Fuh-Sheng Shieu – President, National Chung Hsing University, Taiwan

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Dr Fuh-Sheng Shieu, president of National Chung Hsing University, elaborates on his ambitions to further NCHU's positioning as one of Taiwan's most impactful research universities. He goes on to highlight NCHU's capacity to nurture translational research projects, which through the university's strong academia-industry collaboration, achieve commercial success. Dr Shieu also speaks about the university's diversification from its traditional strength in agriculture to strong capabilities in the sciences.

Can you please introduce yourself as the president of National Chung Hsing University (NCHU) as you enter into your second term?

I completed my PhD in the department of materials science and engineering at Cornell University. Afterwards, I worked for Dow Chemical Co. in Michigan for three years before coming back to NCHU as an associate professor in 1993. Since I was promoted to a professor in 1998, the next year I became the director of the Institute of Materials Engineering, and then I established the Department of Materials Science and Engineering in 2000 and served as the chairman. In 2005, the president of the university appointed me as the Dean of Research and Development which I lead for the next five years. Following this, I became Dean of the College of Engineering for six years and then the President of NCHU in 2015. With this experience, I have been able to deeply

understand the university and identify student and faculty needs.

Additionally, please introduce NCHU and its academic environment.

Taichung has become the second biggest city in Taiwan after New Taipei City. Looking forward, I believe the city will grow to become the largest and most important within the next 30 years. Being positioned in central Taiwan, it is easy to travel to both the southern and northern cities of the country thanks to the high-speed rail installed in 2007, and the cost of living is much lower than in Taipei for example. NCHU is also the only research university in central Taiwan that is recognized by the Ministry of Education. At NCHU, we are very proud to be the first research university founded in Taiwan to reach 100 years old.

Taiwan as a nation has a very strong research capacity in agriculture, plant and animal science, physics, and pharmacology and toxicology according to data from Web of Science. NCHU started as an agricultural institution so we have a special capability in the first two areas.

We have strong ties with the two top research universities, University of California Davis and Texas A&M, in which agriculture and plant and animal sciences are considered to be the very best. Our research performance is comparable with these universities in terms of the quality of papers published.

Despite its historical strength in agriculture, how has the university grown to diversify its academic areas?

NCHU today is a comprehensive university with ten colleges which also include agriculture and natural resources, life sciences, veterinary medicine – the first in Taiwan, engineering, science, electrical engineering and computer science, liberal arts, management, politics and law, and industry innovation. Unfortunately, NCHU does not have a medical school but this has been a major priority during my term as president. Currently, there is no public medical university in central Taiwan. Unlike the US, in Taiwan, public universities are more esteemed than private institutions in general.

The medical field is very close to life sciences which is a major asset that NCHU would have for a medical school. For example, our veterinary college would be very beneficial in conducting clinical trials as the animal model is an essential step in medical research. Even though we do not have a

medical school, according to ESI, we have numerous research areas with a citation record among the top one percent of the world institutions including clinical medicine. Additionally, we have several collaborations with hospital networks here in central Taiwan.

NCHU is also part of the GLORIA initiative. What is the scope of this project and how is NCHU positioned to complete its goals?

The GLORIA project was started by the Ministry of Science and Technology (MOST) to enhance academia-industry collaboration and increase the translation of research by encouraging students and professors to create their own university spin-off companies. In terms of the number of start-ups generated from this program, NCHU is ranked as first.

NCHU has several examples of commercial successes which we are very proud of. The first example is an innovative device and methodology developed for real-time cardiopulmonary rehabilitation treatment with a remote automatic monitoring function. Next, our researchers have also commercialized a biocontrol product from *bacillus mycoides* isolates with innovative application techniques for the protection of crop health. Finally, our professor Hong-Lin Su has developed a clinical-grade human stem cell culture medium which can be an important starting point for the application of future stem cell therapies.

Often time researchers do not know how to commercialize or market their technology, fortunately, we have a college of management at NCHU which can offer resources and advice in this area. Moreover, NCHU has many distinguished alumni in the business sector which can help our students and professors manage their business.

