Knowledge Transfer
Annual Report 2014/15

Submitted to
University Grants Committee

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The Hong Kong University of Science and Technology
Clear Water Bay, Kowloon, Hong Kong

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Foreword

HKUST has continued its endeavors for knowledge transfer (KT) in the year of 2014-15 according to the strategic goals:

- To build a campus culture that is conducive to innovation on an efficient and proactive KT platform
- To bring innovations that meet the specific needs of society, government, and industry
- To expand the influence of HKUST's innovations beyond Hong Kong

The year of 2014-15 was another year of increased variety and intensity of knowledge transfer activities at HKUST. This report provides a summary of the KT-related activities and achievements for 2014-15.

1. Knowledge Generation and Knowledge Transfer Endeavor

1.1 Fostering a Culture of Research Excellence

No amount of research, and by extension KT, would be possible without appropriate funding. In the year 2014/15, HKUST continued its relentless pursuit of research funding and its efforts have certainly paid off— funding for collaborative research was secured to the tune of HK$163 mil, up nearly 46% year-on-year. The number of collaborative research projects[1] supported has also gone up almost 22% to 84.

During the reporting period, four Group Research Grants and two Equipment Grants were awarded to HKUST under the Collaborative Research Fund (CRF) scheme of the Research Grants Council, bringing in a total of HK$34.55 mil. Out of this sum, HK$10 mil was awarded for the purchase and installation of a super-resolution electron microscopy facility (costing over HK$20 mil) for cross-disciplinary materials research that would benefit not just HKUST but other institutions as well. The Group Research Grants will enable research on topics as diverse as Alzheimer's disease, muscle stem cells, soft matter, and food waste disposal.

The HKUST–MIT Research Alliance Consortium, which aims to foster collaboration among companies, universities and the Hong Kong government, won HK$30.81 mil from the Innovation and Technology Fund (ITF) for three "Tier 2" projects targeting research on sensor and wireless networks. The projects, which all commenced in early 2015, underwent their semi-annual review on June 22, 2015 with results presented to the relevant advisory boards within the Consortium.

HKUST also secured substantial amounts of funding from the ITF. These include HK$13.98 mil for four projects under the University-Industry Collaboration Program, HK$10.86 mil for four projects under the Guangdong–Hong Kong Technology Cooperation Funding Scheme, HK$18.95 mil for 12 "Tier 3" projects, HK$54.51 mil for nine "Tier 2" projects (including the three aforementioned HKUST–MIT projects), and HK$6.09 mil for one project funded through the Nano and Advanced Materials Institute Ltd (NAMI). That brings the total number of new projects supported by ITF to 30 (for HK$104.39 mil), up from 21 (for HK$61.13 mil) in the previous reporting period. Overall, the figures attest to the greater interest and commitment of the private sector to engage with HKUST researchers for knowledge generation.

Not to be outdone, HKUST's four Mainland platforms raked in a combined RMB$39 mil for 38 research projects funded by the Ministry of Science and Technology, the National Natural Science Foundation, the Nansha Science and Information Technology Bureau, among several others.

The Croucher Innovation Awards recognizes and supports talented scientists working at an internationally competitive level who are at an early stage in their careers. Dr. Tom Cheung of the Division of Life Science and

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[1] Collaborative research projects are those involving at least two partners (not including the institution itself), one of which is a government or public body.

Dr. Kam-Tuen Law of the Department of Physics were both recipients of the 2015 awards. With his HK$5 mil award, Dr. Cheung will spend the next five years (starting June 1, 2015) uncovering the underlying epigenetic regulation of molecular pathways that are altered during muscle stem cell ageing. Dr. Law, who actually received a joint award of HK$6.8 mil with another junior faculty at the University of Hong Kong, will commence work on topological materials in the second half of 2015.

The funding success and numerous attempts at securing grants demonstrate HKUST's ever growing commitment to research and KT activities that would benefit academia, industry and society.

