

Annual Report on Knowledge Transfer for 2019-2020

To University Grants Committee

remony of the Exhibit 長閒開幕典禮

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Executive Summary

Recurrent funding for knowledge transfer (KT) has been provided by the University Grants Committee since 2009 to build up universities' capability in KT. Moving into the fourth triennium of the KT funding, City University of Hong Kong (CityU) is pleased to report significant progress in some KT aspects. However, the social upheaval in Hong Kong and COVID-19 outbreak worldwide have posed unprecedented challenges in FY2019-20, resulting in a reduction in community engagement activities such as public lectures, exhibitions, etc. as a result of social distancing requirement imposed locally and overseas. Below are highlights of some of the significant KT accomplishments of the University.

Licensing activities have witnessed a healthy growth in terms of the licensing incomes earned. The incomes generated on cash basis jumped from HK\$2.07M to HK\$3.52M in FY2019-20. The three-year average of annual licensing income also increased from HK\$7.08M to HK\$7.99M. However, we shouldn't be complacent as the negative impact of the turmoil is yet to be unveiled. On the market development side, CityU has expanded its reach into inland market with the latest extended to Henan, establishing new relationships with inland government agencies.

Consecutively in the last four years, CityU was ranked among the top 100 universities worldwide, and topped in Hong Kong for receiving the highest number of granted patents by US Patent and Trademark Office.

With increasing awareness of KT in the non-science/non-engineering disciplines, more KT activities were witnessed and an impact case has been cited from these disciplines. Besides, funding continued to be set aside to support worthwhile KT initiatives from these disciplines; and Excellence in Knowledge Transfer Award continued to give recognition to faculties excelling in KT.

Lastly, in terms of entrepreneurial activities, continuous effort has been made to promote the three funding schemes seamlessly designed for the early, mid-, and late stages of start-up lifecycle. In FY2019-20, investment funding has been provided to a CityU spin-off, Cellomics Holdings Limited, which is believed to be another rising star after Vitargent (International) Biotechnology Limited.

1. Fostering Technology Transfer

1.1 Technology Licensing Results

With increasing importance in research commercialization, City University of Hong Kong (CityU) has stepped up efforts in forging this area of work and promising results have been witnessed. However, FY2019-20 was a year full of challenges not only to Hong Kong but also to the global economies due to unprecedented social upheaval in Hong Kong and COVID-19 outbreak worldwide. Although the licensing income in FY2019-20 recorded a healthy growth of 70% from HK\$2.07M to HK\$3.52M on cash basis (from HK\$1.25M to HK\$7.59M on accrual basis), and the three-year average of annual licensing income also increased from HK\$7.08M to HK\$7.99M, we shouldn't be complacent as the negative impact of the turnoil is yet to be unveiled. Outlook for next year is not optimistic given the global economic downturn.

Ten new licensing agreements were signed in FY2019-20, making the total number of active licensing agreements standing at 40. The table below summarizes the ten licensing agreements.

	Technologies Licensed	Nature of Business of Licensee	Where the Licensee is Based
1	Biomedical	Gene therapy	Singapore
2	Semiconductor	Light emitting diodes	South Korea
3	Electrochemical detection	Nanotechnology & materials	Hong Kong
		science	
4	Multi-wavelength laser	Biotechnology	Hong Kong
5	Biotechnology	Biotechnology	Hong Kong
6	Self-healable materials	Nanotechnology & materials	Hong Kong
		science	
7	Battery diagnosis	Electronics	Hong Kong
8	Wearable sensor	Electrical & electronics	Hong Kong
9	Flexible battery	Nanotechnology & materials	Hong Kong
		science	
10	New materials	Technology	Mainland

1.2 Technology Transfer Platforms in China

To expand our marketing reach for the growing innovations under the University's management, CityU has successfully created a comprehensive network of technology transfer relationship covering strategic locations in mainland China for synergistic effect. These places include Beijing, Shanghai, Nanjing, Suzhou, Hangzhou, Yangzhou, Changzhou, Shenzhen and the Greater Bay Area including Zhaoqing, Dongguan, Zhuhai, and Foshan, with the latest extended to Henan.

1.3 Partnership with Leading Institutions Worldwide

Leveraging on the strengths of Hong Kong being a technology and knowledge hub between East and West, CityU has proactively formed strategic partnership with a number of leading universities and institutions worldwide. Such collaboration enables us to pool together state-of-the-art technologies of CityU and its partners for the vast market in China.

1.4 IP Agencies

CityU continues to engage local and global intellectual property (IP) management firms as our marketing agents.

1.5 Web Marketing

CityU's Knowledge Transfer Office (KTO) website hosts a list of IPs to broaden marketing channels for licensing. In order for online access to be more user friendly, a review of the current structure of the KTO website commenced in the second half of the year. The review is expected to be concluded in the first quarter of the next financial year, by then an invitation for a newly designed customer centric website will be sent out.

1.6 Developing Partnership and Collaboration

CityU is dedicated to strengthening global partnership by building and exploring collaboration with renowned universities, research institutes, governments and industrialists, trade and commerce organizations in mainland China and overseas. Below are some of the key projects done in FY2019-20.

Collaboration with Futian District Government, Shenzhen

CityU actively participates in the development of the Hong Kong/Shenzhen Science, Technology and Innovation Collaborative Zone (深港科技創新合作區). Two proposals in the area of advanced materials have been submitted to the Development & Reform Commission of Shenzhen Municipal Government for consideration. With approval from the Futian District Government, Shenzhen, CityU had set up a public-sector organization, a registered mainland legal entity namely the CityU-Shenzhen Futian Research Institute in Futian, Shenzhen. The Entity will serve as a platform for forging cutting-edge discoveries and to translate the University's research results to industrial applications for deriving societal benefits in the Greater Bay Area and beyond.

Collaboration with Various World Renowned Institutions via InnoHK

CityU actively participates in the InnoHK initiative led by the Innovation and Technology Commission of the HKSAR Government. Through participating in the first two clusters (AIR and Health) of the InnoHK initiative, CityU has been discussing partnerships with various world renowned institutions for research development and has submitted a few proposals in health care technologies and artificial intelligence and robotics technologies.

Collaboration with Peng Cheng Laboratory

CityU signed an MOU with Peng Cheng Laboratory (PCL) in July 2019 for sharing of scientific research facilities, scientific research projects, academic exchanges, personnel training and the transfer and transformation of scientific and technological achievements. PCL is a multipurpose research institution approved by the Guangdong Provincial Government, funded and established by the Shenzhen Municipal Government. PCL conducts cutting-edge researches in artificial intelligence and a wide range of related advanced technologies.

Other Collaborations in the Mainland

CityU actively takes part in research collaboration and development in the Mainland, especially in the Greater Bay Area. A few other collaborative MOUs/agreements have been concluded to promote knowledge transfer and research development of the University. Partners include but not limited to 清華珠三角研究院, 珠海市人民政府, 中山大學, 華南農業大學, 中國科學院深圳 先進技術研究院, 中廣核工程有限公司, 澳門大學, 上海大學 and 鋼研高納, etc.

1.7 Strengthening IP Management

The University has in place a well-established administrative framework and policy protecting the intellectual property generated from research activities. After a stringent vetting process,

inventions of high commercialization value are pursued for patent filing. In the year under review, 121 new patent applications were filed in Hong Kong, US, Mainland and other jurisdictions in various fields of technologies with 78 patents granted during the same period. By June 2020, CityU's IP portfolio consists of 551 patents granted with a further 449 patents pending.

After years of cultivation, our patenting work begins to bear fruits. With 49 US patents granted in calendar year 2019, CityU ranked 54th in The Top 100 Worldwide Universities Granted US Utility Patents, and topped in Hong Kong in the last four years in a row for receiving the highest number of US utility patents. We will make our best effort to sustain this leading position and continue to excel in this area.

In July 2019, KTO joined hands with the HKSAR Intellectual Property Department and the Hong Kong Polytechnic University in organizing a three-day AUTM courses on IP portfolio management and academic technology licensing operation tools. Participants included researchers, staff and students of CityU and other local tertiary institutions, as well as industry practitioners who are interested in technology transfer.

1.8 Outreach

Through the CityU Business and Industrial Club (CUBIC), CityU has forged close ties with senior business executives and industrialists. CUBIC regularly organizes events (e.g. Emerging Technologies Forums (ETFs), Special Interest Group gatherings, etc.) for its members, and aligns industrialists and academics from the University and other institutions to build a platform to advance technological development and promote cross-institution collaboration. In FY2019-20, the membership of CUBIC has grown from 1,749 to 1,830, at an annual increase rate of 4.6%. The number of inland CUBIC members has also increased from 427 to 430 during the same period.

Through participating in technology transfer or innovation exhibitions, CityU aims to showcase its latest inventions for commercialization and expand its client base. It was originally planned to join three prestigious exhibitions worldwide including the International Exhibition of Inventions Geneva, Silicon Valley International Invention Festival and TechConnect World Innovation Expo to cover our major markets. However, due to COVID-19 pandemic, the events had been postponed. Nevertheless, we participated in the below international exhibitions in the first half of the year:

- TECHINNOVATION 2019 in Singapore
- 21st China Hi-Tech Fair in Shenzhen, China

2. Broadening Knowledge Transfer beyond Science and Engineering Disciplines

2.1 Knowledge Transfer Award for Non-technology Disciplines

To broaden KT beyond science and engineering disciplines, funding has been provided since 2011 to support quality knowledge transfer initiatives proposed by non-science Colleges/School, including the College of Liberal Arts and Social Sciences, College of Business and School of Law. Every year, each College/School holds an internal competition to prioritise the applications before submitting the proposals to the Knowledge Transfer Office. Seven projects were approved in this reporting year to receive up to HK\$0.2M each as below:

- CityU-Hong Kong Consumer Confidence Index (CityU-HKCCI)
- Transformation Social Innovation into Sustainable Practices: An Analysis of Funded Social Enterprises under Impact Incubator of Social Innovation and Entrepreneurship Development Fund
- Developing a Deep-Learning Based Targeted Marketing Model to Enhance Customer Experience
- Experimental Public Policy Polling for Hong Kong

- A Multi-media Website for Learning Chinese Characters for Dyslexic Children in Hong Kong
- Promoting an Inclusive Workplace for People with Disabilities: Attitudes, Skills and Knowledge
- Designing Built Environment to Meet the Needs of Little People in Hong Kong

2.2 Recognition of Excellence in Knowledge Transfer

To encourage KT and nurture a KT culture in non-science disciplines, Excellence in Knowledge Transfer Award was launched since 2011. The Award gives recognition to faculty members in the College of Liberal Arts and Social Sciences (CLASS) who have made outstanding achievement in applying their knowledge for creating high social impacts. The 2019-20 Excellence in Knowledge Transfer Award went to:

