optimal algorithms, artificial intelligence, image processing and space exploration. According to the report on semiconductor innovation, competitiveness, and security released in January 2017 by the U.S. President's Council of Advisors on Science and Technology, quantum computing will dramatically enhance the accuracy of global climate forecasts and the monitoring of information security.

In general, international players seek to commercialize both hardware and software. The hardware focus is on systems, predominantly the increase

of quantum numbers, stabilization of quantum states (e.g. debugging and coherence times) and dealing with constant quantum entanglements. When it comes to algorithms, open source was established to lower development barriers by inviting participants for testing.

It is worth noting that quantum technology is distinctively different from the mainstream information and communication technology in terms of materials, components, system architectures and manufacturing processes. Structurally speaking, the bottlenecks in the development of quantum computing can be divided into the logical layer and the physical layer. The problem with the logical layer is that it is unclear what applications will become mainstream. Quantum computing algorithms can only address very specific issues and are lacking in universality and development talents.

On the physical layer, the quantum state is fragile, and it is necessary to extend the coherence times to complete effective computing, reading and the access of information. Meanwhile, quantum entanglements cause disability and create the need for debugging, exhausting a massive amount of computing resources. All these issues mean a high entry barrier for the development of quantum computing and its applications.

Because of the abovementioned reasons, it is necessary to invest significant resources and time if Taiwan would like to develop quantum computing systems. However, this investment would not be without returns. Quantum processing units (QPU) should

be manufactured on superconductive silicon wafers in specialist foundries. Also, low temperatures are key to quantum coherence. It is suggested that Taiwanese companies work with international system vendors by focusing on the R&D of microwave control systems for QPUs (for the access of quantum information), QPU testing and packaging, and low-temperature components. This will be the best approach to leverage Taiwan's strengths in the supply chain.

Given the emphasis on security and confidentiality of quantum communication (rather than on communication efficiency), the bulk of R&D efforts are on quantum key distributions (QKD). Single photons are currently adopted by most people. In fact, there are still technical barriers in the design of quantum repeaters due to the fragility of quantum states. Hence, Taiwan may invest in the R&D of adjustable light sources for quantum communication systems (in relation to optics) and management software for quantum key distributions.

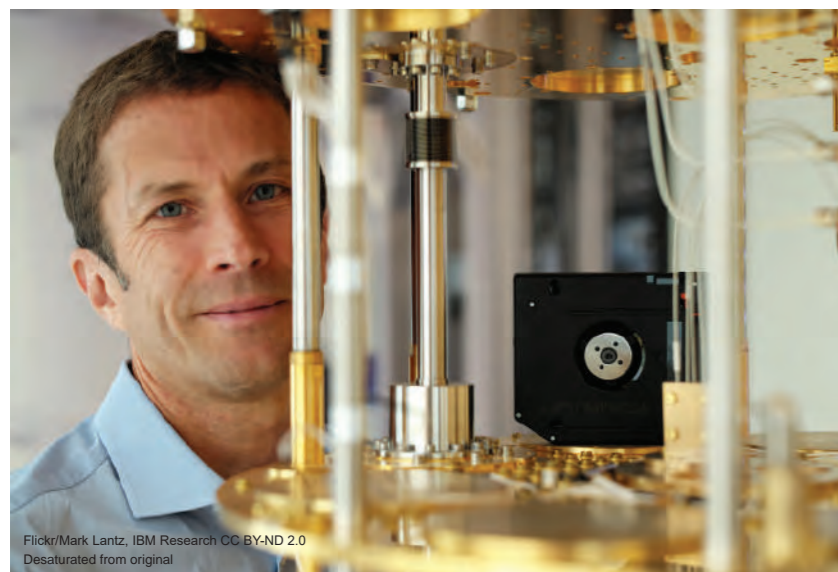
It will be necessary for the industries in Taiwan to establish a global picture of relevant patents owned by different countries. The author searched for these patents by using keywords and identified a total of 9,446 patents relating to quantum technology.

The number of patent applications for quantum computing has picked up significantly since 2013. Nearly 50% were from the U.S., followed by Canada, Japan, Australia, the U.K., Korea and China. The focus is on Qubit, microwave control and algorithms. Some companies have

started working on quantum networking, for communication between quantum computers. China owns close to 33% of the patents in quantum communication. Other countries in the top 12 list are the U.S., Japan, Korea, the U.K., Finland, France and Canada. The focus is on photon systems/components, QKD hardware and software. Many manufacturers are also making efforts in coding/decoding and security keys such as key sharing and backup key vaults.

The U.S. is currently the leader in superconductor patents. Japan boasts the highest number of patents in optics. Taiwan has four patents in quantum communication. Two of these patents are owned by individuals and are for quantum devices and quantum key systems. The other two were one from Chunghwa Telecom in 2011 for quantum key service networks and one from National Cheng Kung University for quantum communication.

In sum, Taiwan will not be absent from the global race for quantum technology. The initial focus may be placed on the development of quantum communication components, hardware and software. Centering on optical components, research institutions and academic organizations should utilize their cumulative R&D momentum and work with telecom companies for the certification of quantum communication networks. This may also be the initial emphasis of quantum patent applications. Quantum networking is an emerging area in quantum computing. Many foreign startups are dedicated to the development of algorithms, independent of hardware. This could also be a preferred entry mode for Taiwan. 🇹🇼



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FOCUSING ON INFORMATION SECURITY VULNERABILITIES

As evidenced by the past events of information security breaches in manufacturing industries, attackers have various motivations from commercial competition, financial blackmail, showing off their capabilities, intention to cause mass destruction, or simply for fun without any malicious intent.

Akuei Hsu, ISTI

Production recipes, manufacturing processes and R&D status are all business secrets for high-tech manufacturers. Information leakage does not only affect orders, but also creates new competition. There have been many such incidents in the past. This is the reason why the demand has been strong over recent years for information security solutions that prevent information leakage.

The WannaCry ransomware attack in 2017 caused significant economic damage throughout the world. The virus spread fast, encrypting the data of victims, and the attackers would ask for ransoms to be paid in Bitcoins to protect their anonymity.

The technological evolution of production systems has led to the emergence of more information security threats in the manufacturing industries.

In conventional systems (particularly with industrial control systems that manage, monitor and control production facilities), production facilities are generally physically separated

from external networks and are not susceptible to network security threats. However, the transition towards smart networking and production management and the demand for real-time equipment monitoring have prompted manufacturers to connect production systems to corporate networks to gain efficiency. This comes at the expense of increased vulnerability. In other words, the legacy protective mechanisms are no longer able to fend off ever-evolving attacks once connected. The above-mentioned issues have led to the following four issues regarding the information security of the manufacturing industries:

1. A Low Level of Controllability Over Smart Manufacturing Systems

Companies typically purchase new production IT systems in the turnkey manner, i.e. software, hardware and operating systems. In order to avoid any disruptions to functionality, vendors do not open access to the highest level of operating systems. Also, corporate IT or information security personnel are

prohibited from installing any software or tools. Unless vendors release updates, IT and information security departments will find it difficult to repair and inspect any information security loopholes. This then begs the question of whether the new equipment from suppliers is free from pre-installed viruses and whether customized software comes with pre-loaded malware. These are all issues that require extra attention.

2. Industrial Control Systems Are Not Capable of Sufficiently Addressing Information Security Concerns

As many industrial production facilities previously sat in an isolated environment, they were not designed with robust protective features such as identity authentication and basic encryption. If the internal networks are invaded, they are usually not equipped with effective defense mechanisms. If the attacker can penetrate via a single point, they can easily access different parts of the manufacturing system, e.g. controllers responsible for monitoring and supervising production programs. This can potentially cause the suspension of operations, damage to facilities, financial loss, theft of intellectual property, or jeopardize the health and safety of personnel.

3. Slowness in Version Updates for Manufacturing Systems

The operating systems for factory facilities and equipment are often powered by special drivers or bespoke programs. They are not off-the-shelf operating systems, but customized versions provided by vendors. As a result, the patches and updates

significantly lag behind those for standard operating systems. The mainframes and computers are hence exposed to the risk of infection from viruses due to the lack of ability to immediately update the system with security patches.

4. A Fixated Priority of Production Reliability

Manufacturers seek to maintain the stability of production facilities. Any environmental changes (e.g. the addition of enhanced security solutions) may affect manufacturing processes. Management prefers to make minor changes and attempt to maintain normal operations and reliability during the adoption of any new security solutions. This implies more time is required for assessment, testing and inspection of industrial control systems prior to installation.

Manufacturers are advised to refer

to the information security risk management framework developed by the U.S. National Institute of Standards and Technology to deal with the above issues. First, it is essential to stay on top of the current status of system versions and known vulnerabilities in the hardware, operating systems and customized functions.

Second, information security audits should be conducted during pre-installation testing and after the new machines come online, with vulnerability assessment and penetration tests, to ensure all the known weaknesses are under proper management and to mitigate the possibility of invasion by external malware.

Thirdly, it is necessary to ensure a complete suite of network information security mechanisms and solutions are in place. It would be a mistake to take these matters lightly simply because the production network is physically isolated.

Finally, it is necessary to perform regular audits, update the versions, install patches for operating systems and inspect the network architecture for any changes required after the new equipment is up and running.

The new systems and outsourced subsystems implemented as part of the introduction of smart networking management, real-time sensors, information and communication management, and service platforms all come with information security risks for high-tech manufacturers in Taiwan. Therefore, it is a prerequisite for companies across the supply chain, from the upstream to downstream, to collaborate on risk management by providing transparent information on equipment and information security events. No companies can cope with information security threats alone anymore. The best way is to construct a robust and comprehensive protection system throughout the supply chain. 📊



THREE TRENDS IN EDGE COMPUTING

The booming development of artificial intelligence (AI) is drawing various industries around the world into the AIoT ecosystem. Many companies have been actively constructing their roles or positioning themselves in the AIoT ecosystem in order to create business opportunities in AIoT applications by working together.

Yu-Yi Chen, ISTI

Taiwanese manufacturers have a long track record in the manufacturing of ICT products for international brands and have built a reputation for quality and cost advantages in hardware. However, the megatrends in artificial intelligence, IoT (Internet-of-Things) and Big Data present a new set of challenges and requirements in cloud computing efficiency, AI algorithm capabilities and Big Data analytics. Among these, AI edge computing is currently the focal point of global industry attention.

The uploading of vast amounts of IoT data to the cloud for AI computing, training and analysis is likely to compromise the efficiency of computing, analytics of data response and machine operation in general. Therefore, it is necessary to shift a portion of the machine learning mechanism from the cloud to terminal devices. In other words, the data training, analysis and forecasting that were previously processed on cloud servers or in data centers are now going to be handled on the edge nodes of the logical network. Therefore, it is a prerequisite to enhance the data processing capability of the edge nodes.

According to the forecast from IDC, a market research firm, the market for edge computing in terms of terminal and network equipment will exceed US \$50 billion in 2020. By then, over 50% of data will be analyzed, processed and stored on network edges.

The Industrial Technology Research Institute observed that in 2017 and 2018, industry players in telecommunication, networking equipment, servers

and platforms, system integration, semiconductor chips, components and terminal devices have been proactively developing a diverse range of solutions and products for edge computing.

The trend in AI edge computing is moving from connectivity across networks in proximity and within the same regions at the hub level towards applications and scenarios of edge devices at the terminal level. In other words, some of the machine learning techniques and autonomous decision-making mechanisms in artificial intelligence will be transferred from the cloud to the edge.

This trend brings three major developments:

First, online training is gaining traction and on-device training will become important. Edge computing is about moving the computing for apps, data and services to edge nodes in the network architecture. From the perspective of

flexible deployment, real-time response at the user end, bandwidth and cost considerations, edge computing will lead to better efficacy and real-time experience. As demonstrated by the solutions of some leading companies, IoT devices do not have to stay connected all the time. This approach resolves issues of bandwidth, power and computing resources. In other words, AI edge computing is enabled with both online training and on-device training. Training is conducted when connected for data transmission. Meanwhile, IoT devices should be equipped with certain decision-making and real-time response capabilities to function while offline.