1.2 Enhancing Knowledge Transfer Supporting Infrastructure

University-wide Knowledge Transfer Infrastructure Enhancement
In addition to the well-established infrastructure to support KT activities at different stage of development through the Office of Associate Provost for Knowledge Transfer (OKT), Office of Contract and Grant Administration (OCGA), the Technology Transfer Center (TTC), the Entrepreneurship Center (EC), and the HKUST R and D Corporation Ltd. (RDC), HKUST has been further enhancing its KT-related systems, policies and processes in 2014/15. The Knowledge Transfer and Entrepreneurship Task Force (KT&E-TF) chaired by Prof. Ping Ko and comprising external members was formed in late 2014 to advise the University on how to expand its KT and entrepreneurship capacities. A two-day Task Force Meeting was held on November 10-11, 2014 with the participation of the representatives of each school and key members of relevant offices to discuss long-term strategic planning and a framework for KT and entrepreneurship activities.

In continuation of the efforts of the KT&E-TF, an internal Task Force chaired by Prof. Gary Chan has been formed with a focus on the educational dimension of entrepreneurship. Students, faculty, staff and alumni were invited to offer their thoughts on how to strengthen our entrepreneurship education so as to create a thriving ecosystem of entrepreneurship at HKUST. A first report has been made to the senior management of the University recently with further actions to be taken during 2015-16 to synergize the different pockets of existing activities.

Review of IP Policies and Technology Transfer Practices
HKUST's Intellectual Property Policy ("IP Policy") was established in the early days of the University's history, which defines IP ownership, administrative procedures, commercialization revenue distribution and general guidelines of IP disclosure and review. HKUST launched a new study in February 2015, with the help of a professional IP consultant, to fortify and enhance the current IP Policies and technology transfer practices. A concurrent effort to streamline the present Invention Disclosure and Review process while upholding the high quality technology review practice of HKUST is also underway and progressing well.

**Industrial Engagement/Cluster Technology Acceleration Initiative**
The objective of the Industrial Engagement/Cluster Technology Acceleration Initiative is to engage domain experts to nurture and enhance industrial engagement efforts in line with HKUST's strategic areas such as IC design, display, big data, materials and biotechnology. The initiative aims at integrating and synergizing the University's KT efforts among various stakeholders by building up an effective research, engagement and KT network. Two new positions have been created, namely an Industrial Engagement Manager who has been assisting and coordinating the overall industrial engagement efforts at the school level, and a Cluster Technology Acceleration Manager who has been helping faculties with a common interest to address applied research directions, engage with industries and develop large-scale research proposals and IP pipelines towards effective KT for selected technology clusters. The initiative is being run on a trial basis for two years in 2014-15 and 2015-16.

New Entrepreneurship Activity Center—The "BASE"

To further strengthen the entrepreneurship culture and enhance student mixing in HKUST, a new entrepreneurship activity center, named the "BASE", will be ready for use in August 2015. The "BASE" borrows the concept of the "base camp" in a mountain from which climbers stage their attempts to reach the summit. With this facility, we want to encourage students to start from the bottom and make it to the summit. The "BASE" was designed to be a vibrant workspace with facilities for students to work on their startups and entrepreneurial initiatives, for speakers to hold entrepreneurship talks and for staff to organize events. It will also serve as a platform for all HKUST members, external startup professionals, and entrepreneurs to mingle, to work, to meet, and to explore partnerships with like-minded people.

HKUST Scholarly Publications Database (SPD)

To enhance knowledge harvesting and dissemination, HKUST has developed a publication analysis system which contains over 61,000 scholarly publications from our researchers, covering journal articles, conference papers, book chapters, books, and patents, and about 550 scholar profiles. The general public can access the system and look up HKUST's researchers, their publications and areas of expertise. The system attracted over 660,000 page views in 2014, thus greatly enhancing the visibility of our researchers and potentially generating a larger impact.
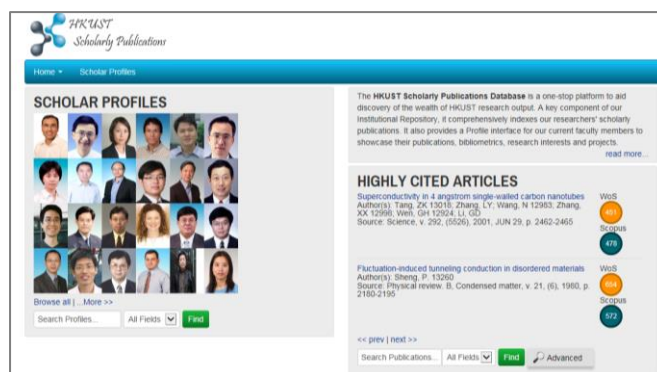
Home page of the HKUST Scholarly Publications Database (SPD)