Project Title	Department	Recipient	
Excellence in Knowledge Transfer Award			
Developing Effective Clinical Communication at Nursing Handover: Improving Patient Safety, Experiences and Outcomes in Hong Kong	Department of English	Dr Jack PUN	
Certificate of Merit			
Catering the Needs of Diverse Learners Using Interactive Dialogue and Creative Literacy Activities in English Language Education	Department of Social and Behavioural Sciences	Dr CHOW Wing Yin Bonnie	
Omega-3 Supplementation to Reduce Externalizing Behavior Problems in Risk-Taking Adolescents: A Randomized, Placebo-Controlled, Double-Blind Trial	Department of Social and Behavioural Sciences	Dr FUNG Lai Chu Annis	

3. Upholding Research Excellence

3.1 Contract and Collaborative Research

Part of the University's mission is to anticipate and respond to the needs of industry, commerce and the community by engaging in applied research with its results used for direct benefit to Hong Kong and beyond. The University continues to maintain its close ties with local and overseas industries through various forms of collaboration including contract research. Highlights of some contract research projects (including projects from government and ITF) are development of materials or systems in a wide spectrum of disciplines as set out below:

- Rapid Detection of SARS -CoV-2 Virus Using Isothermal Nucleic Acid Lateral Flow Assay (IsoNALFA)
- Therapeutic Potential of a Novel Deep Brain Stimulation Target Site and Neural Prosthetic Device for Treating Parkinson's Disease
- Improving Pig/Poultry Health and Production in Hong Kong
- A CRISPR Screen for Diverse Codes of Cellular Reprogramming in Mouse Retinas
- Study of the Ecological Impact on the Use of Recycled Water

- Building a Multi-Agent Deep Reinforcement Learning Framework for Flexible Job Scheduling in Smart Factories
- Generative Adversarial Network (GAN) Based Image and Video Generations for Media Applications
- Blockchain and Smart Contract Enabled Manufacturing Supply Chain and Finance Platform
- Social Impact Fellows Jockey Club 'Bounce Back' Intergeneration Program 2.0: Empowering Seniors and Promoting Intergeneration Engagement

CityU places strong emphasis on application-oriented research that not only brings true benefits to the community but also facilitates knowledge transfer that is conducive to the needs of industries and social bodies. To this end, faculty members are encouraged to engage in contract and collaborative research to contribute to the University's pursuit in knowledge transfer.

3.2 Research Breakthroughs

Noteworthy to report here are some of our research breakthroughs.

A world-first self-healable anti-smudge coating has successfully been developed by a CityU research team led by Dr Yao XI, Associate Professor in the Department of Biomedical Sciences. The new coating has high optical transparency and mechanical strength, enhanced oil sliding and good interfacial adhesion. Sticking firmly to the base of various materials including paper, aluminium, copper and plastics, it offers protection and rapidly heals after damage or mechanical defects. The breakthrough is significant because anti-smudge coating plays an important role in a range of industries. It can be applied to medical equipment, automobiles and electronic products to provide protection and repel liquids. Self-healable materials, as smart materials, are mainly used for conductive, electronic packaging, and scratch-resistant coatings. In particular, they are used for equipment and devices used in industries that require high levels of maintenance such as aviation, aerospace and maritime, and are usually used in medical equipment and robots. The discovery could lead to production costs 80% lower than for existing anti-smudge coatings.

Another pioneering research at CityU has led to the development of the most efficient all-inorganic inverted perovskite solar cells (PVSCs) to date. This novel approach will contribute to addressing the global energy issue in a cost-effective manner. PVSCs are a type of solar cells produced by metal halide perovskite materials, which are an attractive option for the renewable energy technologies due to their high efficiency and low manufacturing cost. The all-inorganic inverted PVSCs developed in the year-long research project have achieved a recorded efficiency of 16.1% and a certified efficiency of 15.6%. This level of efficiency has great potential to enhance the stability and practical value of PVSCs. The findings were published in *Nature Communications* under the title "Highly Efficient All-inorganic Perovskite Solar Cells with Suppressed Non-radiative Recombination by a Lewis Base".

4. Expanding Research Platform and Technology Transfer to the Mainland

4.1 CityU Shenzhen Research Institute

Mainland research development recorded steady growth in FY2019-20. A total of 63 new research projects were obtained via the research platform in Shenzhen, CityU Shenzhen Research Institute (CityUSRI). These included 35 projects funded by the National Natural Science Foundation of China (NSFC), 15 funded by the Shenzhen Science, Technology and Innovation Commission (SZSTI), one project funded under the Major Programme of the Ministry of Science and Technology of the People's Republic of China, and three funded by the Department of Science

and Technology of Guangdong Province. Besides, Shenyang National Laboratory for Materials Science supported a funding of RMB10M for the Greater Bay Area materials research centre construction.

	2017-18	2018-19	2019-20
Number of Active Research	213	265	293
Projects			
Total Grants of the Active	RMB187.15M	RMB212.36M	RMB252.59M
Research Projects			

It's worth highlighting that Prof Jian LU, Chair Professor of Mechanical Engineering, obtained RMB12M of funding from the Science and Technology Department of Guangdong Province for the Major Programme for the project *4D Printing of Ceramics Based Smart Material Components: Key Technology and Demonstrative Applications*. In addition, Prof Lu also received funding by successfully joining the Sino-German Cooperation Group setup by Sino-German Center for Research Promotion, a research funding institution established as a joint venture by the NSFC and the Deutsche Forschungsgemeinschaft (DFG-German Research Foundation). It is of great significance to CityUSRI for obtaining this kind of funding for the first time.

4.2 City University of Hong Kong Chengdu Research Institute

City University of Hong Kong Chengdu Research Institute (CityUCRI) continues to play the role as the second strategic platform of the University after Shenzhen for research and development, incubation and innovation, as well as professional education and training.

Research activity at CityUCRI is gaining momentum and five research projects are ongoing. In addition, a new research centre, Animal Health Research Centre, headed by Prof CHEN Sheng, Associate Dean of Jockey Club College of Veterinary Medicine and Life Sciences, was established.

5. Nurturing Inno-preneurship Ecosystem

5.1 Funding Schemes to Provide Seamless Financial Support at all Stages of Innovation and Entrepreneurship

To support different stages of discovery and innovation, three funding schemes are in place.

- a. Student Early Entrepreneurship Development Scheme (SEEDS) supports early-stage idea validation, feasibility and marketing studies on a project basis. In the fifth round of application, 19 student teams submitted applications, five of which eventually beat out others to win a maximum funding of HK\$200,000 per team. Since its launch in late 2015, SEEDS has granted funding support of around HK\$5.3M to 29 student teams.
- b. Technology Start-up Support Scheme for Universities (TSSSU), helps commercializing business ideas at pre-seed start-up stage, moved into its seventh year of operation. Fifty-five applications were received in the 2020-21 round of application. Sixteen teams were selected to receive a total funding of HK\$8M. After seven rounds of application since 2014, TSSSU has granted funding support totaling HK\$36M to 46 start-ups.
- c. CityUE Investment Fund, a venture-capital-style investment fund, is in place to support CityU spin-off companies in exchange for stock ownership. Funding investment has been made to one CityU spin-off, Cellomics Holdings Limited (Cellomics), during the reporting period. Cellomics is believed to be another rising star after Vitargent (International) Biotechnology Limited with more details given in section 6.1 under Impact Cases.

5.2 Incubation Programmes

There is in place an Incubation Programme on campus to nurture our young innovators/start-ups. The three teams admitted to the Programme graduated in December 2019.

TSSSU recipients are given conditional offer to join the CityU-HKSTP Incubator Scheme jointly organized with the Hong Kong Science and Technology Parks Corporation (HKSTP). Five 2019-20 TSSSU teams were admitted to the Scheme and received a funding of HK\$1.2-1.3M for each team. Another five 2020-21 TSSSU teams received conditional offer for incubation at the HKSTP premises under its Incu-Tech/Incu-App Programmes.

HKSTP's Science and Technology Entrepreneur Programme (STEP) is a one-year start-up support programme designed to nurture tech-focused entrepreneurs to become successful start-ups and help them turn their brilliant ideas into reality. One CityU team was admitted to STEP during the reporting period.

Across the border in the CityUSRI Building, the University's research and professional education establishment in Shenzhen, Innovation Commons (Shenzhen) (香港城市大學創新創業中心(深圳)) has been set up to serve as additional incubator for technology start-ups of our students, staff members and alumni. Twenty-nine projects in areas of artificial intelligence, pharmaceutical & biology, internet and IoT are under incubation. Spark Lecture series were organized for the incubatees. During the reporting period, two lectures had been held on accounting & taxation and IP management respectively.

5.3 Innovation and Start-up Competitions

CityU students shone and clinched distinguished awards in inno-preneurship competitions. Cyberport University Partnership Programme (CUPP) is a flagship entrepreneurial competition of Cyberport. Four CityU teams were shortlisted to participate in the week-long CUPP Entrepreneurial Bootcamp in Chicago, US, in October 2019. Eventually, two CityU teams were awarded the Cyberport Creative Micro Fund of HK\$100,000 each. In the 5th China "Internet+" College Students Innovation and Entrepreneurship Competition, CityU teams received two Silver Awards. Two teams of our students won the 5th Hong Kong University Student Innovation and Entrepreneurship Competition. These two teams together with another four CityU teams won the 16th Challenge Cup National College Students' Extracurricular Academic Science and Technology Contest which is recognized as "China's Youth Innovation and Entrepreneurship Olympic". Their winning projects were showcased at CityU's Wong's International Terrace from 1 to 13 April 2020.

5.4 Innovation/Entrepreneurship Support

With the mission to strengthen the teaching and learning environment of the University, the Office of Education and Gateway Education (EDGE) held the below KT activities to support and facilitate student learning on innovation and entrepreneurship during the reporting period.

- Twenty-nine class visits were made, reaching out to over 1,200 undergraduate and nearly 900 postgraduate students to draw their awareness of IP via a 5-minute video clip. In addition, EDGE also provided flexible learning opportunities for students to learn the concept of IP via an online course.
- EDGE's Entrepreneurship and Innovation Clinic and Makerspace provides coaching services and facilities for students to realize their innovative ideas. Five student projects were under coaching and mentoring during FY2019-20, covering social innovation and innovative products.

• With the social unrest and COVID-19 pandemic, EDGE has made good use of the social media platform to communicate with students and disseminate information. An IP related video was posted on the EDGE Instagram which attracted more than 500 views.