Second, edge computing utilizes edge AI chips combined with AI algorithms on a global scale. For instance, Amazon acquired the chip design company Annapurna Labs and has been recruiting chip design talent for the purpose of shifting some of its smart assistant Alexa's functions from the cloud to the Echo smart speaker device. Microsoft is working with Intel's FPGA chips to develop Project Brainwave, a hardware platform. It is also collaborating with MediaTek for MT3620, the system-on-

chips that support Azure Sphere. This microcontroller enables IoT devices with embedded security and connectivity functions. Google is developing Cloud IoT Edge and Edge TPU chips, so that edge devices can perform machine learning and inferences. In sum, leading companies are integrating chip architectures by taking into account the necessary platforms, systems and software. The combination of chips and algorithms will define the direction of hardware and software for edge computing going forward.

Third, the trend is for the ecosystem of applications oriented AI and machine learning. The ecosystem of edge computing is made up of cross-device connectivity, driven by telecommunication companies, and the variety of applications created by platform heavyweights. At this juncture, the ecosystem for machine learning, enabled by semiconductor chips at the bottom layer is also taking shape. For example, the semiconductor company ARM from the UK offers solutions such as CPU, GPU, NPU and open source software to support the global development of the AI edge-computing

ecosystem. This is expected to benefit Taiwanese players who focus on the hardware for smart edge devices in the pursuit of opportunities in the market for AI edge computing.

From telcos, IoT device and equipment suppliers, cloud platforms and system integrators to semiconductor companies, many players are actively deploying robust solutions in the AI edge computing space. Taiwanese companies may explore opportunities in AI edge computing by lowering deployment costs and enabling computing resources, flexibility, scalability, real-time responses and usability.

Given Taiwan's strength in hardware for smart devices, on-device training should be the preferred route for Taiwanese companies. It is suggested that manufacturers in Taiwan focus on terminal devices by simplifying product design, optimizing the computing requirements; filtering effective data or converging shared functionality. This will bring Taiwanese companies to different regional markets by circumventing the dominance of cloud platforms and 5G companies. ■



About the Author

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ISTI (Industry, Science and Technology International Strategy Center)

The Industrial, Science and Technology International Strategy Center is devoted to helping businesses in Taiwan meet revolutionary changes in a fast-moving knowledge economy. The Center aims to provide customers with value-added, multi-disciplinary information and services by using its ability to do in-depth research on industrial development. It is also able to forecast new trends in technology. The Center will promptly respond to clients' needs in an ever-changing environment by coordinating vast R&D capabilities from its parent organization, the Industrial Technology Research Institute, and by connecting to its international networks that have been persistently cultivated for decades. With its knowledge management and active interactions with the government and industries, the Center is expected to help the nation gain competitive advantages and assist the business community to create value.

VENTURE CAPITAL, 5G AND A PARADIGM SHIFT

Acorn Campus Chairman Wufu Chen, renowned as “the Germinator,” whose passion for entrepreneurship has only grown stronger as he went from startup to venture capital financing, from the U.S. to Taiwan, and from 3G to 5G.

Eden Lien



Wufu Chen did his doctoral studies program in computer science at the University of California, Berkeley. As America’s tech industry grew in the 90s, he was creating numerous companies that later either went public or was acquired by large companies. He established Acorn Campuses in Silicon Valley and Shanghai in 2000. He then relocated his head office to Taiwan and founded Acorn Campus Taiwan.

From Startup to Venture Capital Financing

Entrepreneurship formed the first stage of my life. I love being an entrepreneur and have rather little interest in the latter stages of a company's development. If entrepreneurship were like birthing a baby, I would often say that I only do the birthing while others do the raising. You could say this is a sort of professionalization—even entrepreneurship requires professionalization since those who are adept at creating a company might not be up for the job when it comes to management in later stages.

I built startups until around the year 2000 and had already established over ten companies in America. I thought it was time to begin the second chapter of my life, and went on to help others establish their companies instead. That is, I began as an entrepreneur, and then switched lanes to become a venture capital investor. As an investor in companies in their early stages, I've invested during the seed round, and sometimes even before that. Most of the time, I invest during the absence of the actual product, when only the idea exists. These investments form around 70-80% of the total. Even though I'm known as a venture capital investor, I prefer to call myself an “investing entrepreneur,” a person who invests and becomes a part of the startup(s).

I began as a general partner (GP) and was especially focused on the early stage. My work included investment and corporate governance for improving and enhancing the system. Four years ago, I switched to being a limited partner and consultant because I felt I've been a GP long enough. This kind of looks like backpedaling: Being an entrepreneur, then investing and managing startups, and finally putting money into an investment fund for GPs to manage. Simply put, I invested in more and more companies but participated less and less.



Frankly speaking, I failed as a venture capital investor in the beginning, since I invested with the mindset I had during my entrepreneurial past. These two roles are really quite different from each other. Investors have to be very optimistic, as anyone can tell you that only a tenth or so of entrepreneurs end up a success. Without a cheerful mindset and the belief that what you do now will pay off in the end, you're not even going to consider entering entrepreneurship. Venture capital investors, on the other hand, need to be the complete opposite. They need



to be extremely cautious and be aware of all the risks of failure they can find. They need to be both a balancing force and a complement to the entrepreneurs, providing caveats and filling gaps in their knowledge. When I first started out as a venture capital investor, I was overly friendly to these entrepreneurs, as though I was projecting my own entrepreneurial passion onto them. What optimism I shared with them sapped me of my counteracting force.

Venture capital investors take on a hefty amount of risk, but the experience from having formed a long line of successful startups was my advantage as an investor. Being acutely aware of the problems and processes in each stage as well as the required software and hardware (thanks to my past emphasis on telecommunications development) greatly improved the probability of making a successful investment.

From 3G to 5G

I came from a 3G background. Back in the day, there were three standards for global telecommunication: TD-SCDMA, W-CDMA and CDMA2000. TD-SCDMA was what three other professors and I developed in America and took back to China, where it was to be used as the standard for mobile telecommunication. Although I was very familiar with 3G, I paid little attention to the later 4G, since it only featured a step up in speed from 3G with no major breakthrough in particular. But now that 5G has appeared, I predict that 5G will form a paradigm shift.

What's a paradigm shift? In telecommunications, moving from conventional circuit switching to packet switching forms a paradigm shift. Traditional phones used to take up entire lines, which were "dead" for the majority of the time. Packet switching, on the other hand, only takes up a line at the moment

of use, thereby greatly boosting efficiency. Many opportunities spring up upon a shift in paradigms. To borrow the analogy of architecture: when the market comes up with a new method of laying foundations, the construction techniques used for the structure above will have to adjust accordingly—everything must be reworked. I received my education just when 3G began developing, and I was fortunate to have participated in building its basic architecture. Naturally, I had the chance to see the problems in the construction techniques used for the structure above, and hence many opportunities. The companies I later founded were clearly able to get ahold of the existing trends.

Likewise, I get the same feeling looking at 5G. The whole Internet structure will have to be revamped in the future. A lot of equipment will be replaced, and things that were impossible have now become viable due to 5G, such as autonomous vehicles and automatic factories. Whether it's infrastructure or the overlying software, services or platforms, everything will be different from what they are now. That is an opportunity.

I think 5G is a big opportunity for Taiwan. How? 5G is not only a series of connections between people but extends that connection to objects and exists between objects themselves. Demand for terminals has skyrocketed and meeting that large demand is what Taiwan does best. Furthermore, the rise of network virtualization presents itself as another opportunity for Taiwan. In the past, software and hardware were bundled together, however, virtualization severed all those platforms, allowing users to mix and match as they wish. Taiwan's forte lies in the underlying hardware, although the previous bundling made it difficult for market penetration. Now that hardware and software are split apart and standardized, Taiwan is now fully able to provide the best hardware for the cheapest prices while other countries create the overlying

software. It's called cooperation.

5G and 3G are not exactly similar. Back when I did 3G, someone asked me why I didn't return to Taiwan and aid in the development so Taiwan could sell base stations to other countries. I replied that Taiwan wouldn't be able to get their base stations sold, as they face competitors abroad such as Nokia and Ericsson. It's not easy to put together a team like that in Taiwan. But I reiterate: It's not enough to make the underlying hardware; development must continue upwards. I am now taking a 5G team back to Taiwan to do hardware integration. If 5G continues to develop, it will prove to be a great opportunity for Taiwan.

Looking at Taiwan from the American Perspective

When I first came back from America, I found that there was a stronger sense of class. For instance, you would call me "Chairman Chen" instead of by my name. In America, however, if you came across Bill Gates, you would still call him "Bill" instead of "Chairman Gates." Though this is considered "respectful" by our [Taiwanese] culture, this sense of class impacts companies in the tech industry and also affects entrepreneurial teams negatively.

Since everyone has only a limited amount of knowledge, your success in a particular area does not imply your expertise in every other area. So in analyzing class this way, I feel that though Taiwanese bosses are willing to pay you to be entrepreneurial, you could hardly call them mentors. But things aren't that way in America. Take Mark Zuckerberg for example, the founder of Facebook; he doesn't act all bossy when you meet him.

I always tell my company that hierarchies exist due to differences in roles, but every rung in the ladder is important, and no one "just takes orders." If everyone only took orders, this tech company will only be run by a single brain, and will only enjoy a limited chance at success. Every single person in the startup is a shareholder of the company, and I hope that when you make choices, you make them as a shareholder with a stake in the company. If you did things as a company's shareholder and not as someone who takes precise orders from a boss, you'd have to lose the passivity and take the initiative. Then your passion will fully emerge.

Looking at the Present from the Past

Entrepreneurial opportunities have exploded since back in my day. Entrepreneurial opportunities and investing funds are many. They're basically popping up everywhere in every field, even in the cultural and creative industries. There are so many fields to choose from.

Our generation was a poor one, but there's nothing special about poverty. Most people during those years were poor. From poverty comes a strong will to escape it: "I must not stay poor. I must find a way to distinguish myself." Young people nowadays enjoy a better quality of life. Although there is still economic pressure, no one is poor to the point that life becomes unlivable. As a result, they don't have that strong of a will to escape poverty. And there's nothing wrong with that. If we look at Silicon Valley, the situation is even more obvious. Entrepreneurs in Silicon Valley don't want to make a lot of money, many entrepreneurs already come from a well-to-do family. Entrepreneurship is more like a mission-driven thing, something that they want to do.

But as always, there are no absolutes. Positives come with negatives. People who've grown up in affluent society get in direct touch with the market and have a better idea about what to do. I grew up in a poor neighborhood. How would I know what I wanted to do? How would I know where market demand lies? Earlier societies extolled scholars above all the rest, but now any expertise can make a killing.

Youngsters nowadays live in a well-off society and are cleverer than the earlier generations about what they want to do in life. There are two important ingredients to entrepreneurial success: First is the *What*, the second is the *How*. And if you don't know *what* you want to do, who cares about the rest? Once you've got down *what* you want to do, then you may begin to use technology and techniques, creating that *what* under the least cost and with the best technology—the *how*. A new business model can stimulate the maximum potential of the market, such as the products and services derived from the concept of resource sharing. The good thing about getting in touch with entrepreneurship is that I get to see young people, see how the times have changed, see varying walks of life, and see varying methods of success in each generation. You can't use the definition of success from the past generation to define the young people of today. 📱



HIGHLIGHTS OF INNOVATIVE STARTUPS ATTENDING CES 2020

For three consecutive years, TTA has brought the best innovative startups from Taiwan to CES at Las Vegas. The number of teams in this year's delegation reached 82, and together they have netted US\$ 226 million in business opportunities during the event.

