Research Assessment Exercise 2020
Impact Overview Statement

University: City University of Hong Kong
Unit of Assessment (UoA): 14 - mechanical engineering, production engineering (incl. manufacturing & industrial engineering), textile technology and aerospace engineering
Total number of eligible staff of the university in the UoA: 33

(1) Context

This unit brings together 33 faculty members from Department of Mechanical Engineering (MNE), Systems Engineering and Engineering Management (SEEM) and part of School of Data Science (SDSC). Our core and interdisciplinary research has produced beneficial impact for our local industrial partners, the high-tech companies based in the Greater Bay Area and across mainland China. These include the Federation of Hong Kong Watch Trades & Industries Ltd, Pino Aliprandini (HK) Ltd, Hong Kong Sen Fung Vacuum Plating Company Ltd, Glamm Holding Ltd, Dominion Watch Company Ltd, Gordon C & Co., Ltd, Hanson Metal Factory Ltd, Orbbec Co. Ltd, China Light and Power (CLP) Co Ltd., Huawei, Alphotonics Limited, AI Motion Sports (AIMS) Ltd., BEWIS Sensing LLC., Ningbo Baite Baize Information Technology Co., Ltd, Chengdu Shichuang Information Technology Co. Ltd. Over the past five years, we have helped more than 10 companies to solve their problems and to develop new products.

(2) Approach to impact

Active engagement

We have a long-standing industrial collaborations, which provides a sustainable platform for future impact as well as an environment that enables the development of new links and opportunities. We have an Industrial Advisory Committee that has been making a great contribution to the engagement. It is composed of highly respected engineers and entrepreneurs in Hong Kong, such as Ir Prof. John K. L. MOK - co-founder and chairman of AML Holdings Ltd, including Mr. S. H. CHAN, JP - Manager Director of CLP Holdings Ltd, Mr. Keith S. K. LEUNG - Director, Innovation Lead, Personal Care of Philips Electronics Hong Kong Ltd, Ir Dr Hon W. K. LO - Legco Member, Legislative Council, Ir Dr Tony K. Y. LEE - Chief of Operations Engineering, MTR Corporation, Mr. Simon S. H. NGO - Head of Engineering, Towngas. They advised us on issues related to not only teaching and education but also research strategies. Through this successful engagement, our industrial partners, such as CLP, have contributed to investment in our facilities, such as the set-up of the CLP Low Carbon Energy Education Center (LCEEC).

Several faculty members of the unit have direct contact with industry through consultancy and contract research. For example, Dr. Patrick P. L. WONG and his PhD graduate Dr. Feng GUO have developed advanced optional rolling and slider bearing testers based on two of their patented technologies on “Measurements Apparatus and its Adjustment Method for the Lubricating Films of a Micro-slider Bearing” and “Measurement Method for the Slip-length of Lubricating Films under High Pressure”. The commercialized advanced optical rolling and slider bearing testers have been adopted as a standard measuring equipment by Taiwan Academia-Industry Technology Alliance for Tribology. In addition, Dr. WONG won a consultancy project from Timken Europe, a large rolling bearing in the world in 2018. Dr. Zhengbao YANG successfully collaborated a contract research titled “Piezoelectric Energy Harvesting in the Real Environment with Multiple Excitations” with Huawei of value HK$517,000 in November 2018 and Dr. Lawrence K. Y. LI, appointed by Techmart Industrial Limited as their consultant, has started to work on a HK$300,000 worth project since July, 2019.

Agile approach to opportunities

Through collective efforts, we responded effectively to opportunities to win investment from Innovation and Technology Fund to set up National Precious Metals Material Engineering Research Center (Hong Kong Branch). This generated a recurring funding of HK$ 5,000,000 per year to develop our research in advanced metallic materials. The group members of that center recently secured additional research funding of more than HK$ 30,000,000 for the set-up of unique 3D Atom Probe Tomography (APT) facilities that can be accessed by our industrial partners and other sister institutions. In addition, a substantial number of ITF projects total worthy of about HK$ 35,000,000 have also been secured in the past five years.

Follow-though to make impact

Engineers from industries and other user groups can come to use our facilities, such as the 3D APT system, and work on joint projects. This strengthens our links with the user community and create further opportunities for work leading to impact.

Achieving impact through active support

We encourage our faculty members to spend sabbatical periods working in overseas research labs and universities. We reward and stimulate impact generating research through the Performance-based Pay Review (PBPR) Scheme and the proactive use of the University's Knowledge Transfer Office (KTO). For instance, we have over 20 patents (pending or granted) over the past five years.

(3) Strategy and plans

Our strategy is guided by three key objectives. (a) Developing sustainable organizational frameworks that foster impact in research: we established National Precious Metals Material Engineering Research Center (Hong Kong Branch) to tackle materials related issues facing the whole country. (b) Cultivating and extending user/partner networks through our established facilities and research centers: for example, through the sponsorship of CLP, we establish the Low Carbon Energy Education Center to provide publication on low carbon energy for the sustainable development of Hong Kong. (c) Providing a stimulating creative research environment that fosters development of innovative engineer leaders, such as Dr. Yuanhao HUANG of Orbbec Co. Ltd., and yields publications of the highest possible impact: we have been recently publishing several significant papers in prestigious journals such as *Science, Nature, Joule* and their sister journals on structural materials and energy subjects, which will prove to have significant impacts on industry.

(4) Relationship to case studies

Our three selected impact cases exemplify aspects of our successful approach to impact. "**3D Speckle Vision from Academic Research to the Real-World**" highlights the success of our approach to develop a computerized 3D camera for real-time acquisition and processing of 3D object shapes, which led to commercial products and a spin-off company (Orbbec Co. Ltd) with a value of US$2 billion. "**Motion Tracking and Recognition Using Internet-of-Things MEMS-based Inertial Sensors**" highlights their high impact research in nano/micro/MEMS sensors, which led to three spin-off companies in mainland China employing more than 100 employees. "**Development of Zero-Defect Coating Technology for the Watch Industry**" describes our approach to cementing and forging successful and enduring collaborative relationship with the key companies in the watch industry of Hong Kong.