Innovation Commons (IC) is a one-stop resource centre of the University to nurture inno-preneurship. In November 2019, IC co-organized a Start-up Entrepreneurship Tour to Taipei, Taiwan, with the Hong Kong Polytechnic University and HKSTP for the second time. Five CityU project teams including eight students joined the tour which was an eye-opening experience to them. Not only did they visit the largest start-up festival in Asia—2019 Meet Taipei Start-up Festival, they also visited the start-up incubators/accelerators in Taiwan including the Taiwan Tech Arena (TTA), Taiwan Start-up Stadium (TSS), and AppWorks. The delegation also visited WorkTech Asia, a leading platform-driven workspace community in Taiwan. It was an enlightening and rewarding trip to the students.

IC also co-organized Techathon 2020 with HKSTP and seven sister institutions from 10 to 12 January 2020. An alumnus' team was awarded first runner-up under the Healthcare and Social Impact Category, receiving a cash prize of HK\$3,000.

A mentoring scheme is in place whereby business leaders and professionals, some of whom are CityU alumni, provide guidance and advice to our young entrepreneurs on their long journey to successful enterprising through regular mentor-mentee meet-ups. Thirty-two business leaders and industrialists joined as mentors in FY2019-20. The 18 mentoring applications received were successfully matched with appropriate mentors in April 2019 to receive 12-month's advice and consultation from experienced entrepreneurs/professionals/business leaders.

Apart from the above, funding support is provided to our students for participation in start-up competitions overseas and patent application.

6. Impact Cases

Highlighted below are examples of significant knowledge transfer endeavors of the University carried out during the year under review.

6.1 Groundbreaking Blood Test Technology for Accurate and Early Detection of Cancer Cells

A biomedical research team led by Prof Michael YANG, Yeung Kin Man Chair Professor of Biomedical Sciences has successfully developed a groundbreaking technology that can accurately perform early screening for cancer cells and effectively monitor disease status. With an accuracy rate of over 90%, the new technology can detect cancer cells with as little as 4 ml of blood in no more than five minutes, allowing a patient to know his or her risk of cancer as soon as possible. The new technology can also monitor the effectiveness of drugs used for medical treatment. Key members of the research team include Dr Henry ZOU Heng, Dr Edwin YU Wai-kin and Dr XU Tao in the Department of Biomedical Sciences.

Developed from the "cell manipulation and test platform based on microfluidic chip technology," the process can accurately identify tumour cells circulating in the blood. Without requiring patients to undergo surgery, the technology can detect tumours as small as 0.1mm in the early stages of cancer. Conventional means for cancer diagnosis such as medical imaging and tissue biopsy aren't accurate enough. Testing blood for protein markers produced by a tumour has a sensitivity and specificity of only around 50 to 60%.

The accuracy of blood tests for liquid biopsy has been significantly improved by the screening technology developed by CityU's research team, with high sensitivity and specificity of over 90%. The technology can screen for cancer three to six months earlier than medical imaging can. For instance, medical imaging might not detect tumours as small as 0.1mm whereas CityU's new

technology can detect cancer cells in as little as 4 ml of blood and within five minutes, which makes it currently the fastest screening technology in the world.

When determining whether immunotherapy is an appropriate treatment for cancer patients, the standard way is to conduct tissue biopsy. However, CityU's tumour target technology can determine whether or not a patient needs surgery simply by analysing proteins on the surface of cancer cells. The test result is more accurate than tissue examination.

The new technology can also be used to test whether cancer patients have drug-resistance problems, which can help doctors decide if new medication or treatment is required.

CityU has licensed this newly developed technology to Cellomics Holdings Limited, a CityU spin-off company set up by the research team. The products invented by the company have received accreditation from China's National Medical Products Administration and awarded the CE marking certification of in vitro diagnostic devices from the European Union. Cellomics has also earned the title of Hong Kong Rising Star from Deloitte China and received the Gold Award and the Outstanding Biotechnology Invention Award of Asia International Innovative Invention Award 2019 from Hong Kong Federation of Innovative Technologies and Manufacturing Industries.

Cellomics has been granted funding and work space to convert research achievements into commercial products through CityU's Technology Start-up Support Scheme for Universities and the Incu-Bio Programme of Hong Kong Science and Technology Parks. Cellomics also received venture capital fund under the CityUE Investment Fund, to further grow the company.

6.2 Smart Battery Health and Travel Range Monitoring System

Imagine! You are rushing to an important meeting on an electric vehicle (EV) and its battery fails on you. Or the battery of your motorized wheelchair suddenly ran out as you are going up slope. Wouldn't it be nice if these "unexpected" situations can be anticipated?

Unexpected premature battery failure cannot be discovered easily and accurately even with regular maintenance and experienced operators. Under the support of the Innovation and Technology Fund, with the Electrical and Mechanical Services Department of the HKSAR Government, CityU co-developed a diagnostic system that can conduct real-time estimation of the state-of-charge (SOC) and state-of-health (SOH) of batteries. The estimated SOC and SOH help users determine optimal charging profiles, discharging controls, and capacity balancing scheme for extending the lifetime of the batteries. This battery diagnostic technology has enabled industry collaboration with Beiqi Foton Motor Co., Ltd. to characterize the SOC and SOH of the battery bank for its electric vehicles.

Societal impact was achieved when the research team integrated the battery diagnostic technology with IoT (Internet of Things) for a battery health and travel range monitoring system for wheelchairs. Apart from determining the battery condition, the system can also inform users of the remaining distance that the wheelchair can travel. Users can keep acquiring information about the battery condition and remaining useful life, current location, and allowable travel distance on a mobile APP. This KT endeavor was made possible with support from the Development Office of CityU and the Hong Kong Jockey Club, in collaboration with Direction Association for the Handicapped – a local non-government organization.

6.3 Structured Nursing Handover for Better Patient Care

Ineffective communication is a major cause of critical incidents in hospitals, resulting in patient complaints, harm and even death. Multimodal (spoken, written and in-situ) communication is the core of complexity in clinical handovers. It is, therefore, imperative for Hong Kong to establish

effective communication in health care practices. To address this problem, Dr Jack PUN of CityU's Department of English and his international team formulated the protocol for structured nursing handover. This structured approach implemented through a series of professional development training workshops has significantly improved nurses' handover practices in Hong Kong hospitals.

Through an explorative case study to understand nurses' perceptions in their actual handover practices, an "evidence-based practice" training module was developed. Evidences including video recordings, actual observations and analysis of nurses' authentic spoken interactions at handovers, are used to support professional development to enhance quality of nursing handover of frontline nurses. In training, the nurses learn two communication protocols, ISBAR and CARE, adapted from Australia and the latest research findings and approaches for effective handover practices. Pre- and Post-training interviews and observations are conducted to evaluate effectiveness of training.

This research in communicative complexity of clinical handover was made possible with collaborators from the Hospital Authority of the HKSAR Government, the School of Nursing at the Hong Kong Polytechnic University, and the Institute of Communication in Health Care at Australian National University since 2016. The "cross-disciplinary" approach combines internationally recognized patient safety research and international expertise from both applied linguistics and nursing. Making research findings accessible to practitioners (i.e., clinicians and nurses) enable innovative new ways to conceptualize and develop clinical communication that significantly reduce adverse events and improve patient safety. Structured Nursing Handover for Better Patient Care promotes evidence-based training in communication in order to create safer and more efficient hospital services in Hong Kong.

The above KT endeavor has earned Dr Pun the College's Excellence in Knowledge Transfer Award 2020.

6.4 Hong Kong's First Exhibition of Leonardo da Vinci's Original Works

CityU's Indra and Harry Banga Gallery presented for the first time in Hong Kong 12 original Leonardo da Vinci drawings and showcased his machine models and a replica of one of his famous paintings between 20 September 2019 and early October 2020 to celebrate the 500th death anniversary of the Renaissance master Leonardo da Vinci. The School of Creative Media (SCM) faculty members revealed how Leonardo's legacy lives on in their creative works, and demonstrated once again a beautiful merge of the arts and sciences. This exhibition at CityU, in partnership with the Veneranda Biblioteca Ambrosiana, Milan, attracted over 11,000 visitors and provided them with an unprecedented opportunity to engage with Leonardo's famous drawings that reveal the fecund workings of his imagination and the sublime skill of his craftsmanship.

In tribute to Leonardo's continuing influence, nine contemporary artists, seven from SCM, contributed artworks to the Exhibition, imagining what Leonardo might have done in an era of digital media and virtual reality, and spanning the centuries separating present artistic and scientific world from that of Leonardo. Combining new and old media, the artists responded to his ideas on flight, movement, light, and the act of drawing itself. Their artworks, taken as a whole, forges a new nexus between art and science in the spirit not only of Leonardo but also of SCM, itself dedicated to the integration of art, science, and technology.

The Exhibition offered extraordinary insight into Leonardo's intellectual and aesthetic processes and his role as a researcher – someone who is probing, exploring and questioning in order to arrive at a specific goal, be it artistic, theoretical, or mechanical. It was therefore pertinent to look at how contemporary artists are pursuing such modes of inquiry, inspired by the works of Leonardo. These contemporary and new media works intentionally show varying degrees of proximity to Leonardo's creations, while demonstrating an aesthetic and creative process grounded in technical (technological) and scholarly (experimental) inquiry. It is this humanistic understanding of science and technology that allows Leonardo and like-minded researchers to bridge the yawning gap between the humanities and the science today.



Appendix 1

Summary of Knowledge Transfer Performance Indicators

	2019-20
1. ¹ Sector-wide Performance Measures (in million HK dollars)	
1.1 Knowledge transfer via the provision of research and business serv	ices
Collaborative research and contract research (cumulative value in the financial year)	66
Consultancy (value received during the financial year)	8.4
CPD courses (value received during the financial year)	892.4
Sub-total	966.8
1.2 Knowledge transfer as innovative activity	
Total IP income received	7.6
² Net income from start-ups	N/A
Sub-total	7.6
1.3 Expenditure on public engagement activities	
Public engagement activities except CPD courses	³ 4.6
CPD courses	370.2
Sub-total	374.8
2. Institution-specific Key Performance Indicators	
2.1 Activity level per staff in knowledge transfer activities	
No. of patents filed per full-time faculty	0.15

¹ Data extracted from UGC common data collection exercise.

² The University's wholly-owned licensing arm and investment holding company are not counted as start-ups.

³ The drop in expenditures of public engagement activities except CPD courses was due to cancellation of many activities as a result of social unrest and COVID-19.