You have particular expertise in nanotechnology, an emerging technology in which Taiwan has been a first mover. What is your assessment of the sector today and how is NCHU supporting interdisciplinary initiatives between nano and other industries?

Nanotechnology is very similar to artificial intelligence in the sense that it is an additive technology that can be applied to many diverse industries for several purposes. Nano is the idea of dimension, so it is the different size of material molecules. For example, nanotechnology can be used in the study of drug delivery to better treat diseases through targeted compound release. This technology can also be applied to medical devices such as by minimizing sensors to perform more comfortable endoscopy procedures. Health is one of the biggest application potentials for nanotechnology. One

particular example I would like to highlight from NCHU is a research project applying nanotechnology to microchips for plant disease diagnostics.

Having studied a PhD at Cornell University and briefly working as a senior research engineer in the private industry, what do you see as the main difference between the US research and innovation environment and Taiwan?

In my conversations with the different ministers of the country, I often point out that the structure of enterprises is different here than those in the US. In the US, there are many large companies with strong research departments which create job opportunities for researchers after they receive their PhD. Unfortunately, in Taiwan, more than 95 percent of companies are SMEs who cannot afford to have dedicated R&D departments.

During the past 20 years, when the higher education development was booming in Taiwan there was not a problem of accommodating all the PhDs in the country as faculty. However, since the birthrate of Taiwan has decreased significantly, there are fewer student populations which have resulted in many private universities having to freeze hiring to survive. Now that students see there are fewer opportunities to become professors, the driving force to pursue a PhD degree decreases considerably.

In the US, this is not an issue because the companies provide opportunities to PhD researchers in their R&D department. In Taiwan, only about 15 percent of PhD researchers are hired by private companies. Therefore, we must change our business infrastructure and focus on innovation moving forward. Even compared to the US, the percentage of highly educated individuals is very high in Taiwan – something we are very proud of. How we can best utilize these talents is an important challenge Taiwan faces today, which is why the government is strongly encouraging the academic sector to cooperate with private industry.

The Taiwanese are very smart with open minds who like to learn new things. I believe moving forward, Taiwan will continue to have an even more impactful innovation capability. However, we must learn to work smart not just hard. Having the right innovation infrastructure and culture is key to Taiwan’s success which is something we continuously emphasize in NCHU.

How are they building collaborations internationally to establish NCHU as a world-class research university? Why is Taiwan an international partner of choice?

If we look at the history of the region, Japan has suffered in the last 20 years – one of the causal factors being that they are slightly conserved in terms of globalization. Taiwan, on the other hand, has made a major effort to reach out internationally and actively participate in global conversations whenever possible. Additionally, we are very proud to have a free and democratic system which is something that China cannot compete with. At the university level, I emphasize collaboration on all levels with international universities, particularly in the US.

Within the past two years, NCHU has initiated a very unique dual degree program on veterinary medicine with Kansas State University and Iowa State University. We also participate in research collaborations with several other leading universities in the US such as UC Davis, Texas A & M etc.

What are your goals for the university's academic ecosystem within your second term as president?

When the Ministry of Education initiated the Aiming Top Research University Program in 2006, NCHU was ranked eighth overall. Last year in the Higher Education Sprout Program, we were promoted to the sixth position. Mission as president will be to bring a medical school to NCHU and bring our position to top three in this ranking. I hope to see the university continuously grow stronger and be a partner to the development of Taichung as the next booming city of Taiwan, competing with the northern region.

As you have spent most of your career here at NCHU what continues to motivate you on this journey with the university?

Ironically, when I was first starting my studies, I decided to become an engineer despite my mother wanting me to become a teacher. At the time I never thought I would become a professor let alone the president of a university. Cornell University changed my life by giving me the opportunity to study on a scholarship after I realized that working as an engineer was not the career path for me. My advisor, Prof. Steve Sass, was a very important part of my success at Cornell. From my experience, I have a commitment to always do what is in the best interest of our students while creating an atmosphere where faculty and students can mingle together and also have opportunities to go abroad and expand their horizons.

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