Evan Chao, Nana Ho, Emma Lin, Yi-Ru Chen, Ryan Hsu



OVERSITTING AND FALL DETECTION

Beyond Vision's AI healthcare product CarePLUS, can detect the motions and postures of family members, and ensure elderly safety through the power of AI

The political-economic landscape widely varies among regions, but one common problem faces us all: Aging. Already an aged society, Taiwan is poised to become a super-aged society in 2025 and is the most rapidly aging country worldwide. Eldercare has become a hot button topic these days. How can we leverage technology as a key aide to the elderly population?

Beyond Vision is a startup that provides a solution in the form of an AI healthcare product, CarePLUS. Through cameras installed inside the household, the solution can detect the motions and postures of beloved family members. Its AI system releases warning messages at the moment of danger, such as falling, sitting too long, leaving home without a clear reason, etc.

Beyond Vision's founder Victor Lin himself has much to say in connection with Taiwan's aging crisis, an issue close to his heart. Not only are his parents already past sixty, but his grandparents have already reached their eighties. Living apart from his elders has oftentimes made it difficult for him check in on their situation

in real-time. When his grandmother fell and injured herself a while back, the family didn't realize the incident until a few moments later.

And Victor Lin is not alone in his this predicament. There is a significant increase in the number of elderly people living in solitude compared to the past, and family members often have no way to be aware of emergencies at the moment they occur. Japan even has the term "kudokushi" ("lonely death") to describe elderly people who live alone and fall victim to sudden illnesses or emergencies, as they have no way to seek assistance. "We want to use technology to discover these problems sooner," says Victor.

Elderly Behavior Identification and Real-Time Alarms

Beyond Vision entered eldercare starting this year. Despite already existing technological products that send an alarm based on elderly fall detection, "we think that there are many

more areas for domestic detection besides falling." For example, elderly people with dementia may leave home spontaneously or sit for long periods before getting up. Beyond Vision has therefore developed CarePLUS, which functions using physical devices and app interfaces. A physical device is first installed on the ceiling of the living room, "since the living room is the best place to oversee every entrance and exit." A 360° fisheye lens is used to capture the actions of all family members within that area, and the images are analyzed with a machine learning AI to identify motions and postures.

Every time an elder is detected to have fallen, sit too long, remain too long in the restroom, leave home at the wrong times, etc., the app will give off an alarm to notify all family members. A user may also open the app interface and see a real-time video of the home's interior.

Lin says that, after installing CarePLUS, machine learning requires at least three days to identify the environment and record family member behavior to generate a preliminary analytic report. This report organizes all the events that happened in the living room during those three days on a timeline. If the user wishes to know the activities of a specific family member, they may manually add individual ID tags for the machine to use later. "People's activities at home are quite habitual. You may, for example, have a fixed spot on the couch you like to sit. Not only is position an important indicator, but movement speed may also be used to quickly identify a person. These are all assisting factors that help the AI determine who is who through habitual behaviors."

In the process of accumulating data, "we are also creating technological barriers." Lin points out that there is already a rich repository of flat lens footages serving as data for machine learning training. CarePLUS's ultra-wide 360-degree angle view forms a blue ocean of data: Every moment of posture identification is a moment of unique data accumulation. "Fisheye lenses cause a distortion of people's shapes and motions, which we overcome with a specific technology. This also continually raises the bar for others."



Not only does CarePLUS provide immediate alarms, but given more time, it may also conduct long term health analysis.

Lin thinks that this is precisely the biggest advantage that CarePLUS has over all the other existing home monitoring camera products in the market.

Combining Health Analysis and Real-Life Application

Not only does CarePLUS provide immediate alarms, but given more time, it may also conduct long-term health analysis. A professional team at a hospital claimed that the daily activities of elderly people not only affect nighttime sleeping quality but may also lead to chronic diseases. Too little activity, for example, may lead to sarcopenia, and may also cause apnea due to body fluid overload, higher heart rate and higher pressure on the lungs. "Data of these daily activities may, therefore, assist the doctor when making judgment calls."

Besides healthcare information, CarePLUS can also branch out to other areas of service, such as meal ordering and taxi calls. Lin gives an example: The machine has learned through daily life analyses that mom often enters the kitchen to prepare lunch at 11. If one day, mom has yet to enter the kitchen, it may mean that mom won't be cooking today. The device may then automatically ask whether she needs to place a meal order. Beyond Vision is currently working hard on a smart speaker function that will allow the machine to analyze sentences and understand the user's true intention. "Maybe the person did not fall but was merely getting down to scrub the floor. The machine may learn the actual situation by asking. We stress that machine learning won't be used to cover all areas, but will instead be playing a supplemental role in human-machine interaction with its user-centered design."

CarePLUS is currently expected to sell for US\$299 and includes basic warning functions. If the user requires an in-depth activity analysis report that spans a longer period, or wishes to use the meal ordering or taxi call features in the future, they may use the app for a monthly subscription fee of US\$ 4.99.

Beyond Vision began as a smart-home project under National Tsing-Hua University (NTHU) and then narrowed its focus to eldercare over the course of a year. Besides Lin, who has already 8 years of experience in business, the team also has three other core members, that are all either graduate or doctorate students studying at NTHU. The team hopes to recruit more talents to further speed up AI analysis.

Since the inception of CarePLUS, Lin is now able to understand the situations his elderly family members face in real-time. With a smile, he gave us a glimpse of the app screen, through which we see his grandmother watching TV at home. This is not only his original vision but also his first response to the aging society to come.

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A MACHINE TO LATHER THE WHOLE FAMILY

LESSDO's intelligent Soap-o-Matic allows the user to custom-make personal soap with just a single press of a button and become a handmade soap guru

To lower the threshold and the complexity of making handmade soaps and increase the availability to everyone with skin issues, LESSDO has released the world's first intelligent Soap-o-Matic for the home. It allows the user to custom-make a personal handmade soap apt for skin-care purposes with a single press of a button, quick and hassle-free.

The World's First Smart Household Automatic Soap-Making Machine

Since most soaps sold in the market include additives that cause skin-irritations and pollute the environment, people are beginning to turn to handmade soaps, which are easier on the skin. Handmade soaps have therefore quickly come into fashion and attracted large crowds of enthusiasts. LESSDO CEO Jay Lee, referencing a market research report, says that the US has the world's largest soap market at an annual revenue of up to US\$ 240 million, with Germany, Japan, France and China following behind. Seeing a bright future for handmade soaps, Lee decided

to found LESSDO with friends to engineer the world's first smart household automatic soap-making machine.

Before doing so, LESSDO has done extensive market research to get a grasp of the entire market situation from the user end to sales to the business end. After meeting with soap makers and other players in the market, LESSDO learned that the process of hand-making soaps was all about experience and going with your gut feeling.

The most disheartening part was that market players had to repeat calculations of ingredient proportions, put large sums of money into equipment and jars, and go through 20 tedious and complicated stages in the soap-making process. They must even face the possible risk of failure that awaits them at the end. "There are nearly a million players in the soap-making business in Taiwan, but up to 70% of those players choose to quit in their first three years due to the many difficulties and issues mentioned," says Lee.

"LESSDO has simplified the complicated 20-stage process and various equipment down to a single machine with a single button."

Targeting the Global Market for Personalized Hygiene and Care Products

In order to solve these problems, LESSDO decided to use scientific data and an engineer's angle to tackle each step separately and analyze them. "The two biggest difficulties in traditional soap-making are the ingredients and the mixing," says Lee. Ingredient preparation is the most convoluted and time-consuming part of the whole soap-making process: Players have to buy various ingredients, not only estimating the quantities required for each but also doing complicated calculations on their proportions. Many players decide to give up due to the overly arduous process.

To address this problem, LESSDO has created various DIY packets containing fixed ingredient quantities according to each packet's recipe. The Soap-o-Matic's detection system will apply the mixing parameters best suited for each packet automatically, making soap crafting highly accessible to beginners. Additionally, packets may be combined to create up to 54 possible soaps, allowing consumers to easily make customized and personalized soaps according to the season, age group, skin condition, etc.

Returning to the issue of mixing, whether or not the mixture is evenly stirred will directly affect the quality of the end product.

Most players in the past stirred mixtures with the help of handheld electric stir sticks used for mixing juices; the results were very often handmade soaps with oils separated or of low quality. LESSDO's solution for this is a stirrer with a 10,000 rpm motor and a 304 stainless steel whisk head. This tool greatly reduces the 60 minutes of stirring time needed (when done by hand) down to 10 minutes. Also Soap-o-Matic's patented smart technology allows the machine to determine whether the mixture was evenly mixed. The more even the mixture, the more complete the saponification process. This may further reduce the curing time from a couple of weeks (or months!) down to a single week.

"Concerning products and services, our company has always strived to 'do less, get more,'" says Lee. "True to this ideal, we have simplified the complicated 20-stage process and various equipment down to a single machine with a single button. The user doesn't even have to go through the process of preparing ingredients anymore. All the user has to do is to add the packets numbered 1 to 4 in the right order." This "Do Less" design concept was well received by the market. In May 2019, the company had accomplished the feat of reaching the funding goal on Zeczec, a Taiwanese crowdfunding platform, in only 26 minutes!

The company will move on to realize a wider variety of handmade soaps as it continues to develop packets for soaps designed for different purposes (e.g. washing faces, hairs, clothes, etc.) and users (e.g. elderly people, children, pets, etc.) They will also be releasing a mobile app to allow users to download more recipe parameters onto the Soap-o-Matic through a Bluetooth connection.

To allow more consumers to get a feel of LESSDO's handmade soaps, LESSDO travel soaps have been made available for purchase. The company is also providing customization services for all kinds of soaps to meet the needs of specific individuals and companies. Businesses or stores may custom-order their very own exclusive gift soaps with their logo stamped onto them. For the future, Lee expressed plans to work with Unilever and other giants in the hygiene, healthcare and perfume industries to break into the international scene in hopes of establishing itself as a global brand boasting highly customized and personalized care products. 📺



The packets may be combined to create up to 54 possible soaps, allowing consumers to easily make customized and personalized soaps according to the season, age group, skin condition, etc.

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THE FIRST STEP TO DETECT COLORECTAL CANCER EARLY

RedEye Heme Detection System enables immunochemical fecal occult blood test (iFOBT) at home

Influenced by living and eating habits, the incidence rate of colorectal cancer has been increasing year by year. There are more than one million new colorectal cancer cases in the world annually. More and more colorectal cancer cases are being diagnosed in younger patients. To help patients identify symptoms earlier, RedEye, a startup company, has launched the RedEye Heme Detection System that can be easily used at home, thereby improving people's willingness to undergo screening due to its convenience.

RedEye pointed out that fecal occult blood is an early symptom of many diseases. If the blood is visible to the naked eye, the diseases have often progressed to the second or third stage, when patients need to have surgery or even additional chemotherapy. This will undoubtedly affect the patients' quality of life after treatment. Despite the high incidence and difficulty in detecting it by patients themselves, people rarely take the initiative to do an immunochemical fecal occult blood test (iFOBT), according to statistics. In Taiwan, although the

government provides people over 50 years with a free colorectal cancer screening every two years, only some people do the test. As a result, some people missed the opportunity to detect colorectal cancer early, which indirectly increased the mortality of colorectal cancer.

Built-In Optical Detection, Can Be Completed within 10 Seconds

It is very simple to use the RedEye Heme Detection System. With optical sensing technology, users only need to wait a moment while the feces softens and then put the handheld device in water. After 10 seconds, the device will indicate the current situation of fecal occult blood through a red or green colored indicator on the device.

Based on the built-in noise database, the RedEye Heme Detection System can exclude heme from environmental impurities in the toilet water, providing results compatible

"RedEye Heme Detection System can provide results compatible with hospital iFOBT qualitative tests."

with hospital iFOBT qualitative tests and allowing users to do preliminary screening quickly at home.