	2019-20
No. of patents granted per full-time faculty	0.10
No. of collaborative research projects per full-time faculty	0.06
No. of contract research projects per full-time faculty	0.35
2.2 No. of companies, NGOs, and government organizations with which CityU staff partner	41783
2.3 Number of issued US patents in previous calendar year	49 (Y2019)
2.4 Invention commercialization rate (including non-patentable knowhow, software)	15.0%

⁴ The drop in the number of organizations with which CityU staff partner was due to cancellation of many community engagement activities as a result of social unrest and COVID-19.

Knowledge Transfer in College of Business

The College of Business (CB) and its member departments have been involving in a wide range of KT activities. These KT activities typically include (i) community engagement such as delivering public lectures, media interviews, press conferences and workshops; (ii) involvement in external advisory bodies including professional, industrial and the government; and (iii) student placement and internship.

Highlights of KT Activities of Member Departments

Department of Accountancy (AC)

Unlike Science and Engineering, Accountancy as a business discipline has little to do with technology transfer such as patents and licensing. Our KT effort focuses on applying the professional accounting and business knowledge of our staff and students to serve professional accounting bodies, business community, and social enterprises/NGOs. AC generates impact and contributions to increase the sustainability of social enterprises in Hong Kong and the sustainability of the Hong Kong accounting profession.

Social enterprises play an important role in tackling today's social challenges including poverty, unemployment and social exclusion. A social enterprise (SE) is a business established to achieve social objectives through innovative and entrepreneurial approaches. It is well recognized for the importance of sustainable growth of the social enterprise sector to promote social innovation, enable the socially disadvantaged to be self-reliant through employment, and meet the needs of various community groups. Recently, some established SEs in Hong Kong have been embarking or planning for a new course - transforming from start-ups to scale-ups so as to achieve a bigger impact of social enterprises and social innovation projects. How to scale up social enterprises and their social impact, however, presents a new challenge for social enterprises, government agencies and other stakeholders of the SE sector in Hong Kong.

With an aim of making a strong KT impact in facilitating the development of social enterprise sector in Hong Kong, Dr Sidney LEUNG led a KT research team including Prof Phyllis MO and Dr Raymond WONG in partnership with the Hong Kong Council of Social Services – Social Enterprise Business Centre (SEBC). Both Mr Howard LING, Chief Consultant of SEBC and Mr Tom CHAN, Project Manager of SEBC are our collaborating team members. The team received funding (UGC KT Earmarked Fund) and conducted the KT project *Transforming Social Enterprises from Start-Up to Scale-Up: A Study of Social Enterprises Funded by SIE Scale-Up Fund.* A research report was completed which reveals the major challenges and opportunities facing the SEs and scaling strategies available to them in scaling up their social impact. The report also discusses policy implications and recommendations for scaling up SEs in Hong Kong. Due to the COVID-19 outbreak, we were unfortunately unable to disseminate the report's findings and recommendations to SEs and other stakeholders. We plan to conduct 2-3 seminars in partnership with HKCSS – Social Enterprise Business Centre in the period from November 2020 to January 2021.

The COVID-19 pandemic has caused significant adverse effects on the social enterprise sector in Hong Kong. Our KT research team has started a new project to examine the impact of coronavirus crisis on social enterprises. The goal of this project is to identify major challenges, current measures and planned actions taken to limit the COVID-19 impact on social enterprises in Hong Kong. Currently, we have interviewed over 35 social enterprises to collect data on various issues. A report will be issued before the end of this year.

Department of Economics and Finance (EF)

Despite the fact that it was not an easy year, faculty members of the Department of Economics and Finance (EF) continued working hard and making much contribution to the various prestigious advisory boards of academic, professional, governmental and industry organizations, for instance, HKSAR Government - Financial Reporting Council, Hong Kong Insurance Authority, Hong Kong Research Grants Council, Investor and Financial Education Council, Hong Kong Institute of Bankers, Hong Kong Securities and Investment Institute, Hong Kong Blockchain Society, Vocational Training Council, Hong Kong Shu Yan University, Hang Seng University of Hong Kong, etc. during the reporting period of 2019-20.

In addition, EF faculty members continued to share invaluable knowledge and experience to the industry by organizing, participating, and delivering speeches in various events, such as the 2020 *Virtual Crypto Forum: The Role of Cryptocurrency-Blockchain in the Post Pandemic World, EMBA CEO Forum, Smart Life Insurance and Business Cases*, etc. These events were partnered with renowned organizations or companies such as GOSS Institute of Research, Esquel, InvestHK, Prudential HK, HSBC Insurance, etc.

Department of Information Systems (IS)

1. Editorial service of conferences and journals, especially in A+ or A journals and conferences

Academic colleagues in the Department of Information Systems (IS) have been serving as committee members, editorial board members and editors of a number of renowned international conferences. Representative examples are: Prof Robert DAVISON as Editor-in-Chief for *Information Systems Journal*, Editor-in-Chief for *Electronic Journal of Information Systems in Developing Countries*; Prof Juan FENG as Associate Editor for *Information Systems Research (ISR)*, Senior Editor for *E-Commerce Research and Application*; Prof Choon Ling SIA as Senior Editor for *Journal of Association for Information Systems (JAIS)*; Associate Editor for *Information Systems Research (ISR)*, Senior Editor for Research (ISR); Editorial Board Member for *Information and Management*; Dr Alan ZHANG and Dr Ron KWOK as Associate Editor for *INFORMS Journal of Computing, ACM, TMIS* and *ICIS2018*; Dr Wei Thoo YUE as Associate Editor for *Electronic Commerce Research and Applications*; Dr Raymond LAU as Associate Editor for *Electronic Commerce Research and Applications*; Dr Raymond LAU as Associate Editor for *Electronic Commerce Research and Applications*; Dr Raymond LAU as Associate Editor for *Electronic Commerce Research and Applications*; Dr Raymond LAU as Associate Editor for *Electronic Commerce Research and Applications*; Dr Raymond LAU as Associate Editor for *Electronic Commerce Research and Applications*; Dr Raymond LAU as Associate Editor for *Electronic Commerce Research and Applications*; Dr Raymond LAU as Associate Editor for *Electronic Systems Research*.

2. Talks and seminars of research center, grants and research findings

Owing to the prolonged social unrest occurred in semester A of FY2019-20, as well as the COVID-19 pandemic in semester B, many research activities in forms of seminar/forum/conference have been cancelled.

3. Organizing of research collaboration with industries

- Dr Xin LI on research collaboration with Tencent;
- Dr Wei Thoo YUE on research collaboration with Pfizer Consumer Healthcare China on optimizing a large-scale digital advertising campaign.
- 4. Serving on the Advisory Boards of other universities or companies, key appointments in professional associations/organizations, as well as external academic appointments
 - Prof Kai LIM as Honorary Professor for Fudan University;
 - Prof Robert DAVISON as Visiting Professor for Loughborough University (UK), University of Sydney (Australia), as well as External Assessor for University of Malaya (Malaysia);

- Dr Ron KWOK as Corporate Relations Committee member for Physical Fitness Association of Hong Kong; as Advisory Board member for The Hong Kong Federation of Business Students;
- Mrs Chiamin FUNG as Executive Committee member for Hong Kong Association of Interactive Marketing; Sub-Committee Young PM Development member for Project Management Institute Hong Kong Chapter;
- Dr Daniel TSE as Technical Committee Member for ICSEB2018, ICEEG2019, ICMSAO'19, ANT2019;
- Ms Janet YU as Deputy Chairman of Course Advisory Committee of IT Discipline (PEAK), Hong Kong Vocational Training Council (VTC).

Department of Marketing (MKT)

The Department of Marketing continues to actively engage in various knowledge transfer activities in FY2019-20.

In the area of **industry consultancy service**, the Department provided consultancy services for 15 companies through the BBA Marketing final year projects supervised by a Senior Teaching Fellow. The companies participated in the final year projects included Bayer HealthCare Limited, CooperVision Hong Kong Ltd., Dash Consultancy & Management Limited, EATOJOY, LH Group - Kabushikigaisha Limited (MouMouClub), Magnum Research Limited, Source Beauty Enterprise Limited, Wilson Communications Ltd., Heep Hong Society, eBay Hong Kong, DDY Scientific Health and Beauty Ltd., Society for the Prevention of Cruelty to Animals (HK), Otsuka Pharmaceutical (H.K.) Limited, and Great Eagle Holdings Limited.

In the area of **community engagement**, both faculty and teaching grade staff have proactively engaged in media interviews and community activities. In total, 16 media interviews were conducted and 16 public lectures/speeches were delivered in FY2019-20. Also, some faculty members contributed to the success of various community events in different capacities. For example, a teaching grade staff was adjudicator for a statistical projection competition for secondary schools which was organized by Hong Kong Statistical Society. Two faculty members were judges for HKET Shopping Mall Awards and an insurance award organized by the Metro Broadcast Corporation Limited.

In FY2019-20, the Department organized 10 Business Leader Forums, which were opened to the public.

In the area of professional services, faculty members are advisors/reviewers for a number of organizations/associations such as the American Economic Association, Association for Consumer Research, Chinese Marketing Association of Universities, Society for Consumer Psychology, Israel Science Foundation, World Green Organization, Peter Drucker Academy, Hang Seng Management College, Hong Kong College of Technology, Chu Hai College, Tung Wah College, and CityU Community College. A faculty member serves as Chairman of the board of Autotoll Limited. He is also the Chairman for the panel of HKJC Accreditation for the Hong Kong Council for Accreditation of Academic & Vocational Qualifications. Another faculty member is Fellow of the Chartered Institute of Marketing, United Kingdom. Moreover, almost all faculty members have served as reviewers and ad-hoc reviewers for journals such as Journal of Business Research, Journal of Contemporary Marketing Science, Journal of Marketing Communications, Journal of Marketing Science (Chinese), Journal of Marketing Science, Journal of Systems Science & Systems Engineering, Journal of the Association for Consumer Research, Management Science, Manufacturing & Service Operations Management, and California Management Review. Some faculty members are editors or editorial board members of some journals such as Customer Needs and Solutions, Journal of Business Research, and Journal of Advertising.

In conclusion, the Department always encourages faculty members to engage in knowledge transfer activities. Contract research will be an area the Department will promote.

Department of Management (MGT)

The Management Department is engaged in knowledge transfer to multiple constituencies: research organizations, educational institutions, and the broader industry and general society.

Research Organization Activities

In FY2019-20, the Management Department remains highly engaged in activities serving the academic community. Prof Jane LU is the President of the Asia Academy of Management and a member of its Board of Governors, as well as senior editor of *Journal of World Business*, consulting editor for the *Asia Pacific Journal of Management* and consulting editor of the *Journal of International Business Studies (an* A+ *journal)*.

