

“Robotic medical technologies can change the future of healthcare”



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Jane Wang,
CEO and Co-Founder,
Rocesio Technologies,
Singapore

UOB economist Francis Tan had said in a research note: “Singapore’s population will reach a critical juncture next year, as the number of people above 65 will equal those under 15 for the first time in history.” By 2030, the gap between the young and old in Singapore is expected to widen considerably; the percentage of seniors will rise to 27 per cent, and that of youths will fall to 10.8 per cent. This will put Singapore on a similar footing with current-day Japan, the oldest society in the world with 26.6 per cent of its population above 65 years old.

While younger generations till now are serving as caregivers, the rapid rate at which the world’s aging population is alarming and in this fast pacing world availability of human caregivers have become scarce. Many researchers are trying to address this issue with unique robotic inventions. Robotics is providing increasingly viable ways to complement healthcare technology trends such as smart monitoring systems and mobile applications, thus easing the reliance on human caregivers. Disability to perform daily tasks does not come from old-age alone. Loss of muscle control, impairment, activity restrictions, as well as disabilities due to stroke, cancer, accidents, and injuries impairs independence which creates a huge impact on one’s life.

One such unique invention is a smart robotic glove to assist and rehabilitate patients who have lost hand functions due to injuries or nerve-related conditions. Created by Singapore-based Rocesio Technologies EsoGlove is a soft robotic hand rehabilitation system that helps patients gain self-reliance in the most natural and efficient way. Speaking to Aishwarya Venkatesh of BioSpectrum Asia, Jane Wang, CEO and Co-Founder, Rocesio Technologies shares her insights on EsoGlove, role of soft robotics in healthcare and challenges in setting up a medtech startup in Asia. **Edited experts;**

When and how was the company established? What inspired you to start the company?

After working in multinational corporations for almost 8 years, I decided to go back to school to pursue Masters in Intellectual Property and Technology Management. I met my co-founders Dr Yap Hong Kai and Dr Raye Yeow at a tech commercialization module called TechLaunch in the year 2015. Dr Yap Hong Kai and Dr Raye Yeow have been developing a unique soft robotics actuator technology at NUS, Faculty of Biomedical Engineering. I would like to say that I fell in love with the technology immediately and saw the potential in various sectors especially in healthcare. After spending months to validate the soft robotic technology with experts from various industries, we decided to focus on medical industry, especially rehabilitation and assistive functions. Eventually, the company was registered in 2016.

Starting a healthcare related startup was always a dream and now it is a dream-come-true. With all the interviews we have conducted with doctors and therapists, we can see that soft robotic technology can help both hospitals and patients. Improving



Q&A

healthcare with technology is the main motivation that drove us to start the journey.

Please tell us more about EsoGlove

EsoGlove is a soft robotic hand rehabilitation system helping patients gain self-reliance in the most natural and efficient way. EsoGlove system consists of a glove with soft robotic actuators, a pump-valve control system with touch panel and actuating the soft robotic glove, and an external device GUI. The soft robotic actuators are activated based on air pressurization. The EsoGlove system can be operated in two modes: passive mobilization and functional task-specific training. In passive mobilization mode, it allows high intensity and repetitive finger joint mobilization exercises, including cyclic flexion and extension or individual finger mobilization, to prevent the development of spasticity and edema.

In functional task-specific training, it allows the training of important tasks such as power grip and key pinch that are required for conducting activities of daily living. Task-specific training and intensity of repetition have been proven to be key strategies for facilitating neuroplastic changes and recovery after suffering from neurological disorders such as stroke. All exercises can be pre-programmed via the software system or programmable buttons. Roco Technologies have also developed an intention detection function that can detect the intention of patients while they want to start the pre-selected functional task training. The intention detection feature has been validated by various neurologists, rehab doctors and occupational therapists to be critical in creating neuroplasticity.

Please highlight the uniqueness of this technology and what difference it can create in medical industry?

Soft robotics is made of soft materials such as polymer, rubber and fabric. It is a relatively new domain of study that has gained popularity in recent years due to the possibility of filling the gaps of traditional robotic technologies. Due to the lack of trained manpower in rehabilitation and the ageing population, rehabilitation robots are in high demand to improve healthcare productivity and help patients recover faster with high intensity training. However, most of the hand rehabilitation devices are made of rigid components, which bring many limitations such as discomfort, limited range of motions/exercises, long setup time (10-25 minutes), bulkiness and high price. With soft robotic technologies, we are able to create a device which is comfortable, supporting both passive and active exercises including functional

training, short setup time (less than 3 minutes), portable (1 kg) and more affordable. With all these advantages, soft robotics technology will enable home therapy and improve rehabilitation tremendously.

As a startup that designs robotic solutions for healthcare, what are the challenges you faced in setting up business in Asia?

I have to say that developing a startup alone is very challenging, not mention a medical robotics startup.