Through the RedEye app, which is now being developed, users will be able to send the test results to their mobile phones for record keeping and trend observation. Because the test is anonymous, the data will not be stored in the system, so there is no need to worry about privacy issues. The system can also be shared with the whole family.

The RedEye Heme Detection System consists of two parts. First, there is the handheld device that is IPX7 waterproof with clip-on filter paper at the front end to filter impurities in the water. The other part is the water-repellent charging stand, which has two functions: UV sterilization and air drying. The device is simple and lightweight enough to fit anywhere in the bathroom.

Considering the possibly high selling price, the RedEye Heme Detection System will first be offered to the elderly and users with a family medical history. At present, some inspection laboratories, nursing homes and insurance companies are now asking about cooperation through leases. RedEye is currently evaluating these requests.

Currently in market, there are products to detect occult blood at home. Typically, the feature test strips that are put into the toilet. However, the environment easily influences the results and disposable test strips have a relatively high cost. In comparison, the RedEye Heme Detection System can operate for at least 5 years. The only consumable is the optical grade filter paper at the front of the device. This design raises the acceptance and trust of users who want to do health monitoring at home.

Cooperating with Clinical Institutions for Clinical Experiments while Integrating Smart Homes

RedEye has completed the first phase of a 50/50 clinical trial with the Hsinchu branch of the National Taiwan University Hospital, where the accuracy rate of the heme detection system reached 95%. The team expects to expand research plans in the future and is currently in discussion with hospitals like Chi Mei Medical Center, Chang Gung Memorial Hospital, Cathay General Hospital, Veterans General Hospital, etc.

In addition to a detection system similar, in form, to a home appliance, RedEye also plans to modularize the technology and cooperate with well-known toilet manufacturers in Taiwan and Japan to create a smart toilet, thus giving the public more choices.

Like most start-up companies, RedEye encountered many difficulties in the initial startup stage in 2017. Product development and design must integrate various aspects such as integration of optical structure and electronic software. In terms of fundraising, investors hesitated to invest in the beginning. However, the company is now being approached by many investors.

Just like sphygmomanometers and ear thermometers, RedEye hopes to make the heme sensing system a must-have product at home. The company also plans to introduce extended products for different use scenarios in the future, such as the detection of drug use, bacterial infection or urine protein tests for kidney disease.

Dr. Neison Yan, the founder, says that the reason why he chose to develop the RedEye Heme Detection System is to help people notice disease early and get treatment early. He believes that the heme detection system will help patients save medical expenses while preserving a better quality of life. 📱



With optical sensing technology, users only need to put the handheld device in water. The device will indicate the current situation of fecal occult blood through a red or green colored indicator on the device.

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BRINGING FORTH SMART FLEET MANAGEMENT

Swisys provides top-notch OBD II/CAN Bus signal value-added service

A professor at Southern Taiwan University of Science and Technology and a team of electrical engineers founded Swisys in 2016. It is an automotive electronics and communications solution provider based on the CAN Bus and OBD II standard. Swisys offers customized and effective solutions for connecting any equipment to VANET (vehicular ad-hoc network). OBD II vehicle diagnostics, driving recorder, fleet management, and driving behavior analysis can all be read by the CAN Bus signal of the OBD II interface. Swisys stated that it is centered on CAN Bus automotive electronics. The CAN (Controller Area Network) communications protocol is currently the hottest mainstream technology of VANET. It can control the information exchange between various ECUs (electronic control units, aka nodes) inside the vehicle such as windows, doors, lights, or sensors. Going forward, Swisys will focus on the collection, detection or diagnostics of CAN bus signals.

In addition to the high-speed CAN (up to 1Mbps data transfer rate), there is also the low-speed LIN (Local Interconnect

Network) communications protocol with only 20Kbps for a lower cost. LIN is used for automotive peripherals such as door/central lock and window regulators. In terms of safety, engine information exchange is supported by CAN, including engine speed, rpm and CO₂ emission.

Establishing a Foothold with IDH (Independent Design House)

Since 1985, the State of California has stipulated that all vehicles must be equipped with OBD (On-board Diagnostic). Taiwan has also required all imported and new vehicles to be equipped with the OBD-II system since 2008. The OBD system is mainly used for monitoring the oxygen sensor, catalytic converter, and any irregularities of engine performance. Currently, one of the government's aims is to promote automotive systems that reduce air pollution.

In response, Swisys has launched the CAN Bus OBD-II network

“Swisys’s V-Bridge is a vehicle diagnostics and data collection solution, which can connect the driver or UBI insurers with the vehicle.”

bridge that supports the CAN 2.0A and CAN 2.0B protocols and complies with the OBD-II standard. It can capture SPD (speed), RPM (revolutions per minute), IAT (intake air temperature sensor), and VIN (vehicle identification number). It can also read non-OBD-II CAN infobox for further diagnostics of the vehicle. Moreover, the network bridge can provide additional information for the value-added processing of raw data.

The CAN Bus OBD-II network bridge provides a high-speed UART interface that can integrate Bluetooth, Wi-Fi, 3G/4G, DSRC, and NBloT. The product has also passed automotive reliability tests such as BCI (bulk current injection), EFT (electrical fast transient) and ESD (electrostatic discharge). It supports the versatile MCU/CPU firmware to facilitate secondary development and integration. In terms of application, the network bridge is especially ideal for fleet management, V2V communications, GPS, vehicle management, vehicle performance log management, vehicle diagnostics and maintenance, IVI (in-vehicle infotainment), vehicle pollution monitoring, and driving behavior analysis.

In short, Swisys’s V-Bridge is a vehicle diagnostics and data collection solution. Through Swisys’s in-house development of cost-effective hardware and consumer-oriented software, V-Bridge can connect the driver or UBI insurers with the vehicle. It can also be connected to smartphones through

Bluetooth, transferring the collected data to the app on a phone for browsing. The data will eventually be stored on a cloud database. It can be used for subsequent advanced applications and services such as big data predictive analytics.

The Swisys team said that in the first two years, the company explored the demands of the automotive market as well as its role and path. Swisys has now decided to, on the one hand, focus on the reading of the CAN bus signal. Swisys will cooperate strategically with SI and establish itself as the independent design house (IDH) of SI. A third party network developer will undertake subsequent applications. On the other hand, Swisys will take on reverse transformation and decoding of the signal. In addition to vehicle peripherals, Swisys will focus on reverse decoding and control of car lights and door signals. The company predicts that this will not come to fruition until next year.

Mastering Four Core Technologies

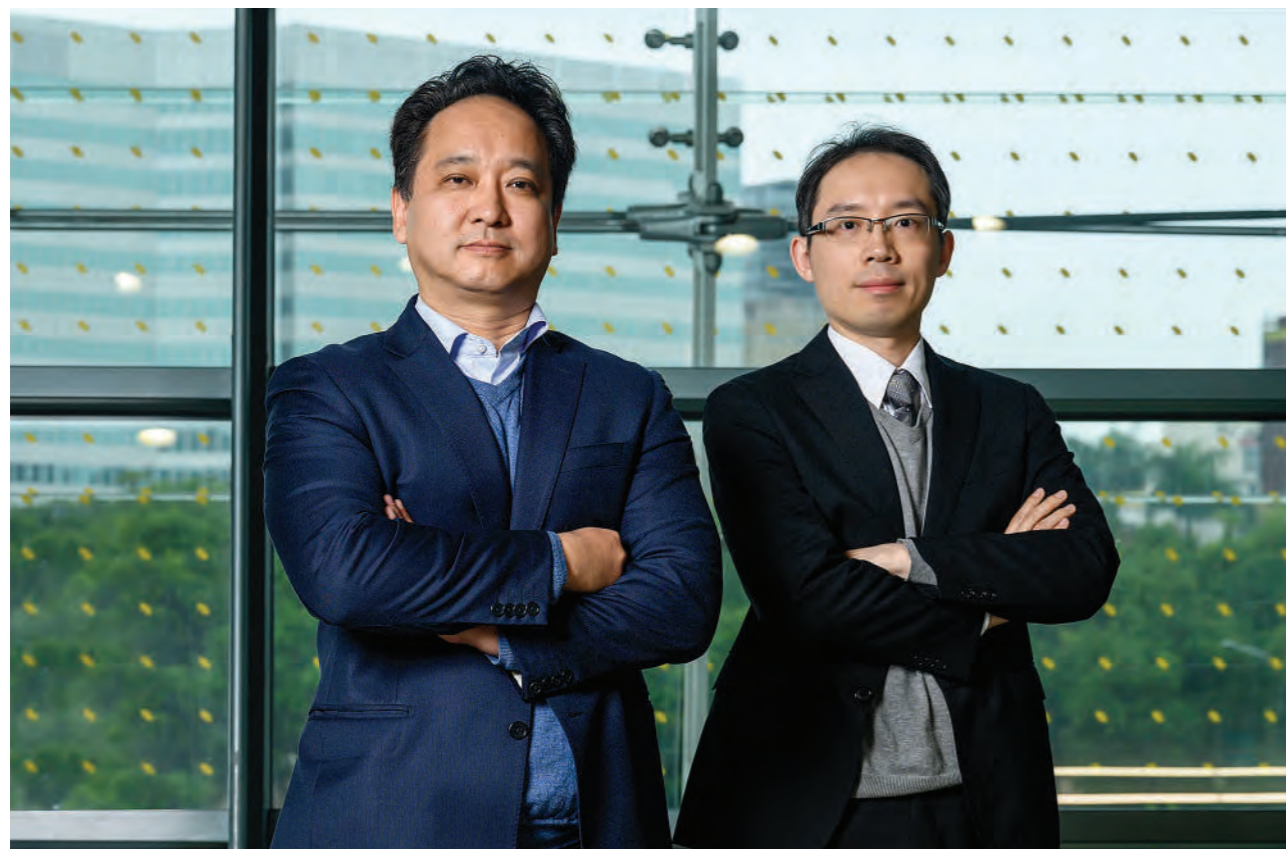
Through a process of refinement, Swisys has now mastered four core technologies: CAN vehicle ECU, OBD-II light-duty vehicle diagnostic system, SAE J1939 heavy-duty vehicle diagnostic system, and CANopen Industry 4.0 network. Light-duty vehicles are distinguished from heavy-duty vehicles by 3.5 tons and under. For fleet management, OBD-II is used in light-duty vehicles and the J1939 network bridge in heavy-duty vehicle. Currently, most of Swisys’ major clients are heavy-duty vehicles in the tour and intercity bus industries. Swisys assists its clients in collecting and analyzing relevant data through the J1939 network bridge. This helps manage their fleets including driving behaviors such as drunk driving and braking, as well as vehicle conditions, tire pressure, fuel consumption, driving distance, and vehicle dispatch.

On the whole, Swisys has long been cultivating talents and teams well versed in in-vehicle electronic communication protocols and technologies for the industry. It’s a professional team that is the best at capturing and diagnosing this type of information in Taiwan and throughout Southeast and East Asia. The team’s most important task is to capture the correct automotive electronic information and then work with the back-end system integrators to develop complete application products and services. 📱



The company representative Kun-Yu Li stated that it is centered on CAN Bus automotive electronics. The CAN (Controller Area Network) communications protocol is currently the hottest mainstream technology of VANET. Going forward, Swisys will focus on the collection, detection or diagnostics of CAN bus signals.

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THE FIRST INTEGRATED 60GHZ GESTURE RECOGNITION SOC

KaiKuTek's developing mmWave/deep learning technologies can meet the needs of specific applications of AI and create a sustainable and profitable business model

Mike Wang, the technical director of KaiKuTek, has lived in the United States for more than 30 years. He has more than 25 years of experience in analog/RFID design. He saw the potential of the application of the 60GHz mmWave WiGig (Wireless Gigabit, 802.11ad) in gesture recognition and went forward to establish KaiKuTek in January 2017.