Nine members of the Department are currently taking up a total of 26 editorial board positions. Included in these are five A+ journal board positions, three A journal board positions, and eight each B+ and B journal board positions. Five Department members have also done ad hoc reviews for a total of 17 different journals.

Department members have been invited or served as keynote speakers at a total of 19 conferences and universities.

Educational Institution Activities

Members of the Department are active as advisors for other universities, including the International Advisory Board of HHL Leipzig Graduate School of Management; External Academic Advisor for the Lingnan University BBA programme; member of the Programme Advisory Committee for the Global Business Management at Hang Seng University; Academic Advisor to the CityU Community College University of Woollongong's BBA Human Resource Management and BBA General Management programmes, as well as serving as chairman of the HKCAAVQ reaccreditation panel.

Industry and General Social Activities

Department members have written articles or been interviewed in publications targeting the general community. Examples include interviews by BBC Capital, Ming Pao, and seven members writing eight articles for CB Magazine which targets alumni and a broad audience in society. Department members have also given speeches or conducted training to the general public, such as training for the Juewei Group or a public speech to business leaders.

We have begun organizing activities to benefit our alumni community, including an alumni webinar on career management, and an alumni-alumni mentoring scheme, where senior alumni would mentor junior alumni.

Finally, staff were involved in pro-bono consulting activities with the assistance of students, working with the Scout Association to identify ways of improving communications and engagement of their volunteers, and with Hyakunousha International Ltd. to identify alternative ways of providing health benefits to part-time employees.

Finally, the Department has recently begun exploring ways to further increase our knowledge transfer activities. These efforts have already shown promise, with Long Wang just receiving a

Knowledge Transfer grant for next year.

Department of Management Sciences (MS)

MS keeps promoting knowledge transfer via providing consultancy services to the external organizations, academic activities, student internship and social media.

The Statistical Consulting Unit has proactively engaged in knowledge transfer. The Unit has conducted two consulting projects for the Hong Kong & Kowloon Ferry Holding and the CityU's School of Graduate Studies. It also conducted four investigations and released quarterly Consumer Confidence Index for four regions across the straits. The index has reflected the difficult time of Hong Kong consumers' situation during the periods. It has been published by many mass media in the mainland, Hong Kong, Macau, and Taiwan, including Hong Kong Economic Times and Radio Television Hong Kong.

MS also assisted the University to set up a Food Safety Index Project with the Vitargent Company in 2017 to build a platform for research and development of innovative technologies to reflect food safety level in Hong Kong. The contract is pending for signing.

For students, nine groups of 27 postgraduate students enrolled credit-bearing internship scheme that benefits both students and employers in terms of career plan and manpower resources.

MS faculty members also actively take up honorary consultant roles in the committees of the public/private organizations, hence directly providing professional comments and advices to the community. For example, consultancy projects with Tmall (Alibaba) on the dynamic assortment planning and pricing for e-commence and Citadel LLC (New York Office); a contract research with Hospital Authority on the review of patient transport service, etc. Our members were also invited to participate in the workshops of PanAgora Asset Management and Autumn Seminar of Inquire Europe; in the guest lecture of AXA IM Chorus and CUHK; and in the seminars of Jinan University, Shanghai University of Finance and Economics and Boston University.

MS has made significant contribution and hopes to disseminate more knowledge and inputs to the community, industry and public.

Knowledge Transfer in College of Engineering

Department of Architecture and Civil Engineering (ACE)

ACE has been continuing in promoting knowledge transfer through providing high-level consultancy services (13 projects totalling HK\$2.2M) and contract/collaborative research for the public and private organizations (eight projects totalling HK\$1.79M). There were 65 on-going externally funded research projects with a total funding of over HK\$45.41M (TRS, ECF, ITF, RIF, ECS/GRF, and other-RGC joint schemes). Besides, our faculty members have been conducting 17 Mainland funded projects with a total amount of RMB28.36M. ACE's research activities are supported by a range of the state-of-the art equipment, including a 600-ton MTS Universal Testing Machine, the Wind Tunnel Facility, an experimental water flume (i.e. 12.5 meters long test section), a well-equipped Indoor Air Quality Laboratory and Built-information and Smart Cities Cluster to facilitate multi-disciplinary research approaches and activities.

ACE colleagues have been actively sharing their expert knowledge by taking up external advisory appointments, serving as panel members of statutory bodies and committees at the HKSAR Government and professional institutions such as the Appeal Board Members, Disciplinary Tribunal Panel Members for Buildings Department and Accreditation Board Members. They also took up the role of editor or editorial board members for prestigious journals as well as committee members of international conferences and judging panels, etc. During the reporting period, more than 24 ACE faculty members served on over 66 HKSAR Government Committees, professional institutions, non-profit making organizations and the industry.

Department of Biomedical Engineering (BME)

Researchers from the BME Department have made great efforts to apply their research expertise and innovations with substantial impact to the industry and community in Hong Kong and mainland. Faculty members have engaged as members of external advisory bodies, including professional, industrial, government, statutory and non-statutory bodies (e.g. The Institute of Electrical and Electronics Engineers (IEEE), Canadian Academy of Engineering, Royal Society of Chemistry, International Society of Magnetic Resonance in Medicine, International Society of Bionic Engineering, Textile Institute, Chinese Association of Automation, Chinese Society of Micro-Nano Technology, Hong Kong Institution of Engineers, Hong Kong Medical and Healthcare Device Industries Association, Hong Kong Biotechnology Organization, Hong Kong Institution of Textiles and Apparel, Hong Kong Civic Association, Hong Kong Far Infrared Association, Hong Kong Federation of Invention and Innovation, Hong Kong Wellness Science and Technology Park, Ministry of Education of China, the HKSAR Government's Research Grants Council, Innovation and Technology Commission, Hong Kong Examinations and Assessment Authority, and Curriculum Development Council). They also have served as editorial board members of international journals and adjunct/visiting professors and advisors of universities, institutes and companies. In addition, they have given public lectures and speeches at universities, research institutes and companies.

There were a total of 10 on-going consultancy and collaborative projects (CRFs, ITFs, contract research, donations, and NSFC/RGC Joint Research Scheme) at a total value of HK\$13M undertaken by BME faculty members, including projects with donations from mainland universities and local manufacturers. Moreover, two start-up companies were established and one US patent was granted, along with two US patents and three mainland patents filed.

Division of Building Science and Technology (BST)

Staff members are encouraged to contribute to the development of the building industry through applied research, consultancy services, contract research, engagement in advisory bodies, and delivery of public lectures to practitioners.

In FY2019-20, BST staff have undertaken three on-going contract research for private companies and government departments with an amount in excess of HK\$2.9M. A patent application for an invention of "Heat-driven Vacuum Dehumidification" has also been documented for submission. The Division is well connected with many relevant government departments and reputable professional institutions such as HKIS, HKIE, CIC, and HKGBC. Our staff have actively served in various external advisory bodies, as well as holding various leading positions in these professional bodies and government departments.

Following an outbreak of COVID-19 in Luk Chuen House and Lek Yuen Estate of Sha Tin, a group of members from four local universities, including BST staff, performed an environment study at the request of Professor K Y YUEN with the coordination of the Environmental Protection Department, Centre for Health Protection and Housing Department from 16-17 June 2020. The study aimed to identify possible roles of the building drainage system, and air flows on the COVID-19 spread. The CityU team measured 15 sampling locations out of a total of 20. The data strongly suggested that there was leakage in drainage stack/pipes. Further measures for improvement were recommended to related parties.

The Division will continue to explore knowledge transfer opportunities in the areas of building energy and environmental technology, construction management and engineering, and surveying so as to benefit the community and promote its image.

Department of Computer Science (CS)

CS has received worldwide recognition for its outstanding research and pedagogical development. Ranked the 13th Best Computer Science Department globally by the US News & World Report (2020), and top-100 worldwide by QS World University Rankings by Subject (2020), the Department is engaged in an on-going pursuit of excellence.

The Department conducts world-class fundamental and applied research. With more than 195 research projects in progress with total funding of over HK\$142M, the vital areas covered include artificial intelligence, bioinformatics, cloud computing, data science, evolutionary computation and metaheuristic, information security, machine learning, mobile computing, multimedia computing, software engineering, vision and graphics.

The Department has established a strong reputation in the research community and actively participated in various KT activities. We regularly host major international conferences and workshops such as the Summer Summit on Cryptocurrency and Blockchain Technologies from 1-2 August 2019 and ACM Conference on Information-Centric Networking 2019 from 24-26 September 2019. Our staff have been serving as journal editors, committee members of international conferences, and judging panels and committees for the government, learned societies and professional bodies (e.g. Editor-in-Chief of *IEEE Transactions on Evolutionary Computation* and *IEEE Transactions on Cybernetics*; Vice President of IEEE Systems, Man and Cybernetics; Vice President of Chief Executive's Award for Teaching Excellence, Education Bureau; and HKIE Accreditation Committee Members for Computer Science).

Collaboration with Industry

CS has developed a wide range of applied research initiatives in collaboration with leading edge

institutions and companies. These include projects on autonomous driving, blockchain applications, bioinformatics, advanced video coding, which have attracted funding amounts of over HK\$30M from the industry and the Innovation and Technology Commission in the past year. Examples of applied research projects obtained by CS Staff in FY2019-20 are shown below:

Principal Investigator	Project Title	Amount (HK\$)
Prof WANG Jianping	Security and Safety in Autonomous Driving - RMGS	13,042,285.00
Dr CHOW Chi Yin	Building a Multi-Agent Deep Reinforcement Learning Framework for Flexible Job Scheduling in Smart Factories	2,896,620.68
Dr WANG Cong	Building Trustworthy and Secure Data Aggregation Services on Blockchain Platforms	2,282,145.15
Dr LI Shuaicheng	Genome Assembly and Haplotyping Based on stLFT Data	1,398,400.00
Dr LIAO Jing	Technical Cooperation Project on Mobile Computational Photography - RMGS	1,160,000.00

Nurture Entrepreneurship and Encourage Start-ups

CS recognizes the importance of nurturing students' entrepreneurial spirits in leveraging the knowledge to applicable business practices. Our efforts in promoting entrepreneurship have reaped fruits with a number of recent graduates starting up their own companies.