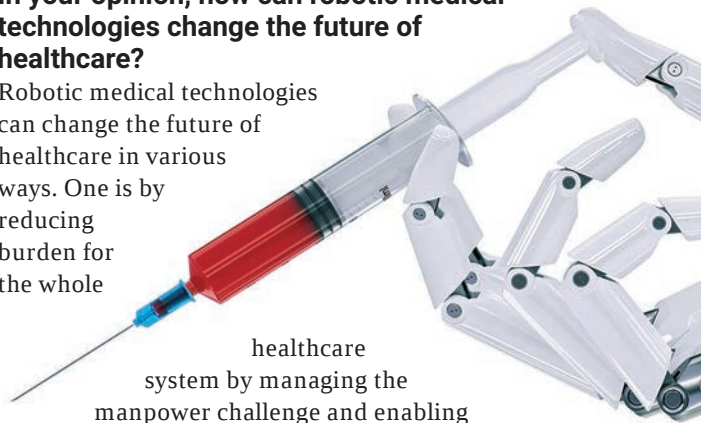
The first challenge we have is a common challenge faced by all hardware or deep-tech companies - talents. In the past 10-20 years, the Engineering sector has been losing top engineering talents to banking, oil & gas and other industries with better welfare. This is partially caused by our economic structure and lack of focus on corporate innovation. With the support on startups from our government and change of mindset of young people, we will see improvements slowly in terms of talent attraction and acquisition. And Singapore is a talent magnet; I believe we are able to manage it with supportive manpower policies to startups and tech talents.

The second challenge we are facing is the lack of a strong tech startup ecosystem, and this consists of both partners and funding. In Singapore, it can take 9 months to 1 year to finish a prototype design while it may only take half of the time in other places. We have seen engineering partners changing business direction due to the lack of fast monetary return working for startups on design services. In terms of funding, it is no news that raising fund for hardware startups is challenging despite the fact that there is abundant capital in Singapore. However, despite all challenges, we are grateful to receive tremendous support from various parties such as Enterprise Singapore, NHIC, JUMPSTART and NUS Enterprise. All of them are working so hard to make entrepreneurs' life easier.

In your opinion, how can robotic medical technologies change the future of healthcare?

Robotic medical technologies can change the future of healthcare in various ways. One is by reducing burden for the whole

healthcare system by managing the manpower challenge and enabling



patients receive care faster without compromising quality. The other is offering better precision and accuracy by reducing human errors. With the development of AI, machine learning and hardware technologies, robotics can be more reliable and intelligent in supporting clinicians in various tasks with minimal supervision. To achieve all these, medical robotics companies need to invest heavily in research, talents and the implementation of quality system to ensure the safety and efficacy of the devices.

What are your future plans in terms of marketing/product/profile expansion?

We position ourselves as a soft robotics expert and would like to develop a range of devices with soft robotics as platform. That means soft robotic devices for various parts of the body will be researched and created to improve rehabilitation and patient mobility. At the same time, research will be done on add-on features such as brain computer interface, sensing/IoT and gamification to improve the performance of the devices. Our current focus is the

stroke market, in the long run; we have planned to design devices to help other groups of patients such as cerebral palsy, spinal cord injury and arthritis.

What are the challenges that you see in the success path of the company?

One challenge that most entrepreneurs are facing is to find the right resources to meet milestones. These resources generally include partners, talents and money. Successful entrepreneurs have to be very resourceful. As a company based out of Singapore, we have to look at international markets at a very early stage. Therefore, finding the right international partners is critical and it requires a lot of time and efforts to get it right. The other challenge is the ever-rising number of competitors. Rehabilitation and mobility is a fast-growing market, and this attracts many new players joining the competition on a regular basis. Keeping up with the competition is not easy, but we don't let it distract us from our final goal and company's vision. Competition does not necessarily have to be a negative factor. We believe that healthy competition helps in the growth of the industry and leads to new avenues.

What are the other products that the company is working on?

In addition to EsoGlove Pro (rehabilitation device), we are also developing an assistive glove which can assist hand-impaired patients in daily living activities such as eating, drinking and wearing clothes. The device will be sold to individual patients at reasonable pricing and it will be highly portable and easy to operate. Compared to EsoGlove Pro, it will cater to a wider range of patients such as stroke, SCI, MS, and elderly people with weak hands.

The other device in the pipeline is Esock, which is a soft robotic sock technology to prevent deep vein thrombosis (DVT) and joint contracture for bedridden patients. The existing product in the market can prevent DVT by compressing the calf muscles to improve blood circulation; however, it cannot prevent joint contracture being developed. Esock will be able to fulfill both needs of the patients. It is currently under clinical trial and we have seen some very positive results.

What are your future plans for the company?

EsoGlove is set to receive FDA clearance by November 2018, which means we will launch the product in the US market by end of this year. We will be able to launch in ASEAN and EU in mid-2019. At the same time, we are setting up our Chinese entity to plan for CFDA approval. **BS**

ONE CHALLENGE THAT MOST ENTREPRENEURS ARE FACING IS TO FIND THE RIGHT RESOURCES TO MEET MILESTONES. THESE RESOURCES GENERALLY INCLUDE PARTNERS, TALENTS AND MONEY. SUCCESSFUL ENTREPRENEURS HAVE TO BE VERY RESOURCEFUL. AS A COMPANY BASED OUT OF SINGAPORE, WE HAVE TO LOOK AT INTERNATIONAL MARKETS AT A VERY EARLY STAGE. THEREFORE, FINDING THE RIGHT INTERNATIONAL PARTNERS IS CRITICAL AND IT REQUIRES A LOT OF TIME AND EFFORTS TO GET IT RIGHT. THE OTHER CHALLENGE IS THE EVER-RISING NUMBER OF COMPETITORS.