HKUST Fok Ying Tung Research Institute

Positioned as the University's technology transfer and commercialization platform in the Mainland, The HKUST Fok Ying Tung Research Institute (FYTRI) is fully committed to promoting technology transfer on various fronts. FYTRI's new campus building located at Nansha IT Park was officially opened in Dec 2014, with a total floor area of 36,000 sq. meters and advanced labs and facilities for research and education. With this new campus building in place, FYTRI is well positioned to capture new opportunities emerging in the district of Nansha, which has become part of the China (Guangdong) Pilot Free Trade Zone (中國廣東自由貿易試驗區) since the end of 2014. To cope with the new development, the **Technology Marketing and Incubation Office**

New FYTRI Building at Nansha IT Park, opened in December 2014

(TMIO) has been set up in Nansha to build up the marketing capability in the Mainland by closely working with OKT, TTC and RDC back on the Clear Water Bay campus.

"Redbird Entrepreneur Cradle" (紅鳥創業苗圃) held in Nansha in Jan 2015.

During the reporting year, FYTRI has organized five entrepreneurial training workshops under the "**Redbird Entrepreneur Cradle**" (紅鳥創業苗圃) Program. Over 500 participants comprising FYTRI staff and students from other Mainland universities attended. In this connection, the "**DIY Center**" is being established in FYTRI campus building to provide hardware support to HKUST faculty, students, and young entrepreneurs who have built or intend to build start-ups. Recognizing FYTRI's efforts in advancing technology transfer and

Prof. JS Wu holding the plaque for Guangdong-HK-Macau (International) Youth

entrepreneurship, the Mainland governments have awarded FYTRI the title of "Guangdong-HK-Macau (International) Youth Entrepreneur Hub" (粵港澳國際青年創新工場) and "Guangzhou Nansha (International) Entrepreneur Platform" (廣州南沙國際創業基地).   A competition called "You Show @ Redbird" will be organized to screen qualified startup teams to work in the Hub.

HKUST Shenzhen Research Institute

The HKUST Shenzhen Research Institute (SRI) continues to play a vital role in the University's innovation and technology advancement in the Mainland. SRI has been approved as the supporting organization of NSFC since 2011 and has developed extensive collaborations with research institutions and enterprises in the Mainland. The six centers and labs specialized in the fields of molecular neuroscience, novel emissive material, traditional Chinese medicine, automation & UAV, marine environment and livelihood have shown distinguished research capacity and outputs. Another five collaborative labs are hosted jointly by SRI and industrial partners with the aim of accelerating technology transfer and enhancing applied research collaboration.

Start-up enterprises stationed in IER Building

SRI is dedicated to facilitating technology and knowledge transfer and offering support in various aspects. The "Incubator Express" program and the newly established Entrepreneur Center are set to encourage entrepreneurship and innovations. Up to Jun 30, 2015, 14 start-up companies have been established by HKUST professors or alumni in the HKUST IER Building, covering various fields such as biological recognition, mobile health, internet finance, automatic control,

The newly established Entrepreneur Center

biological medicine, integrated circuit, etc.

1.3 Cultivating Knowledge Transfer Culture and Talents

Open Faculty Forums

HKUST is heightening its emphasis on engagement with industries and society-at-large. Aiming to develop better consensus in regard to KT and entrepreneurship actions, several university-wide open forums were conducted in 2014/15. In Aug 2014, OKT organized the "Forum on Policy, Procedures, Metrics & Outcomes for Knowledge Transfer", where Prof. Isaac Kohlberg, Chief Technology Development Officer from Harvard University, shared his knowledge and expertise in innovation and technology development and transfer. Subsequently in Nov, the "International Entrepreneurship & Innovation Seminars Series" was organized for the HKUST community, with Prof. Shlomo Maital from Technion and Mr Alex Lucena from Pontifical Catholic University of Rio de Janeiro as speakers. In March and June 2015, two more forums took place. One of the forums featured three HKUST entrepreneurs, Prof. Zexiang Li, Prof. Ping Ko (former Dean of SENG), and Mr Frank Wang (HKUST Alumnus & CEO of DJI), who shared their views and personal experiences in fostering transfer of research outcomes for greater societal benefits; the other forum was "Fireside Chat on Technology Entrepreneurship" with Dr. Wen Hsieh, partner of KPCB.