Graduate (Name, Programme & Year)	Name of the Company	
XIONG Bernie (MPhil 2010)	Klook Travel Technology Limited	
WONG Nok Ching Joshua (BScCS 2017)	Flow Entertainment Limited	
Mr HANG Ching Nam (BScCS 2019, PhD student); Mr LING Lin Alex (PhD student); Mr YU Pei-Duo (PhD student)	Nautilus Software Technologies Limited	
ZHOU Liuyang Leo (PhD 2014)	智言科技 (artificial intelligence to develop chatbot solutions)	
ZHANG Jiadong (PhD 2015)	Social Mind Analytics Ltd. (analytics platform for social media)	
WONG Shek Fei Duncan (BScCS 2015)	HoTechie Ltd. (IoT solutions, mobile apps)	
CHAN Chung Ngok (BScCS 2014)	Innothink Tech Ltd. (mobile apps); Musedom Tech Ltd. (cloud-based application)	
WONG Ka Wai (BScCS 2013)	Algo Tech Ltd. (enterprise system); Raysion Tech Ltd. (clinic management system)	

IT Professional Placement

Since its introduction in 1988, our IT Professional Placement (at least nine months) has constituted a fundamental and strong component of our undergraduate BScCS programme to allow our students to gain experience within a workplace and transfer their knowledge learned at the University to the industry. The number of organizations participating in the programme has increased every year, and there were around 57 companies offering placement in FY2019-20, including some very prestigious companies such as IBM, Jardine Matheson, HK Exchanges and Clearing, Siemens, Smartone, Bank of East Asia, Hospital Authority, etc., with extension to overseas institutions in recent years. Through expanded liaison with industry partners and enhanced administrative support, we successfully placed 158 students and received a mean score of 3.97 out of 5 rated by employers this year.

Department of Electrical Engineering (EE)

Faculty members have continued to actively apply their expertise and innovations to benefit the industry and the community. They have produced respectable paper publications in top-notch journals including *Nature*, IEEE transactions and journals, as well as journals of a similar calibre. The yearly average number of journal publications per faculty is about five. They have also delivered a number of technical seminars or workshops to both local and overseas communities. Such an effort was continued through online platforms despite the special circumstance arising from the outbreak of COVID-19.

In September 2019, a new initiative of CityU EE Joint Lab has been launched with an aim to empower recruitment, research collaboration, commercialization, and technology transfer. It is a "Government-Industry-Academic-Research Centre" scheme for collaboration between the EE Department and industrial associations, research centers, corporates and organizations. This scheme includes an online platform linked with EE's website to share the progress of collaboration and projects; a series of regular networking events for industrialists, faculty members, and students; as well as a lab entrance showcasing the collaborations. Currently, five important technology organizations, namely, Automotive Platforms and Application Systems R&D Centre (APAS), Electrical and Mechanical Services Department (EMSD), Hong Kong Applied Science and Technology Research Institute Company Limited (ASTRI), Hong Kong Electronic Industries Association (HKEIA), and Hong Kong Productivity Council (HKPC) have joined the scheme.

For KT activities with the local community, EE has built close connections through providing consultancy services (six projects amounting to HK\$1.59M) and contract research (10 projects amounting to HK\$6.93M). Riding on its strong commitment on conducting world-class fundamental and high-impact research, there are more than 85 externally funded projects in progress with a total funding of over HK\$125M (GRF/ ECS, CRF, TRS, ITF, NSFC, NFSC-RGC, mainland funding schemes, donations, and other joint schemes), in which 10 are industrially related with a total amount of HK\$42M. Several faculty members have also been actively engaged in research related to COVID-19 contributing to the global fight against this epidemic. The research works accumulated over the years have brought 14 active licenses generating a gross profit of HK\$0.9M. Since 2001, there have been 164 patents granted (10 newly granted patents this year) and 92 patents filed.

Faculty members continued to serve as editors or editorial board members for prestigious journals. They also served in advisory roles in, for example, Research Grants Council, Innovation and Technology Commission, Hong Kong Science and Technology Parks Corporation Limited, Asia Pacific Neural Network Society, Electrical and Mechanical Services Department, Home Affairs Bureau, Education Bureau, and Vocational Training Council, for contributing to various academic and industrial institutions, professional bodies or government units.

Department of Mechanical Engineering (MNE)

Faculty members have been actively engaged in a variety of knowledge transfer activities. These include serving as members of various advisory committees, such as advisory committee of Nuclear Safety in Atomic Energy Council of Taiwan, Sustainable Development Committee-Long-term Carbon Reduction Strategy Support Group of HKSAR Government, and International Science and Technology Committee of Alstom Holdings in France, or panels, e.g., engineering panel of RGC, or editorial boards of various journals. The Department has organized academic visits, such as those organized by the CLP Low Carbon Energy Education Center. In

addition, faculty members have given invited/plenary speeches and public lectures, such as Environment Bureau's Long-term Decarbonisation Strategy Public Engagement Forum. Through these visits, the Center introduces to the public the notions related to the harness and safe use of low carbon energy, particularly nuclear energy, in our daily life. Our faculty members also actively participated in community engagements through the visits/lectures to local governments in mainland China. Significantly, our faculty members have filed five patents in US and mainland China through their innovative researches. A significant impact case entitled *From 3D to 4D printing: From Rigid to Stretchable* has also been reported. In addition, to support the development of local industries, we have secured nine ITF projects with a total amount of HK\$24,501,113.

Department of Materials Science and Engineering (MSE)

In FY2019-20, MSE faculty members have achieved remarkable accomplishments in knowledge transfer activities, such as contract research and patent applications. To be specific, we published more than 800 articles in various high-impact journals during the report period. Among them, many of the works have the promising potential to be further commercialized. For example, there are two spin-off companies established from the projects of flexible batteries performed by Prof ZHI Chunyi and his team, and three patents have been licensed to these two companies for further technology and product development. Another example comes from the project carried out by Prof Robert LI on the material development for paper-based packaging. Over HK\$5M has been obtained from the government and industry to build an industrial ecosystem solution. A start-up company, Ecoinno (H.K.) Limited, has experienced significant expansion, starting from two founders to 12 full-time staff, employing eight local university graduates, and other top tier talents with a strong industrial background. Apart from these product commercialization activities, our colleagues are also very active engaging into different communities, including to serve as editors or editorial board members for prestigious scientific journals. They are also invited to review research grant proposals for overseas research funding agencies as well as master's theses and doctoral dissertations for local and overseas universities.

Department of Systems Engineering and Engineering Management (SEEM)

SEEM has continued its effort in knowledge transfer activities by engaging in various contract research projects. SEEM faculty members have established a strong network of industrial linkage worldwide. Industrial collaborators include companies and organizations in diversified industries such as public utilities, transportation, healthcare, government organization, etc.

SEEM faculty members continued to provide advisory services to the government and professional organizations including the University Grants Committee, Secretary of Education, Occupational Safety and Health Council, Hong Kong Institution of Engineers, Hong Kong Institute of Utility Specialists, Hong Kong Nuclear Society, Hong Kong Society for Quality, and American Society for Quality.

Knowledge Transfer in College of Liberal Arts and Social Sciences

The College of Liberal Arts and Social Sciences (CLASS) was the first College in the University to launch the Excellence in Knowledge Transfer Award in 2011 and this has become an annual event since then. In FY2019-20, three winning projects were selected as below:

Project Title	Department	Recipient	
Excellence in Knowledge Transfer Award			
Developing Effective Clinical Communication at Nursing Handover: Improving Patient Safety, Experiences and Outcomes in Hong Kong	Department of English	Dr Jack PUN	
Certificate of Merit			
Catering the Needs of Diverse Learners Using Interactive Dialogue and Creative Literacy Activities in English Language Education	Department of Social and Behavioural Sciences	Dr CHOW Wing Yin Bonnie	
Omega-3 Supplementation to Reduce Eexternalizing Behavior Problems in Risk-taking Adolescents: A Randomized, Placebo-controlled, Double-blind Trial	Department of Social and Behavioural Sciences	Dr FUNG Lai Chu Annis	

CLASS continued to publish the College magazine "CITY CLASS" annually to report knowledge transfer and research, as well as academic achievement. The magazine is able to reach a wide range of readers including academics, potential donors, prospective students, alumni, CityU supporters and the general public with a circulation of 4,000 copies and electronic version is also available on the College website. A dedicated channel on SCMP.com was also launched this year to host the College magazine and promote College's KT activities.

CLASS faculty members proactively responded to the COVID-19 by submitting policy proposals to the China government; and providing free and timely on-line resources to facilitate on-line teaching and learning opportunities. They have been interviewed by different prime media outlets on their professional insights regarding disruptions brought by COVID-19, e.g. from psychological impact of the virus on people including issues like anxiety, the impact of quarantining, to health communication and the efficiency of healthcare systems in different countries. Prime media outlets include Bloomberg, The Economist, ViuTV Six, South China Morning Post, China Daily, Hong Kong Economic Journal, etc.

Departments of CLASS were also actively engaged in various KT activities and their significant highlights are summarized as below:

Department of Asian and International Studies (AIS)

Through its KT activities, AIS disseminates new knowledge concerning socio-political, economic and cultural processes of change in Asian countries, situating these changes in the broader global context. AIS placed a strategic focus on media outreach for its KT contribution in 2019-20. For a small department, we managed a record number of media interactions during the year—99 to be exact—enabling us to reach regional and global audiences. AIS takes seriously the role of engagement with top global media outlets to ensure that CityU remains ranked as the world's most international university and the DAA has observed that "few departments around the world can

boast such an array of media impact." AIS media engagement serves to offer new ways of approaching issues that are then reflected upon by decision-makers and the general public. It also builds CityU's global brand, which facilitates research ties and recruitment of top international students.

Department of Chinese and History (CAH)

Our department serves the community and transfers our knowledge via:

- 1. Mainstream and online media interviews on South China Morning Post and Metro Radio;
- 2. Participation in the Global commemoration of 100th anniversary of the May 4th movement including exhibitions, talks, and social media sharing;
- 3. Organization of online exhibition "Re-discovering Joseph Needham's Science and Civilisation in China";
- 4. Designing historical walking trials for Hunghom community at The Kowloon City Themed Walking Trail Project;
- 5. Actively participation as board members in government bodies; and
- 6. Organizing workshops for secondary-school teachers and students.

Department of Media and Communication (COM)

In FY2019-20, COM carried out the following KT activities:

- 1. 21 public lectures, seminars, and workshops to a variety of audiences, including:
 - public lectures and online seminars to audiences at major universities locally and in the Greater China area on a variety of topics including health communication, political communication, and communication technology and policy; and
 - three lecture sessions on suicide prevention using hotlines;
- 2. Four Media interviews/publications were recorded including:
 - one interview with The Economist;
 - two interviews with local press Ming Pao; and
 - one article for 8btc.com.
- 3. 28 appointments in advisory positions at various professional organizations including:
 - 16 editorships/associate editorships at academic publication outlets; and
 - 12 external advisory appointments in the capacity of external examiners, mentors, and administrative leaders.