After fundraising in seed round and Series-A funding, KaiKuTek has successfully developed the world's first 60GHz gesture recognition SoC that combines mmWave, a deep learning algorithm and AI accelerator. It is expected that mass production will begin by the end of the year.

Taiwan ranks highly in mathematical proficiency, and with the heavy promotion of AI by the government and the industry over the years, the country has cultivated many AI talents. It is because of this that Mike Wang decided to return to Taiwan and set up a company. However, he believes that most of the AI applications in Taiwan are currently limited to a few areas like

finance and shopping. Realistically, maximum synergy can only be achieved when AI is combined with hardware. At present, there is an enormous startup manufacturing industry chain in Taiwan. KaiKuTek's AI accelerator can meet the needs of specific applications of AI and core technology development in this industry and other markets.

KaiKuTek Melts mmWave, AI Algorithm and AI Accelerator into One Pot and Ventures into the Aspect of Sensor Fusion

"We have fused three major technologies, each having a high threshold, into one to create the 60GHz gesture recognition total solution." Mike Wang said: "The first is mmWave technology that includes radar signal processing, IC and antenna design. The second is deep learning and an AI algorithm. The third is AI."

This powerful integration skill spawned the world's first fully integrated embedded system that combines the 60GHz

"Applying a deep learning algorithm to sensor-side SoC eliminates bandwidth issues commonly found in cloud computing."

mmWave radar and dedicated AI accelerator. KaiKuTek has demonstrated its patent planning and mapping ability, including the special mmWave IC circuit design know-how that improves efficiency and reduces power consumption, as well as the special AI/deep learning algorithm that improves accuracy and reduces IC implementation, power consumption and complexity. In addition to providing a complete 60GHz hand/finger gesture recognition/tracking SoC and relevant algorithms, KaiKuTek will also develop other mmWave/deep learning technologies for different markets and applications.

KaiKuTek has selected 60 GHz because it is a free and unlicensed band. Its maximum bandwidth can reach 10Gb/s (current maximum available bandwidth) in the future. Many other

standards, including 802.11ad/WiGig and 802.11ay, are all on this band. More importantly, its radial distance resolution is 1.5 cm. This distance is especially important for gesture recognition applications because finger movement is very subtle. In addition, mmWave signal attenuation in the air occurs rapidly, so 60GHz is ideal for line-of-sight and short-range applications (fewer than 10 m). With a directional antenna, it can provide better privacy protection and reduce interference.

Mike Wang emphasized that the product adopts sensor-side computing, which has low-latency, provides immediate benefits, and is also very economical. Specifically, applying a deep learning algorithm to sensor-side SoC eliminates bandwidth issues commonly found in cloud computing. Also, compared to being run on software processors, a deep learning algorithm can provide lower latency and power consumption when combined with the dedicated AI processor on the SoC.

Focusing on the Gesture Recognition of Smartphones/Wearable Devices and Games

At present, gesture recognition/tracking has a wide range of applications. These include mobile phones (provides more diverse control experience), IoT wearable devices (smart watch, headset, smart bracelet), games (motion detection, game control), smart home/appliances (TV, lighting controls), in-vehicle controls (audiovisual controls, call answering), and security (keyless entry, alarm system).

"We founded the company and developed the mmWave radar 3D gesture recognition/control project because we did not want to be a typical trend follower. We increased our value and advantage through innovative integration methods. Also, by combining hardware and services, we can provide customers with customized value-added services," said Mike Wang. At present, KaiKuTek provides different business models such as built-in module supply and personalized gesture and gesture app development platform tailored to mobile devices/wearable devices, consumers and developers. Personalized gestures allows the user to add gestures and upload them to the cloud via the paid app. Lastly, KaiKuTek will establish a profit-sharing system with service providers to build a sustainable and profitable business model. 📱



KaiKuTek's powerful integration skill spawned the world's first fully integrated embedded system that combines the 60GHz mmWave radar and dedicated AI accelerator.

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HONOREES OF CES INNOVATION AWARDS INCLUDE 13 STARTUPS LED BY TTA

Taiwan has become closely integrated into the global ecosystem for technological innovations as its startups attracts the attention of investors worldwide through TTA's branding and marketing strategy. The national team of startups led by TTA has made a huge splash in Eureka Park during CES 2020, getting noticed by the international media and industry leaders. Among TTA's startups, 13 have been recognized with CES Innovation Awards for their achievements.

AGRITALK TECH

AgriTalk integrates biotechnology, IoT, big data analysis, and AI to develop a non-toxic agricultural regulation system

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AgriTalk Tech Inc. was founded by Dr. Wen-Liang Chen, an associate professor at NCTU College of Biological Science and Technology. The "AgriTalk Management Platform" system integrates biotechnology, IoT, big data analysis, and artificial intelligence to develop a non-toxic agricultural disease and fertilizer regulation. Through big data analysis and AI learning of farmland environment data collected by various sensors, AgriTalk has created the automated monitoring and management platform that can precisely regulate factors like disease, pest, soil fertility, moisture/humidity, temperature, and light exposure.

AgriTalk's mission is to use its technology to solve the current agricultural problems in Taiwan. This mission resonates especially well with Dr. Chen, who comes from a family of farmers in Yunlin. When he was a child, he witnessed the horrifying scene where his father almost died from poisoning while spraying pesticide. This is why non-toxic agriculture became his life's pursuit.

Another common problem on farms is soil acidification caused by long-term pesticide and fertilizer abuse, which can cause soil fertility and crop yields to decline. Dr. Chen said that long before the establishment of the company, its R&D team had already separated and developed biological pest inhibitors from 5,000 spider neurotoxins to solve this

issue. They can kill specific pests but are harmless to humans and bees.

According to Dr. Chen, the most direct result of farm population migration and aging is labor shortage. Dr. Chen believes that encouraging young people to return home is the solution to this predicament. Taking Nanzhuang as an example, he mentioned the township mayor has been eagerly inviting AgriTalk to set up a local demo site. Since young people understand and identify with technology, it will naturally spark their interest in coming home.

AgriTalk's automated, non-toxic, and precise fertilization can reduce labor demand, maintain soil nutrients, and prevent loss of land productivity, which

solves the soil acidification problem step by step. Dr. Chen mentioned that the most important thing is to attract investment from businesses and agricultural marketing channels. This is to build a more secure contractual business model for farmers, thereby opening an avenue that is connected to the upper, mid, and downstream, and provides long-term profit for the entire village and even the agriculture industry in Taiwan. This will encourage more young people to come home, and solve the issues of labor shortages and long-term care. According to Dr. Chen, AgriTalk is actively seeking strategic partnerships to achieve mighty goals and hopes to link all the companies, resources, products, technology, and solutions into a value chain. 🌱



AUTHENTREND TECHNOLOGY

A pioneer in password-less protection, AuthenTrend helps drive the trend towards fingerprint security

According to Verizon's data breach report, 81% of company data breaches are due to weak or stolen passwords. To reduce security risks and IT costs, while maintaining security and convenience, password-less authentication is gaining mainstream adoption. Fingerprint security solution startup AuthenTrend is founded on this belief.

"Our vision and goal is to replace passwords with biometrics," said Zake Huang, Vice President of AuthenTrend. "Password-less authentication has been widely adopted in Microsoft's Azure AD identity management solution. Google also announced the launch of its hardware security keys in 2017 to protect its 85000 employees from hacks and phishing. We can thus foresee a future without passwords."

AuthenTrend mainly provides fingerprint-enabled security key solutions targeting applications such as IT identification, access control and tracking, and blockchain cold storage. As a member of FIDO, the company has the largest number of FIDO2 certifications in Taiwan and is also the world's first fingerprint security key solution provider to obtain FIDO2 certifications.

It is also worth noting that AuthenTrend became a member of MISA (Microsoft Intelligence Security Association) in October 2018 and demonstrated its products with four other security key solution providers (including Yubico,

FEITIAN, and Korean e-WBM) at Microsoft's Ignite in November 2019.

Zake Huang says AuthenTrend has a close strategic tie with Egis Technology, which enables AuthenTrend to provide fingerprint cards and USB keys in an extremely compact size. These products boast the fastest recognition speed and extremely low power consumption. Through energy optimization techniques, the devices can support up to 100 times of fingerprint recognition.

With the company's patented standalone enrollment technology, users can register their fingerprints directly on the cards or the USB keys without needing to

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download an app for registration as with traditional fingerprint devices.

AuthenTrend will initially target the Asian market including Taiwan, Japan, and Korea before expanding into the US and European markets. The company has made remarkable achievements in the medical, education, enterprise, and government sectors in Japan. For example, AuthenTrend has helped a Japanese university build a fingerprint attendance system and worked with a leading medical equipment vendor to integrate its fingerprint recognition solution to automate data transmission of measuring the instruments securely and efficiently. ■



BRILLIANT OPTRONICS

Brilliant Optronics turns glass into smart windows and solves the challenge of single-function and high cost glass replacement

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With the advancement of new technologies and the arrival of the Internet of Things, a diverse range of smart home products have sprung up and are transforming our everyday lives. Brilliant Optronics, a tech startup based in southern Taiwan, is one of the major companies that took advantage of this trend. They have recently developed a new type of smart film that can turn ordinary glass panels into smart windows.

Brilliant Optronics is a startup focusing on photonics, co-founded by Professor Tsung-Hsien Lin, the Chairman of the Department of Photonics at National Sun Yat-sen University, and the university's two Ph.D. candidates Heng-Yi Tseng and Cheng-Chang Li. Their primary product, a smart film that is capable of adjusting light transmissions, has taken the university more than a decade to develop.

Unlike a typical smart film, which can only display a black or cloudy effect when charged with a current, Brilliant Optronics' smart film is capable of showing three different kinds of effects. When not charged with power, its surface is clear and transparent; when charged with power, its surface can either turn dark or cloudy, or become a black transparent screen for displaying images and videos.

Brilliant Optronics' smart film is constructed by placing a liquid crystal

molecule film between two PET films. By controlling the voltage applied to the film that forces the liquid crystal molecules to change alignments, the film can exhibit the three contrastive effects mentioned earlier. Users can press a button, a Bluetooth or WiFi device, or app to activate the voltage control module that allows the film to switch between its different states.

The installation of the smart film is simple. To apply it, just adhere it to the surface of a window. The fact that there is no need to replace or install new windows saves a lot of costs and reduces risks, especially for commercial buildings or skyscrapers. Due to the

smart film's compatibility with different curvatures and sizes, it can be applied to all types of glass.

Although their smart film has yet to hit the market, Brilliant Optronics has already attracted a lot of attention from various expos and startup competitions. Many potential investors are also showing interest in the team.

Heng-Yi Tseng says that their main goal, for now, is to improve their smart film technology's yield rate and production processes. After achieving a steady yield rate, the startup team will begin to purchase equipment that can produce films on a larger scale. ■



GANZIN TECHNOLOGY

Ganzin Technology's eye tracking module combines the virtual and real world, replacing the hand-operated user interface

There is always an ideal user interface for every technology product. Only when human-machine interaction becomes intuitive and easy to operate can this product become a part of everyday life. "The user interface for computers is a mouse, and for smartphones it's a touchscreen. We believe the best user interface for AR/VR products is our eyes," said Shao-Yi Chien, the founder of Ganzin Technology and professor at the NTU Graduate Institute of Electronics Engineering.

Recognizing that AR/VR will be the next revolution that transforms people's lives, after computers and smartphones, tech giants such as Microsoft, Facebook, Google, Magic Leap, Sony, and HTC have dived into the development of AR/VR devices. However, most of the products still rely on handheld controllers, which are very user-unfriendly. As a result, VR/AR developers have been aggressively seeking new technologies to develop new user interfaces.

Ganzin Technology has put a lot of effort into developing eye tracking technology, to enable AR/VR users to control devices with their eyes or view the information of an object when they look at it, thus releasing their hands. It is possible that in the near future, assembly line workers in a factory can browse and exchange information of the object they are assembling using an AR/VR headset, allowing AR/VR devices to create more value and improve work efficiency.