Google Solve For X Competition at HKUST

The Google Solve for X competition, a collaboration between Google and HKUST, has brought an exciting moonshot platform to Hong Kong for the first time. It provides an ideal platform for HKUST students and faculty across disciplines and schools to engage in intellectual and research discussions. The competition aims to promote entrepreneurship, encourage wider academic and research exposure outside classrooms and labs, and better prepare students for their future careers. Participants introduced and discussed their radical

technology ideas during the competition. The winning entry from HKUST has become Hong Kong and Mainland China's first project to be accepted by Google on its Solve For X platform.

My Toy Design Competition with Toy Industry Leaders

The 2nd My Toy Design Competition co-hosted by HKUST, the Federation of Hong Kong Industries, the Hong Kong Toys Council and the Toys Manufacturers' Association of Hong Kong Limited was held on May 29, 2015. The competition

An awards presentation ceremony to recognize the outstanding work of the HKUST faculty and student awardees held on 18 March 2015

aims to foster local creative culture, to bring innovative ideas to the industry, and to cultivate the creativity of students and designers. With keen participation this year, 309 entries from over 1,000 participants were received. Thirty-eight finalists from the Student Group (Secondary schools and Tertiary Institutions) and 24 finalists from the Designer Group were selected by professional judges comprising design professionals, academics, industrialists and toy players. Thirteen awards were presented and a team of young participants aged 15 in the Student Group was awarded the Special Award.

The 2nd My Toy Design Competition Award Presentation Ceremony

Throughout the competition, different workshops about the toy Industry, toy design, apps and toy safety and marketing were held for the participants in order to enhance their industry knowledge. In addition, over 30 industrial and academic professionals were invited to join the "Mentorship program", in which experienced mentors guided the finalist students to transform their creative ideas into tangible products with play values. Apart from gaining knowledge in toy design and receiving cash prizes, winners will also be supported by sponsors to mass produce their toy designs in order to let more toy players know their creative ideas and talent.

Hong Kong's First University Student-Led Hackathon

Entitled Hackathon@HKUST, the activity was co-organized by a group of HKUST students and Tencent Foundation. It was a 24-hour coding competition in which participants collaborated intensively on a software or hardware project, centering on one of the three themes of this year, namely charity, entrepreneurship, and women consumers. This year, the competition was open to students and alumni of all local universities. The number of participants doubled from 105 in 24 teams last year to 225 in 47 teams this year.

The first university student-led Hackathon in Hong Kong was successfully held on 28-29 March 2015 at HKUST

1.4 Undertaking Knowledge Transfer Endeavors

Invention Disclosure and IP Protection

Rooted in the great effort of HKUST's faculty and researchers to pursue excellence in innovation, there is evidence of a steady number of reported innovations. The invention review and screening process has been strengthened to facilitate strategic development of major technology patent portfolios, such as novel acoustic materials, aggregation-induced emission materials and their applications, the SANI wastewater treatment and a series of novel medical devices. Overall during the reporting year 139 inventions were disclosed and 199 new patent applications filed. With 73 newly granted patents, the University's current IP portfolio, including our satellite campus, contains 940 active patents and patent applications.

Two campus-wide IP seminars were organized during the year to equip researchers with more IP management knowledge and skills. The first one "Best Timing for IP Protection" provided a practical guide to HKUST members on how to better extract value from their inventions and how to balance the need to publish their work and the necessity of protecting their work through the patent process. The second one "Best Strategy to Protect Biotech Invention" attracted a full-house of attendees.

IP Seminar: Best Strategy to Protect Biotech Invention

IP Seminar: Best Timing for IP Protection— Publication vs Patent Application

Contract Research, Consultancy & Testing Services
Partnering with HKUST's faculty members and researchers, RDC has offered research and consultancy services to the private sector in a wide spectrum of technological areas including bio-imaging technology, traditional Chinese medicine, information technology, wireless communication, civil and geotechnical engineering, and environmental science. In 2014/15, RDC signed 124 new contract research and consultancy agreements worth a combined HK$83.0 mil. Out of these, 108 are research and development in nature and 16 are consultancies.