Department of English (EN)

The Department of English's knowledge transfer activities focus on academic/professional communication, teaching/training activities and community literary events. Literary events include: 1) A public exhibition and creative writing workshop in collaboration with the Hong Kong Holocaust and Tolerance Centre, Yad Vashem - The World Holocaust Remembrance Center; 2) A writing competition for secondary school students and the publication of a collection of creative writing by Hong Kong secondary and tertiary students, entitled *Halfway Home X*. Academic/professional training activities include the use of media and social media to reach out to a wider public with a series of instructional YouTube videos on academic and professional communication in social sciences and natural sciences. One significant case study is a nursing training collaboration between CityU Department of English, Hospital Authority of the HKSAR

Government, School of Nursing (PolyU), and the Institute of Communication in Health Care at Australian National University.

Department of Linguistics and Translation (LT)

In this reporting period, faculty members at the Department of Linguistics and Translation continued to contribute their expertise outside CityU by serving as conference committee members and panel members at government bodies, and with leadership roles in a number of academic associations and journals. Our faculty members supervised four funded knowledge transfer projects, and received support from the Research Grant Matching Scheme. Further, a research project resulted in the award of a U.S. patent. Regarding impact cases, the Department reported two major outreach efforts to secondary school students, postgraduate students and international scholars.

Department of Public Policy (POL)

POL colleagues have been highly active in KT activities, in terms of external advisory appointment (serving on editorial board of internal journals, advisory panel of professional organizations, academic programmes, industrial bodies, NGOs and governmental departments) and community engagement (delivering public lectures, having media interviews, etc.) during the reporting period.

The impact case of policy proposal on "How Tolerating Decision Errors Can Improve Early Response During COVID-19" directed by Prof WANG Xiaohu, showcases organized effort to build up KT capabilities step by step and improve KT performance of colleagues within and beyond POL, by bridging academic studies and policy-making bodies.

Department of Social and Behavioural Sciences (SS)

The growing spotlight on achieving impact through academic activities has inspired the Department of Social and Behavioural Sciences to encourage KT activities with community collaborators. A culture of collaboration is being promoted among faculty members, students, alumni, and community partners to discover and innovate best practices to build capacities, improve health and education, and inform public policy to benefit our society. Despite confronted by unprecedented challenges in FY2019-20, SS colleagues continue their KT activities actively in developing Massive Online Open Courses (MOOC), conducting public lectures, workshops, research salon series, and exhibitions of students' creative work, organizing conferences and forums, receiving media interviews, press conferences and radio shows, providing consultations and conducting contract research for external bodies, including professional, government, statutory bodies and non-government organizations (NGOs).

Chan Feng Men-ling Chan Shuk-lin Language Centre (LC)

KT activities for the reporting period include the engagement in accreditation, examining work for HKEAA, and a professional development programme for English Language teachers from non-mainstream institutes in Pakistan.

The engagement in accreditation exercises organized by HKCAAVQ provides the Centre with up-to-date knowledge in quality assurance and qualification frameworks. The experience also strengthens the Centre's network, including the Industry Training Advisory Committee, professional bodies and representatives of education institutions.

The examining work for HKEAA provides a great opportunity for the Centre to share its expertise and assessment skills to its educational counterparts. The collaboration gives the Centre's access to the best practices and developments relating to teaching, learning and assessment. The professional development programme was a free program for the madrassa teachers, sponsored by an NGO and the U.S. Embassy in Pakistan. This activity was capacity building for non-mainstream teachers in Pakistan which is an initiative for bringing people in society who are sometimes marginalized into trainings to help them develop their communities. Through this successful and effective engagement, the Centre's reputation is significantly enhanced as an active participant in the community who addresses the needs of the society and shares its expertise and knowledge with its community partner.

Knowledge Transfer in College of Science

Member departments of the College of Science are active in KT with accomplishments given below:

Department of Chemistry

The Department of Chemistry strongly encourages faculty members to participate in various knowledge transfer activities. There are two examples in FY2019-20.

Prof ZHANG Hua and his collaborators have discovered that the ultrathin gold nanoribbons with unique hexagonal (4H type) crystal phase shows "liquid-like" behaviour under heating, but its hexagonal crystalline structure remains stable. This finding provides insight into the thermal stability of this new type of metallic nanomaterials and facilitates the development of future practical applications in nanoelectronics, plasmonics and catalysis, which involve operation in high temperature.

Phorbiplatin, a new anti-cancer chemical compound developed by Dr Guangyu ZHU offers hope for minimizing the degree of damage that "normal" cells undergo during cancer treatment. A US patent for phorbiplatin is currently pending. This new treatment provides a more efficient and effective means trigger anti-cancer agents inserted into the tumour.

Department of Mathematics

The Department of Mathematics has conducted various knowledge transfer activities pursuing outreach to society and industry, and strengthening scientific research and collaboration with the public sector in FY2019-20.

The project Advanced Talent Education Programmes for Gifted Students in Hong Kong with an awarded amount of HK\$0.92M was granted by Gifted Education Fund of Hong Kong Education Bureau this year. A 9-month course is being offered to 68 participants this summer. Faculties participated in the Joint School Science Exhibition, offered expert talks to secondary school students, delivered scientific/career talks and promotional talks for PhD programme in the Mainland. Seven undergraduate students attended an online summer programme organized by Sun Yat-Sen University. A seminar series with 10 talks for students aiming to broaden the knowledge creation component in students' academic programmes is actively in progress. To enhance undergraduate students' competency and employability, the Department has also offered some research internship positions this summer.

Faculty members have made tremendous efforts in their active participation in government, industry and professional advisory bodies and have served selection/advisory committee membership roles for mathematical awards and competitions. An undergraduate student was awarded Top Quartile for Individuals – Stonehage Fleming/Marais Prizes in the 2019 Simon Marais Mathematics Competition this year.

The Department always strives for a vigorous research culture to promote transfer of scientific research knowledge. Faculty members have worked on 85 projects (total funding HK\$37.68M) exploring artificial intelligence, sparse representation systems for manifold and graph data and deep learning techniques for various real-life applications in social network data analysis, establishing a control method for Neospora caninum infections in dairy, and studying the cause of abnormal cell development and provide a potential treatment for clinical studies, etc. The Department has proposed five projects that are of high potential for commercialization and collaboration

opportunities in an activity. To promote global networks for research collaboration, the Department has co-organized the International Conference on Mathematical Analysis and its Applications with Hong Kong Institute for Advanced Study. In professional services, 14 faculty members are actively serving editorial roles in 77 mathematics journals.

Achievements of research students include Best Student Paper Award (Third Prize), Outstanding Research Thesis Award, Outstanding Teaching Award for Teaching Assistants, and the HKMS Best Thesis Award. Faculties received numerous honors including the HKMS Outstanding Young Scholars Award, Highly-cited Researcher, Recognition of Leadership Award (IEEE), the Teaching Excellence Award for innovative teaching and learning through knowledge transformation for global challenges in this year.

The Department has developed/participated several collaborations with industry/overseas institutions including a PhD internship programme under an agreement with Hong Kong Productivity Council, a collaborative agreement for teaching and research with the University of Edinburgh and a project with researchers from Shenzhen Institute of Artificial Intelligence and Robotics for Society to work on developing practical algorithms in pMRI regularization models for medical imaging aiming to improve the quality of the MRI images.

A patent "Method for Determining Optimal Laying Arrangement of Infrastructure Link" collaborated with two other departments was registered this year.

Department of Physics

In the reporting year, the Department of Physics made significant knowledge transfer achievements. Two notable examples are: Prof Paul CHU has a US patent granted (US 10,603,412 B2); and Dr Condon LAU co-founded a start-up company (ITsci Company Ltd) to commercialize a CityU technology invented by him. Our faculty members continued to engage in various local and international academic and industrial institutions. Locally, Prof X L WANG served as the President of the Physical Society of Hong Kong. Several of our faculty members served as committee and advisory board members of professional and governmental agencies including the Biomedical Discipline of the Hong Kong Institute of Engineers, the Hong Kong Physics Olympiad Committee, the interview panel of the Hong Kong Scholarship for Excellence Scheme (HKSES), the Assessment Panel for Competitive Research Funding Schemes and Joint Research Scheme for the Research Grants Council. Moreover, Prof X L WANG also served as a member of the Overseas Assessment Panel of the Chinese Academy of Sciences. In the international academic community, our faculties served in the editorial and advisory boards of many scientific journals, including the Journal of Environmental Radioactivity, Nuclear Technology & Radiation Protection Journal, the Open Conference Proceedings Journal and as Editor/Associate Editor of the Journal of Applied Physics and the Open Journal of Physics. In the industrial sector, Prof Paul CHU was on the Board of Shenzhen CAS Morefound Co., Ltd., the Board of Plasma Technology Limited and the Board of Chengdu PulseTech Electrical Co. Ltd. Furthermore, some of our colleagues served as External Examiners for PhD candidates and as reviewers for grant proposals and faculty promotion/tenure panels in local as well as overseas universities and research funding agencies. Our junior faculties have also been especially active in promoting science education, our Department and the University by delivering public lectures locally (including in local high schools and the science museum) and in many mainland universities.

The Department strongly encourages colleagues to reach out and contribute directly to the society and international scientific community. Contribution to consultancy and patent application are recognized in the Department's performance appraisal scheme. The Department also facilitates the application for industrial related research funding, e.g. ITF, and contract research by colleagues in order to build up direct collaborative relationship with the industries. The Department will work towards maintaining high-level and high quality capabilities and external links for KT.

Knowledge Transfer in Jockey Club College of Veterinary Medicine and Life Sciences

Over the past year, the Jockey Club College of Veterinary Medicine and Life Sciences (JCC) continued its efforts to contribute to the transfer of knowledge through various channels and platforms to benefit the community at large. The following highlights showcase JCC's knowledge transfer endeavours to make a difference at local, regional and international levels.

The Department of Biomedical Sciences and Department of Infectious Diseases and Public Health carry out internationally competitive research and promote interdisciplinary collaboration in fields of biomedical sciences and veterinary medicine. The research programmes aim to understand fundamental mechanisms of biological processes and diseases, and translate new knowledge into the development of novel diagnostic and therapeutic strategies for prediction, prevention, and treatment of human and animal diseases.

The Centre for Applied One Health Research and Policy Advice (OHRP) in JCC provides a pivotal platform to facilitate knowledge transfer activities. Its mission is to generate scientific knowledge that will lead to the development of evidence-led policies at local, national, regional and international levels for the prevention and control of infectious animal diseases affecting human health and animal production, welfare and health. It will also emphasize the societal impact of its outputs through effective science-policy communication.