The Aurora eye tracker module, Ganzin Technology's first-generation product, can precisely track eye movements. More importantly, it features ultra-low power consumption which consumes only one-sixth of the power of its competitors. Once the battery is fully charged, it will run for 12 hours consecutively, supplying enough power for a full day of activity. Also, the Aurora is light-source agnostic and can be used both indoors and outdoors, significantly increasing its usability. With a small form factor, the module can be placed on the frame of any smart glasses or AR/VR headsets.

Shao-Yi Chien adds that eye tracking technology has not been widely adopted in AR/VR devices, with Microsoft being

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the only company that plans to mass-produce this technology on its HoloLens 2. In addition to gaining a foothold in the manufacturing and gaming industries, Shao-Yi Chien has identified four key applications for eye tracking technology, including market hotspot analysis, medical treatment, educational training, and mobility aids. For example, eye tracking can be used to check the speed of pupillary constriction during medical treatment to inspect eye or brain diseases. It can also be applied in educational training to ensure students follow standard procedures before working online. As for the application in mobility aids, eye tracking technology enables patients diagnosed with a stroke or cerebral palsy to communicate with people.



HAPPY ISLAND TECH

To provide a comprehensive sports experience, Happy Island Tech is gradually building a sports technology ecosystem

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Happy Island Tech Co. Ltd is a startup company focusing on sports wearable technology. Galerdo Beker Pro, its second-generation audio swim tracker & music player, not only records data such as swimming time, distance, round trips, and number of strokes but also has a built-in interactive real-time cloud voice assistant. Users can listen to swimming conditions in real time without headphones or connecting to a mobile phone, and can also listen to music while swimming underwater. This innovative wearable device has been recognized by the industry, winning the CES 2020 Innovation Award.

Jordan Huang, the founder and CEO of Happy Island Tech, who has been engaged in research and development for nearly ten years, established the company that specializes in sports wearable technology in 2012, with the combination of technology and sports interests. "The company's goal and vision are to provide comprehensive sports experiences for the target group and to build a sports technology brand generally recognized by users," said Jordan Huang.

After Galerdo Beker, the first-generation music shell of the product, the company launched the second-generation Galerdo Beker Pro, which is the world's first game voice tracker specifically designed for swimmers worldwide, without headsets, and with a built-in instant voice cloud AI assistant. The most enjoyable features

of the product are the built-in AI and underwater bone conduction technology. There's no need to wear headphones or use smartphones; the voice assistant can instantly notify the recorded swimming data and status to users.

"Managing independent technology, establishing a brand, outsourcing production, and retailing through e-commerce are the four major elements of Happy Island's business model," said Jordan Huang, "First of all, we have exclusive patented technology and innovative products to create brand awareness and trust that build up market influence. Happy Island manages the technology and marketing, while the production is outsourced to a professional third-party team. Through e-commerce,

we can quickly and effectively connect to the target customers and promote to the global market."

Additionally, Galerdo Beker Pro has an exclusive App that supports the synchronous data uploaded to the cloud and community sharing, thereby creating a sports community. In the future, in addition to launching wearable devices for different sports, the company will also launch voice-training courses. Users can complete training courses at different stages through the guidance of voice commands. Jordan Huang specifically points out that in the future, swimmers, coaches, swimming pool operators, equipment manufacturers, etc. will be connected to create an exclusive sports technology ecosystem.



IBLE TECHNOLOGY

Enjoy the forest anytime and anywhere, ible Technology creates the world's most mini wearable air cleaner

Air pollution has become a global problem, while the United States, Japan and other countries are more troubled by hay fever. Large air purifiers are commonly used to protect people while indoors. However, for people who often travel around, there will inevitably be risks for the respiratory system. To solve this long-standing problem, ible Technology Inc., a startup company, has specially developed the world's most mini wearable air purifier using anion technology. It allows users to easily eliminate the hazards of PM 2.5, pollen, dust and volatile gases anytime, and anywhere.

ible Technology Inc. is an Internet of Things and smart wearable startup company founded in 2015, with its team coming from monitoring software companies. The company's main business includes Internet of Vehicle projects and smart wearable products.

"In order to balance wearability, the company has developed the world's smallest wearable air purifier Airvida using anion technology, with a weight of fewer than 20 grams and a battery life of 28 hours," said Fred Chein, CEO of ible Technology Inc. "With the exclusive circuit design and technology, the purifier can release 2 million anion/cm³ every 0.6 seconds near the user's nose and mouth. Its concentration can reach 100 times that of the anion in the forest. Any PM2.5, pollen, dust, and volatile gases will fall to the ground, so

the product is like an invisible mask for the nose and mouth."

For different user groups, the product has an L1 model for women, M1 for men, and C1 for children. Users can easily wear it for various occasions and use the charging stand after returning inside to use it as a desktop or bedside air purifier. In addition to launching next-generation products of the future, the company will also develop related apps and new wearable products.

The Airvida wearable air purifier, which won the CES 2020 Innovation Award, is currently sold in 10 countries around the world. This product is even more popular in Japan and has won the favor of local consumers. It has also been strongly



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recommended by the Japan Ringolf Golf Association and Nail Art Association.

In market operations, ible Technology Inc. is committed to deepening product lines and brand awareness through agents and partners who can cultivate the local markets and communities. At the same time, the company has expanded its locations and adjusted its channels. In terms of sales, it has adopted the strategy of both online and offline retailing. Fred Chein says that major pharmacy chains have become the main physical channel (including all 600 Watsons in Taiwan). With the expertise of pharmacists, local market education can be implemented to let more consumers understand the product's features and advantages, thereby increasing sales. ■

JARVISH

Jarvish's smart helmet provides a better experience for motorcycle riders and sets new trends in the motorcycle industry

Startup company Jarvish, whose core members mainly consist of former employees from Hon Hai, has spared no efforts to develop top-notch motorcycle gear for connected vehicles. By utilizing its strong technology integration capabilities, Jarvish has brought the world a smart helmet featuring a stylish design and practical functions.

Jarvish's smart helmet comes with a built-in 2K HD action camera, a sensor that detects whether the helmet is being worn, OGS surrounding HD sound system, smart voice control system, wireless charging module, and HUD (Head-Up Display) that allows you to browse information while riding. "Unlike other mobile devices, smart helmets need to provide not only high performance and advanced technology but also safety. Therefore, we have studied safety regulations in different countries and set our eyes on markets with high requirements," said Jeremy Lu, founder of Jarvish.

To meet the safety requirements, the materials, the placement of the microphone, camera, HUD, battery, and Bluetooth module, as well as the wiring of the helmet must be thoroughly planned. For example, since the battery is placed near the rider's head, the lithium battery commonly used in commercial products must be replaced with the explosion-proof ceramic battery intended for military use. The ceramic battery can run for up to five

hours. Also, the HUD consumes power constantly; therefore, the battery size and the thickness and weight of the EPS insulation panel must be designed properly. These details all demonstrate Jarvish's ability to integrate technologies from different industries.

When the helmet is connected to the network via a smartphone, the rider can use leading brands' voice assistants such as Siri, Google Assistant, or Alexa to make phone calls, activate navigation services, listen to music, or broadcast a live video on Facebook without using their hands. The rider can also customize voice commands via Alexa Skills Kit if needed.

Jeremy Lu added that they would try to provide support for all mainstream voice

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assistants in the helmet. That being said, there are less than 30 voice commands used when riding a motorcycle. Therefore, Jarvish has developed its own voice assistant specially designed for riding scenarios, and also worked with the world's largest mapping software company. By using its own app, Jarvish' smart helmet can be updated with all kinds of voice information including riding speed, speed camera warnings, weather forecasts, nearby gas stations, nearby Gogoro charging stations, and navigation data.

"Once Jarvish's smart helmets are widely adopted, the big data they collect can also be used to improve traffic conditions and construct smart cities," said Jeremy Lu confidently. ■



LULUPET

AI recognition in the litter box: detect abnormal cat litter before it's too late

Cats are quite capable of withstanding pain, hiding any signs of discomfort they may be experiencing. This means that the quickest way to tell your kitty's condition is through its litter. Taiwanese startup LuluPet has developed an intelligent litter box solution. Combined with AI image restoration technology, this litter box automatically detects cat litter condition and helps look for abnormalities in the cat's body in places where cat owners cannot.

Among the top ten causes of death for domestic cats, seven were feces-related diseases. Cats, however, are born concealers of their own weaknesses, making it difficult for owners to find out whether their precious feline is in pain. LuluPet illustrates this with the example of kidney failure: Statistically, a cat's kidneys are 70% damaged by the time the owner suspects an illness and brings the cat to the veterinarian. The organ damage is not only irreversible, but subsequent medical fees may cost up to US\$ 1,200.

Some symptoms aren't completely undetectable. According to the Bristol stool scale, cat feces may be divided into 7 categories, ranging from constipation to diarrhea; constipation may be caused by the pressing of a tumor, while symptoms of diarrhea may be the result of common systemic diseases such as kidney failure. Stool analysis thus becomes the most straightforward way of detecting these diseases.

People are paying more and more attention to pet healthcare, yet there will inevitably be owners who are weighed down by the complexity and busyness of modern life and become less perceptive of their pets. Owners who raise multiple cats find it difficult to assign litter to a specific cat. LuluPet identified this pain point and put 2 years into developing an "intelligent litter box."

This intelligent litter box works mainly by using a camera to detect whether the cat is urinating or defecating. It not only detects littering frequency and litter weight but also the condition of the litter (normal, constipation, diarrhea, etc.). After judging litter conditions through the use of AI image restoration, it uses this data to notify the owner of the cat's health.



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LuluPet also notes that a cat's behavior of burying their litter is nothing to worry about, as the intelligent litter box combines cat identification, weighing, fur identification and AI image restoration technologies. The litter box comes with 2 AI systems: one for litter analysis, and another that analyzes clumping between litter and litter box material. The latter attempts to reconstruct litter shape and present it to the former for confirmation, and can currently identify litter with an accuracy of up to 90%. The Intelligent litter box keeps a record of cat conditions that often go unnoticed by the owner. LuluPet says that it also plans to further develop its AI and allow it to conduct initial diagnostics via stool observation the day after enough data has been collected.

MINDTRONIC AI

Taiwanese innovative IP and AI engineering provider Mindtronic AI launches AI turnkey solution for automotive industry

In 2017, Mindtronic AI set up offices in Austin (US), Taipei (Taiwan), and Shanghai (China). As an AI startup specializing in human-machine interaction, computer vision, and automotive applications, Mindtronic AI, whose R&D workers make up 95% of the total workforce, has positioned itself as an innovative IP provider. Committed to becoming the "ARM of the automotive industry," Mindtronic AI has won three innovation awards at CES and the German Design Award since its establishment, demonstrating its outstanding capabilities in innovation.

"The Taiwanese manufacturing industry has long been dependent on the contract manufacturing business model characterized by low-profit margins. The tariff pressure from the US-China trade war has further compressed Taiwanese manufacturers' profitability and room for development," said the AI team at Mindtronic AI. "In fact, Taiwan should use the tremendous pool of talent it has to develop its own IP industry."

Automotive applications (including smart vehicles and self-driving cars) and AIoT are recognized as two major driving forces for the market. With high hopes for these two trends, Mindtronic AI has gathered specialists in AI algorithms, systems, software, automotive applications, and hardware from around the world to develop innovative IPs and technology. "Once an IP is successfully developed and adopted, it can be applied

to various applications and regions, thus facilitating the global deployment of AI," said the team at Mindtronic AI.

Mindtronic AI is currently focused on three areas including ECU (Electronic Control Unit, also known as in-vehicle computers) integration, AI empowerment (application of AI in automobiles), and digital cockpit enhancement. In line with these applications, Mindtronic AI has launched an AI turnkey solution consisting of embedded DMS modules, AI digital cockpits, and UI/UX design. Mindtronic AI also provides a stand-alone DMS module that has been validated in real automotive use cases and can be integrated with existing dashboards. Additionally, the company has developed an SDK compatible with any embedded



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hardware systems. In terms of AI digital cockpits, the company provides design services to integrate the embedded AI framework, model, and applications into a full-stack automotive hardware and software platform.

Mindtronic AI's DMS modules target fleet management operations and OEM customers. With the integration of big data analytics, the modules can provide subscription-based predictive analytics services. For example, a fleet can analyze the driver's behavior and provide the best solution for reducing energy consumption, troubleshooting, and maintenance. Mindtronic AI's goal for 2020 is to create a semi-autonomous system that combines DMS and ADAS systems.

NESTECH CORPORATION

Nestech's smart system can improve the flexibility of company management

With the advent of the smart city, the biggest challenge will be how to apply intelligent management systems to various company operations.

In order to help small and medium-sized hotels and businesses conserve human resources, the startup company Nestech has launched a smart access control and unmanned reception system. It is a simple visual system that replaces conventional cumbersome methods, thereby improving the flexibility of company management.

Founded in 2013, Nestech is an ICT developer specializing in IoT software and hardware integration. To optimize front desk management for hotel bookings, Nestech launched the CellBedell smart access control and unmanned reception system in 2017. It is a system solution that provides greater convenience for small and medium-sized hotel management.

The administrator needs only to download the app to send the password to the registrant and set it to automatically expire on the day of checkout, which will economize manpower. With edge and cloud computing, CellBedell can also be used in offline mode.

Since CellBedell does not require cabling. Due to its small size and price advantage, it is extremely popular in the hotel industry across Southeast Asia.

Nestech has recently added a smart disaster prevention function to CellBedell. With built-in sensors that detect temperature, humidity, smoke, and gas, CellBedell can signal the status behind every door as soon as a fire starts. Jia-Jia Yeh, the co-founder of Nestech, points out that there are approximately 3 to 5 doors on every floor of a regular building. In the past, the method was to sense the temperature of doorknobs and assess smoke conditions, which shortens the escape time. The status inside the room can now be visualized by CellBedell's signals, increasing the chances of escape during critical periods.

In addition to increasing escape efficiency, CellBedell's disaster prevention system can also provide

early warnings. By determining the safety factors of the rooms, the system's sensors can monitor each area in real-time and notify the administrator at the onset of a disaster. Jia-Jia Yeh says it is like the "brain" of the building, a system that can regulate the overall safety.

In concert with the government's promotion of 5G, Nestech will work with FarEasTone and Qualcomm in the coming year to conduct field verification for the smart disaster prevention system at Central Taiwan Science Park, AI Robotics Hub, and Hsinchu American School. Should fundraising and team expansion be successful, Nestech will venture into B2C applications to build an even more convenient and secure smart living experience. 📱

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RICE EAR

Rice Ear's LuftQi is committed to developing non-consumable nano photocatalytic purification technology to improve air quality

LuftQi is a startup that develops mini air purifiers. Its patented nano photocatalytic purification technology decomposes allergens that cannot be filtered by traditional air purifiers. It is a game-changing technology for improving indoor air quality and respiratory health.

LuftQi's Luft Cube mini air purifier has already received the Taiwan Excellence Award and America's CES 2020 Innovation Award.

Titus Chang, the co-founder and marketing director of LuftQi, has previously worked in the LED industry. He saw that there was a lack of local brands in Taiwan's LED industry, and with the pressure exerted by China's LED policies in recent years, he decided to start a new company, LuftQi. Among the three basic necessities of life—air, sunlight and water, LuftQi is dedicated to "air."

Interestingly, the word "luft" means "air" in German. The name reflects the company's mission to improve air quality and health with its experience in LED technology.

According to relevant statistics, Titus Chang points out that driven by global urbanization, one-eighth of the world's population will be concentrated in 33 megacities by 2030. The air quality in these cities will inevitably deteriorate due to overpopulation. The WHO statistics also indicate that

air pollution and allergens account for approximately 7 million deaths each year. That is why LuftQi is committed to solving the air pollution and respiratory health conundrum.

After six crowdfunding efforts, LuftQi has made six major improvements to the original PoC verified product, ultimately launching the Luft Cube mini air purifier. The Luft Cube is claimed as the most lightweight, non-consumable air purifier on the market. It is also the first model to employ nanotechnology.

With the nano photocatalytic purification technology, the Luft Cube can effectively decompose and destroy harmful substances and allergens such as molds, bacteria, pollen, PM 2.5 organic

compounds, and bioaerosols.

The Luft Cube does not require a filter, which reduces replacement costs and prevents secondary pollution. Also, with a power consumption of only 2.5W, the Luft Cube is extremely energy efficient in the long run.

Striving to make further advancements, LuftQi is currently developing a new special photocatalytic technology. Titus Chang mentioned that the sterilization and decomposition efficiency of the new product will be doubled. A sensor will be installed for data collection as well as big data analysis. New value-added services and a subscription business model will also be launched in accompaniment soon. 📱

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TAIWAN USER-FRIENDLY SENSOR & TECH

Say NO to food allergies! TFT creates personalized food allergen detection system

Taiwan User-Friendly Sensor and Tech (TFT), a startup team currently coached by Taiwan Startup Institute, will be officially launched in April next year. Three experts in the medical testing field founded the company. For a long time, they have educated the public on the immediate health hazards the food allergens may cause. At the same time, they are optimistic about the huge market potential behind food allergies and decided to explore the potential business opportunities and value of this market.

Wen-Hao Chen, founder and CEO of TFT, pointed out that food allergies have become a present-day epidemic. Many people are allergic to foods like peanuts, nuts, seafood, milk, etc. Almost 34 million people in the United States have severe symptoms of food allergies. Reactions to allergens in food cause one hospital visit every 3 minutes in the U.S., accounting for 22% of all emergency patients. According to the Food and Drug Administration (FDA) of the U.S., the annual cost of health care for food allergies is about US\$ 25 billion.

Currently, common food allergen detection technologies mostly use a fast-screening test, similar to the pregnancy test. Thus, the test result is only "yes" or "no," but cannot meet the needs of users with different physical conditions. In response to this, the food allergen detection system introduced by

TFT fills in this gap and uses medical-level detection technology to further test the actual amount of allergens in food, helping different users effectively ease the allergic symptoms.

Wen-Hao Chen mentioned that this food allergen detection system combines nanotechnology to enable the fastest process of detection in the industry (up to 2 minutes), and achieves high quality and high sensitivity performance with a limit of detection (LOD) of 1ppm.

The team also uses AI and big data analysis technology to create a cloud monitoring system and personalized applications for long-term tracking. Users can easily track and manage the date of detection through mobile

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apps. At present, there are many types of allergens, with gluten as the hottest topic among them. Even ordinary people have begun to focus on gluten-free foods. This, in turn, has led to the growth of the market for gluten-free food. In the U.S. alone, the market size reached US\$ 9 billion in one year. Given this, TFT will start from gluten, in the beginning, to enter the allergen detection market, and then gradually expand to other allergens such as peanuts, milk and nuts.

"We have recently reached a cooperation agreement with a well-known gluten-free food supplier in the U.S., which serves as a great starting point for our next expansion to gluten-free factories," Wen-Hao Chen concluded.



YUNYUN TECH

Yunyun AI Baby Camera leads the industry with smart baby monitor "Cubo" giving parents peace of mind

Many first-time parents are worried about suffocation risks when their baby rolls over onto their tummy while asleep or when placed on their front to sleep. Recognizing the lack of a monitor capable of detecting and alerting such situations automatically, Yunyun Tech, a startup developing baby monitoring solutions, was founded by a group of first-time parents, pediatricians, and AI experts.

After surveying 8000 first-time parents and carrying out 158 in-depth interviews, the company has developed the world's first AI-driven smart baby monitor Cubo to keep babies safe and give parents peace of mind.

"Yunyun Tech was founded in 2017 and became part of the AppWorks program, the biggest startup accelerator in Taiwan, in March 2018," said CSO Brian Lin. In May 2018, Yunyun Tech launched a crowdfunding campaign on zec zec and reached its crowdfunding goal of more than US\$ 33,000 within 30 minutes. The system even crashed at some point due to too many donors. Within hours, more than US\$ 330,000 was raised, making it the fastest project to ever to raise US\$ 330,000 on zec zec.

Cubo, which looks like a white bird, offers four key features: mouth and nose coverage detection, dangerous zone detection, automatic photo taking, and ultra-HD night vision. It also provides a crying reminder, two-way audio, invisible

IR night vision, temperature & humidity detection, night light, and a stand that grows with the baby.

First-time parents can use the app to check on the baby in real time, check the temperature and humidity, take photos or record videos remotely, and record the baby's growth using the built-in time wall function.

"Our dream is to become a leader in the baby monitor market," said Brian Lin. "Apart from developing new features such as breathing detection and embedding heart rate and fever sensors into the device, we plan to launch subscription services offering a variety of content such as event information, music, sleep analysis, and the Cubo

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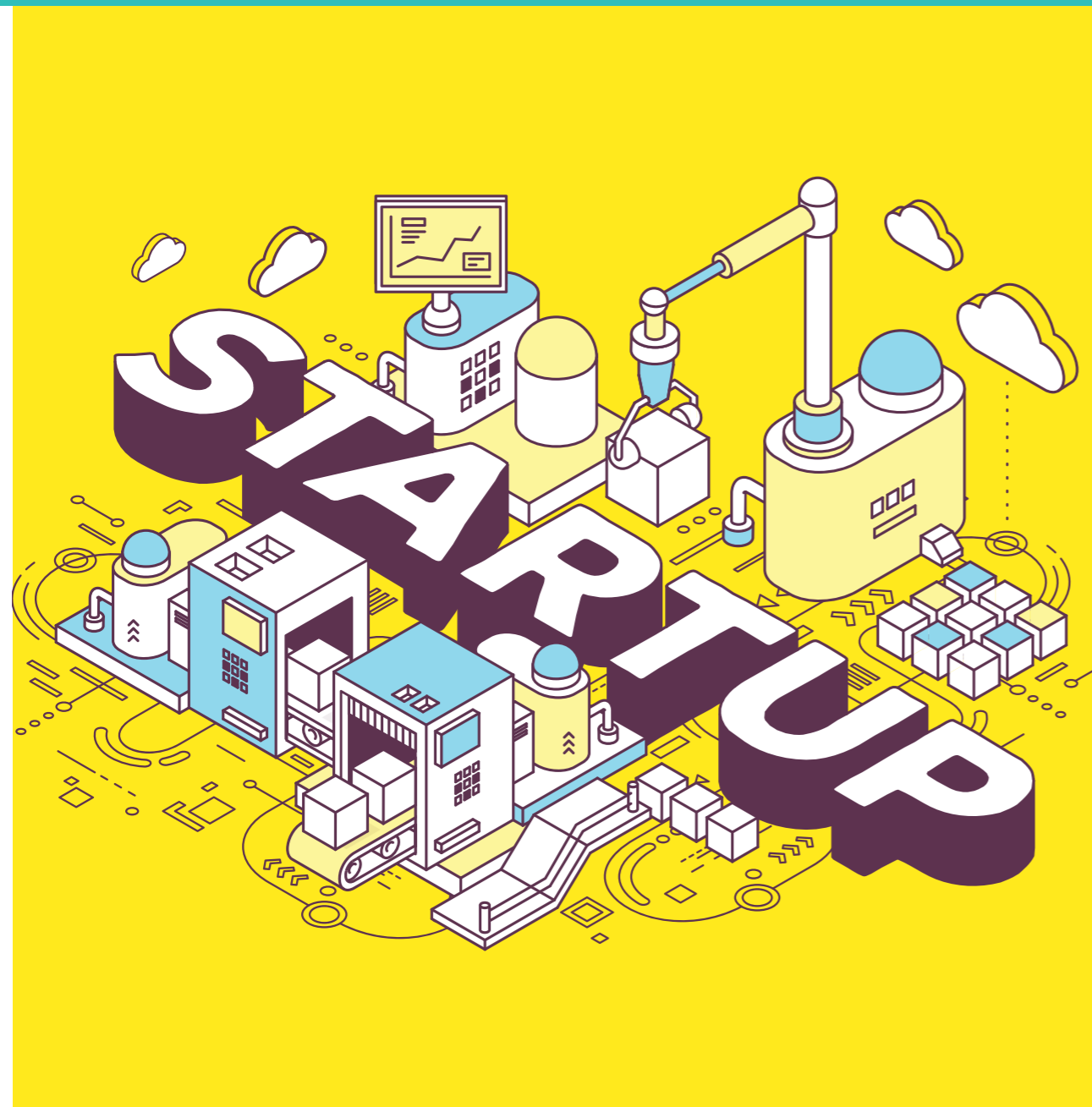
Store. We will also work with third parties to build an AIoT and big data ecosystem.