With generous support by the Agriculture, Fisheries, and Conservation Department, HKSAR Government, the Department of Infectious Diseases and Public Health (PH) continued to provide the first ambulatory veterinary service for fish, pig, and poultry farmers in Hong Kong with a funding of HK\$35M that was awarded to JCC previously as contract research. The overarching goal of the ambulatory service is to work with the farmers to find solutions for preventing disease and to improve the sustainability of their farms. The ambulatory team examines terrestrial and aquatic production needs. They aim to enable them to respond more rapidly and cost-effectively to different animal health and production issues. The projects not only benefit individual farmers but also enhance the economic and environmental sustainability of the pig, poultry and fish farming industries in Hong Kong. Effective animal health strategies for local farms ensure healthy animals and safe food for the consumers. Having healthy local animal populations will also guarantee a steady supply of fish and meat to safeguard Hong Kong's food security.

Knowledge Transfer in School of Creative Media

In this reporting year, the School of Creative Media (SCM) has yielded a remarkable range of activity in the area. The School's performance in knowledge transfer is largely characterized by its community and public engagement through the organization of exhibitions and shared campus collaboration.

The first case of outstanding knowledge transfer endeavor is the "Leonardo da Vinci: Art & Science. Then & Now" Exhibition which was held between 20 September 2019 and early October 2020 at CityU Indra and Harry Banga Gallery. This exhibition, curated by Dr Isabelle FRANK and Prof Jeffrey SHAW, staged 12 original drawings by Leonardo da Vinci from the Pinacoteca and Biblioteca Abrosiana in Milan which were brought to Hong Kong to celebrate the 500th death anniversary of the artist, and featured a contemporary response to Leonardo's work by contemporary digital artists from the School of Creative Media.

The second case of knowledge transfer took place is Prof Jeffrey SHAW's solo exhibition "WYSIWYG". The acronym WYSIWYG – what you see is what you get – describes the image on a computer screen that matches its printed output. But as the title for Prof SHAW's solo exhibition, it describes the experience gained from the viewer's immediate response to interactively exploring his artworks. WYSIWYG presents milestone works that are hallmarks of Jeffrey SHAW's singular achievements in the avant-garde of contemporary media art.

The third case of knowledge transfer is Dr Tobias KLEIN's solo exhibition: "Metamorphosis or Confrontation". This exhibition is an exploration of 3D printing applications in architecture, art, design and interactive media installations. This exhibition traces Klein's work over the past decade and is structured in four distinct areas: Bones, Masks, Mutations and Forces. Each theme unravels the relationships and evolution of the artist's body of work, while at the same time demanding that visitors take a position of negotiation, evolution or confrontation. As part of the exhibition Klein conducted online talks, workshops and guided tours.

The fourth case is the Shared Campus Collaboration that ran as a summer programme. SCM is one of the founding members of the Shared Campus Network, along with Zürich University of the Arts (ZHdK), Taipei National University of the Arts, China Academy of Fine Art, Kyoto Seika University, LaSalle College of Art Singapore, and University of the Arts London. The network aims to improve excellence in research and education through enhanced international collaboration. The successes of Transcultural Collaboration partnership prompted a series of round-table discussions among the participating institutions that resulted in the present-day Shared Campus Network and culminated in the signing of the network agreement at the Shared Campus Launch Conference at Zürich University of the Arts (ZHdK) in December 2019, which also featured a presentation by Dr ZHENG Bo, Associate Professor at SCM. In summer 2019, SCM hosted a Shared Campus Summer School "Fabrication of Relics", led by Mr Warren LEUNG, Associate Professor of SCM and co-taught with Mr Billy DAVIS of ZHdK. The course featured a number of visiting lectures and workshops by local artists and practitioners, integrating Hong Kong perspectives in the course themes. In the same summer, SCM students participated in the "Hacking Global Pop Icons" summer school at ZHdK.

Knowledge Transfer in School of Data Science

The School of Data Science (SDSC) at CityU is the first of its kind in Hong Kong and one of the first in the world to lead the development of this new discipline. The faculty is composed of interdisciplinary academic leaders in multiple domains including theoretical analysis, algorithm development, smart cities and Industry 4.0, and applications in fintech, energy, environment, public health, and precision medicine.

In the reporting year, SDSC organized two online forums to present the data science approach to the coronavirus pandemic. The forums brought together international academics, industry experts, CityU faculty and students, aiming to help the public understand and cope with the worst pandemic in recent human history through analyzing complex data and recent news.

Knowledge Transfer in School of Energy and Environment

Introduction

The School of Energy and Environment (SEE) was founded in July 2009 with the mission to perform state-of-the-art research and provide professional education in energy- and environment-related issues. The faculty staff in SEE is enthusiastic in participating in knowledge transfer activities, like contract research, community service, external advisory bodies, etc. which developed interactive exchanges with government, collaborators, related organizations, and society in general.

Outside Practice

Faculty staff in SEE has conducted contract research with different institutions, Drainage Services Department (HKSAR), Hong Kong Federation of Insurers and LANCOME PARFUMS BEAUTE & CIE from 1 July 2019 to 30 June 2020.

Efforts to Build Up KT Capabilities

- 1. SEE worked with South China Morning Post by contributing articles to promote SEE and the respective research areas of faculty staff, and also inspire the general public to care and recognize the importance of energy and environment issues, so as to promote CityU's excellence in research and professional education, and care for the community and environment.
- 2. Faculty staff in SEE has been interviewed by various media, such as RTHK TV programme, South China Morning Post/Young Post, Sky Post, International Association of Energy Economics Podcast Series and other newspaper publishers on innovative research and technology. The interviews help transfer innovative knowledge to the general public.

Outstanding Knowledge Transfer Initiatives

- 1. As a co-principal investigator, Dr Alicia AN received Theme-based Research Scheme 2019-20 Funding from University Grants Committee (UGC) for a project titled *Paradigm-shifting, Fully-integrated, Compact Wastewater-to-resource Facility (WWRF)* with HKUST, HKU, PolyU and Chinese University of Hong Kong. Dr An will lead one of the main tasks to develop a sustainable hybrid membrane module system for the next five years (i.e. from 2020 to 2024). This system will optimize the process operations by minimizing the cost of water production from saline sewage and maximizing the rate of water recovery.
- 2. To promote outreach/knowledge transfer on air pollution and society, SEE organized a Tech Talk Series on May 23, 2020. Prof Chak K. CHAN, Prof Peter BRIMBLECOMBE, Dr Theodora NAH and Dr Xuan WANG were the speakers to present their latest technologies and methodologies on air pollution measurements, characterizations, modelling, as well as the effects of cooking and COVID-19 on air pollution.

Knowledge Transfer in School of Law

Below are highlights of knowledge transfer activities that the School of Law (SLW) and its colleagues carried out during the reporting period.

i) Research Contracting/Consultancy

Two of the major forms of knowledge transfer by universities and academics are through provision consultancy research contracting and of services, which enable universities/individual scholars to transfer their expertise to the necessary organizations/institutions, the broader society at large, or even internationally. Below are examples of contract research/consultancy services performed by our colleagues during the reporting period:

- Prof ZHU Guobin has been appointed as an Advisor of Our Hong Kong Foundation with effect from 1 April 2020.
- Dr Surya DEVA has been invited by the United Nations Global Compact to join its Target Gender Equality Global Coalition, a multi-stakeholder group bringing together gender equality and business experts.

ii) Professional Services

In addition to their excellent achievements in teaching and research, SLW colleagues are also engaged in knowledge transfer through serving as members of professional bodies, government bodies, statutory bodies, and being given visiting or adjunct appointments by other universities, for example, during the reporting period:

- Prof TAN Cheng-han is a member of the Law Reform Commission and member of the Standing Committee on Legal Education and Training.
- Prof LIN Feng is a member of the Telecommunications (Competition Provisions) Appeal Board.
- Ms Theresa LOW is a member of the Standing Committee on Legal Education and Training.

iii) Community Engagement Activities

As a law school, one of our missions is to facilitate academic exchange and to provide a platform for disseminating legal information and knowledge to academics, students, practitioners, as well as the interested general public. The most direct method to achieve this mission is through organizing conferences and public lectures/seminars.

During the reporting period, the School of Law, together with the research centres under it, namely the Centre for Chinese and Comparative Law, the Centre for Judicial Education and Research, the Hong Kong Commercial and Maritime Law Centre, and the Public Law and Human Rights Forum, have organized various conferences / workshops / symposia / public lectures / seminars. Most of these events were open to the public for free.

Apart from events organized by the School of Law, SLW colleagues were also invited to participate in various conferences/seminars and to give lectures to different groups of audiences. Their active participation and contribution in these activities definitely enhanced the School's achievements in knowledge transfer.

iv) Mooting

Mooting competitions are important knowledge transfer activities for law students. By participating in mooting competitions, students not only learn substantive legal principles related to different moots but also develop oratory and advocacy skills. These skills equip students for future learning and their pursuit of a legal career. Below are our students' participation during the reporting period:

- The 2020 Philip C. Jessup International Law Moot Court Competition (HK Regional Round)
- The 17th Annual Willem C. Vis (East) Int'l Commercial Arbitration Moot (Held virtually)
- The 27th Annual Willem C. Vis International Commercial Arbitration Moot (Held virtually)
- Manfred Lachs Space Law Moot Court Competition 2020 (Cancellation of the oral round, only by submission of memorials)

v) Training for Mainland Judges

SLW collaborates with the Supreme People's Court of the PRC and its National Judges College to admit Chinese judges to its Master of Laws (LLM) programme and to offer a tailor-made Doctor of Juridical Science (JSD) programme for Chinese senior judges, while a short-term and highly specialized programme is also organized for other Chinese senior judges. The presence of these mainland judges in CityU's SLW offers an exceptional opportunity to its students for exchange of views as well as a well-informed understanding of the current Chinese legal system and its development.

As of July 2020, there are 268 Chinese judge graduates from SLW's Master of Laws (Common Law) programme. Fifteen rounds of Advanced Programme for Chinese Senior Judges were held from May 2009 to June 2020, and a total of 408 senior Mainland judges joined the programme. For the Doctor of Juridical Science programme, a total of 114 Chinese judges, out of which 110 are senior judges in mainland China, have been admitted.

vi) Student Placement

Legal placement enhances students' hands-on experience apart from their theoretical learning in Hong Kong. Given its significance, legal placement is offered as one of the electives for SLW's LLB and JD students. The students did placement in Hong Kong, mainland China, Seoul and Geneva in a variety of organizations such as law firms, barrister chambers, international banks, insurance companies, NGOs, courts and international institutions.