With Taiwan as its home market, Yunyun Tech has set its eyes on global expansion. Brian Lin believes the biggest challenge for a startup is to decide what to keep and what to toss while identifying the target market. Therefore, Yunyun Tech will initially focus on English-speaking markets. The U.S., in particular, is the world's biggest baby product market where 4 million babies are born every year. Yunyun Tech has adopted a B2C business model by selling directly to end consumers through Amazon and its official website. Currently, the company has customer service teams in Taiwan and the US and aims to provide customer services 24/7 in the future.



WITNESS THE VAST INNOVATIVE POWER

The various international accelerators that are partnering with TTA have been an enormous assistance to the development of domestic startups. Their dedication and impressive results can be witnessed in the following interviews that were held with MOX Managing Director William Bao Bean and several startup teams at TTA's Demo Day event.



INTERVIEW WITH WILLIAM BAO BEAN @MOX7 TAIPEI

On August 27, MOX hosted their 7th demo day showing off 10 of the most promising startups in the fields of Fintech, digital identity, EdTech, healthcare IoT, entertainment, and social commerce.

MOX, or Mobile Only Accelerator, is operated by Silicon Valley based venture capital firm SOSV and oversees US\$ 650 million in assets. SOSV is recognized as one of Silicon Valley's most successful VCs with a net IRR of over 30%, putting it in the top 10% of VC funds in the world.

MOX entered Taiwan in 2015 and has since partnered with Taipei Tech Arena (TTA) and the Ministry of Science and Technology (MoST). We sat down with MOX Managing Director William Bao Bean to learn more about MOX, the partnership with TTA, and the secret to the accelerator's success.

How Strong Are the Teams Presenting Today?

We look at MOX in terms of batches. We don't look at the companies individually until we've worked with them for at least 6 months. The better way to answer this question is looking at historical context.

MOX was the first international accelerator to launch in Taiwan and our first batch was in January 2016. Our second batch didn't occur until a year later. Each successive batch is getting better because our brand is

we're working with most SEA telcos as well as some major media companies and cell phone brands. Our ability to help our companies get free users in India and Southeast Asia is our greatest strength.

South Asia is much greater now and we're able to attract companies with better traction. Just in this batch alone, we have companies doing over a million in revenue before this program...So this batch is probably the best batch we've had, not to the detriment of previous batches but because the program has come a long way.

improving, and the value that we deliver is increasing. The goal at MOX is to help our apps get free user acquisition... now, our MOX apps alone have almost 80 million users for cross-promotion and



What Are Your Expectations for This Demo Day?

I think the most important thing for any entrepreneur is to clearly communicate the problem they're trying to solve, why solve it, and why they're the best team in the world to solve that problem. That's all we're looking for...the biggest challenge for entrepreneurs is they spend so much time in the problem working on the product that they just talk about the product instead of why the product exists. Most investors actually walk away from meetings without knowing what the startup really does or why it's important. Clarity of information is really our focus in demo day.

So How Does MOX Train and Select These Teams?

We select companies that we can help. They need to solve a problem or challenge in which we have interest. They need to be the right team to solve that challenge, but we also need to be able to help them because our program is expensive. We're a VC that charges 6% equity with our program, so how do we earn that? We solve 3 challenges for entrepreneurs, the challenges being user acquisition, mentorship from other serial entrepreneurs, and finally what you'll see today, the process of fundraising.

Most entrepreneurs are really good at solving problems, but they suck at fundraising as it's a different skill. You'll notice in today's pitches that they almost follow a formula; and while every

company is different, the information investors need to make an investment decision is basically the same.

Can You Elaborate on That?

We follow an effective format and are the #1 ranked accelerator in Asia by the research firm GUST in 3 areas. We've accelerated more companies than any other accelerator, we've invested more money into companies than any other accelerator, and the money we invested has raised more money from other people than any others in Asia. We're the first accelerator to have a unicorn go through the program—2015's BitMax, the world's #1 cryptoexchange in the world by trading volume.

SOSV Has 6 Accelerators Around the World, Are There Any Markets You're Looking to Expand into?



SOSV is a VC fund and our accelerators are all global, we don't focus on a particular geography. What MOX does is invest in companies around the world, and we help them enter Southeast Asia, South Asia, [and other countries]. Our focus is not in one geography but to help startups be in multiple regions. The challenge is that unless you're in North America or China, your home market is too small to build a real business.

Why Did MOX Select Taiwan as Its Location?

Taiwan has always had a great and vibrant tech ecosystem, but it didn't really quite make the transition from hardware to internet. However, there are quite a lot of well educated, super talented programmers here. There's a shortage of actual companies but the talent is here, and that's the reason we're in Taiwan.

Think about it as a natural resource; China may have a bigger market, India has lots of people, Taiwan has amazing talent. Dollar for dollar Taiwan programmers are the most productive in all of Asia as shown in data from a Fortune 500 company. That company actually moved their development operations to Taiwan after the internal study and we thought we would also take advantage of that.

We've landed 10 of our startups in Taiwan. 6 of them have done hires here, and at this point I think we have more than 100 employees for our global internet companies in Taiwan, including over 60 programmers. These are not people just doing robot work, not outsourcing type stuff. These are people actually building products being used by millions of people around the world. You may not see the next

Paypal in Taiwan but the next Paypal may setup an office in Taiwan and our goal is to bring them here. When they do that, the people who work in those world-leading internet companies will pick up the skills necessary to start their own companies.

How Does the Partnership Between MOX and TTA Work? How Has the Partnership Helped Sustain Your Program over the Past 4 Years?

We were the first international VC to come into Taiwan without government support. We came here because of business reasons, not subsidies. Once we got here, what we're doing actually fit quite well into the strategy of TTA. What we do is, we try to bring international companies in because you don't become a tech hub without attracting the best of

the best around the world, and that's our job, as well as showing them the benefits of being here.

We started working together last year and the support has been great. We have a wonderful office, we have rent space, and we have a bunch of connections into the local startup ecosystem. We run joint happy hours which are mixers for both networking and education. We fly mentors in from around the world to mentor our companies and also open them up to the community so that anyone in Taiwan can attend the mixers and learn from the mentors that come here.

Speaking of Learning from Mentors, Do You Have any Advice on How We Can Energize Taiwan's Market and Take Our Teams Abroad?

When you haven't gone swimming before, you look at the water and it's scary. Once you jump in, it's actually not that scary once you start swimming. Entrepreneurs might be scared to jump into the water, but once they're in they swim really well. My advice is to jump into the water.

You have a lot of earlier stage accelerators supported by TTA whose focus is on homegrown startups. We are a later stage accelerator focused on scale-up and cross-border market entry. Some of their later stage companies have gone through our program but we're also pulling startups from around the world into Taiwan. 🇹🇼



THE HIGHLIGHT OF BE ACCELERATOR'S DEMO DAY #2

On July 1st, BE Accelerator, TMU Accelerator, and GLORIA hosted a second Demo Day showing off 10 of the most promising startups hailing from countries such as the U.S., Canada, Singapore, France, and Taiwan.

The theme of the event, "Health Tech Epoch" was on display at the entrance where old and new hospital room technologies were compared, giving us a taste of the future.

The event kicked off with a keynote by Suzanne Shugg, CEO and founder of the U.S. company Teleplus Healthcare. With more than 10 years of experience working in the medical industry, she shared the current state and difficulties of telecare in the U.S. as well as the different types of problems doctors face in Taiwan.

During her talk, Suzanne noted that despite Taiwan's advanced healthcare system, it has unique problems that allow for opportunities in the further development of health tech.

The majority of companies on hand to pitch at the demo day held a B2B focus and sought to disrupt current diagnostics and treatment methods through fields such as artificial intelligence, telecare, and biotechnology. Many of the companies sought to raise a seed round while Diabnext and ucare.ai both aimed to expand out of their home markets by raising a series A round.

The Great Launchpad for Health-Tech Startups

For many of these companies seeking to get their companies off the ground, gaining the support from BE Accelerator and Taiwan Tech Arena (TTA) has become critical for their success.

It is common knowledge in the tech industry that Taiwan provides a special environment with an excellent network of hardware manufacturers and suppliers that can quickly form ideas into prototypes. Taiwan also has an advanced software industry with highly capable talent. While these are invaluable for any tech startup, companies working in the field of health tech are often bottlenecked by the lack of willingness from patients to share data with tech companies.

BE Accelerator bridges this gap by partnering with Taipei Medical University, a pioneer of medical AI in

Taiwan that also provides access to data sets for clinical trials and more. This combination of hardware/software infrastructure with access to clinical trials truly sets Taiwan apart from the competition as success in this market helps companies gain a foothold for expansion into nearby Asian countries.

Some of the more notable companies at the event include Medfluid, a company using microfluidic technology in their fAST system to rapidly screen and identify effective antibiotics combinations to treat bacteria resistant to all commonly used single antibiotics.

Diabnext aims to provide a telemonitoring platform to the global population of 500 million diabetics as well as assist patients to monitor blood glucose and insulin dosage to reduce overall health spending for the prevalent disease.

Modar.ai, once selected by renowned SV

accelerator Y Combinator is a company seeking pre-seed round financing to create an AI companion on smart glasses to assist millions of individuals who require long-term care in relation to brain health.

WeavAir, the previous winner of the TTA SingularityU APAC Global Impact Challenge, was also at the event to demo their predictive AI solution for HVAC system management that reduces energy consumption and improves indoor air quality to prevent serious contamination issues.

Finally, Radica Health, a company funded by the Ministry of Science and Technology believes the future trend is to be in decentralized medical care services. The company offers services such as telecare centers, ICU solutions, and medical records based on blockchains in addition to applying AI systems to assist with personnel shortages that effectively

reduced 800 service hours for medical staff each month.

Asia's Gateway of Health Tech

Since their first demo day, BE Accelerator has continued in their quest to transform Taiwan into a global health hub and the gateway of health tech in Asia. The country's advantages, such as a comprehensive single payer policy, competitive software/hardware services, world class research institutes such as National Taiwan University, and adjacency to all Asian markets have helped BE leverage partnerships with Stanford's Byers Center for Biodesign and MassChallenge, one of the largest non-equity accelerators.

On stage, BE Executive Director Arthur Chen pointed out that since the previous demo day, BE accelerator has helped raise US\$12 million within a single year, reflecting strong investor and enterprise appetite in health tech. Mercom Capital Group provided additional support for the growing trend of health tech in their annual report, stating a 32% growth in digital healthcare investments to US\$ 9.5 billion from US\$ 7.2 billion the previous year.

If Demo Day #2 is any indication, the future of health tech seems to trend towards AI and technology-powered solutions that streamline operations and increase efficiency by focusing on preventative and remote care. The companies pitching today showcased the exciting potential of future healthcare and a glimpse of how health tech will change the world by 2030. 📊





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