In line with HKUST's mission of helping local and regional industries, RDC has been providing analytical and testing services to companies in Hong Kong and elsewhere, by making use of the University's major equipment and facilities. Rates and accessibility of the equipment and facilities are made available to external clients upon request. During 2014/15, 495 jobs have been performed by various University research centers, bringing a total cash receipt of $2.2 mil.

Licensing and Relevant Activity
TTC and RDC have been jointly identifying KT channels and arranging licenses with suitable technology receivers in various jurisdictions including China and the USA. As of 30th June 2015, RDC is managing a total of 93 active agreements (including assignments, exclusive and non-exclusive licenses on patents and software). The total cash receipt generated through intellectual property licensing and assignment agreements signed or managed by RDC last year was HK$3.3 mil. HKUST is a pioneer in the online distribution of educational materials with worldwide MOOC providers. Ever since the University became one of the first in Asia to join Coursera in 2012 and edX in 2013, it has strived to promote and incorporate this innovative pedagogy into traditional teaching. Activities related to MOOC Courseware distribution at HKUST are gaining momentum, and the licensing revenue for the reporting year was HK$2.08mil.

1.5 Entrepreneurial Technology Transfer

Proof-of-Concept Fund 2015
The Proof-of-Concept Fund (PCF) has been implemented at HKUST since 2009/2010, with the support of the KT funding. The fund aims to provide gap funding to enable pre-commercialization development of promising, cutting-edge technologies emerging from the University's research. For the year 2014-15, 19 projects submission for the PCF were received. The PCF Selection Committee, chaired by APKT, together with industry experts from different technology sectors, has recommended seven projects with commercialization potential

for a total funding of HK$1,353,000 in 2014-2015. These seven projects cover areas of biomedical device, environmental technology, cloud service, as well as visible light communication.

PCF provides timely gap funding opportunities for continuing development of the technologies, including further funding opportunities as well as technology licensing. A technology license has been granted to each of the five technology start-ups of HKUST. Examples include the development of High-Performance Mesh Protocols technology licensed to a local start-up company focusing on providing cost-effective Wi-Fi technology solutions for the industry, and the sound proofing metamaterials technology to another start-up company which aims to develop and commercialize multiple sound proofing applications using the technology.

Commercialization of Deep-cell Super-resolution Imaging Technology
Deep-cell Super-resolution Imaging technology developed at HKUST has strengthened HKUST's position at the forefront of biophysical and biomedical research. It has enabled collaborations among Life Sciences, Physics, Chemistry and Engineering researchers. This technology has been licensed to a HKUST start-up company located in the Hong Kong Science and Technology Park. The company provides cutting-edge super-resolution imaging services for researchers based on this powerful technology. The company has been selected as one of the awardees for the Technology Start-up Support Scheme for Universities (TSSSU) fund in both 2014/15 and 2015/16.

Commercialization of a Novel Drug Delivery Technology
A novel drug delivery technology recently developed at HKUST can enhance the intrascleral delivery of therapeutic macromolecules, which include proteins, polymers, DNA, RNA, nano-carriers and macro-carriers of drugs. A team of postgraduate students has taken the technology to the HKUST Million Competitions in 2014 and won 2nd prize. In 2015, they were one of the Semi-Finalists in the Rice University Business Plan Competition, which is considered the world's largest graduate-level student startup competition with 42 teams from around the world competing for over US$1 mil in cash and prizes. With the confidence and experience gained in the competitions, this team has formed a startup company to apply this method for delivering eye drugs to treat ocular diseases as a better treatment method than conventional injection. The company has been admitted to HKUST's Entrepreneurship Program and has also been selected as one of the awardees for TSSSU fund in 2015/16.

3D Reconstruction Technology and Start-up
Based on years of research, a cloud-based technology for fully automatic generation of 3D mapping from unmanned aerial vehicles and helicopters has been developed by a research team from the Department of Computer Science and Engineering at HKUST. The image generation is fully automatic with true 3D realistic textures and scalability. This advanced technology is currently protected by multiple patent applications and has received the PCF fund for further optimization and demonstration. The startup company formed by members of the research team, is working on building a service model and building up the capability to deliver 3D mapping construction services. The company has been admitted to HKUST's Entrepreneurship Program and has also been selected as one of the awardees for TSSSU fund in both 2014/15 and 2015/16.

2. Expanding Horizons for Knowledge Transfer

2.1 Industrial Engagement

Industrial Partners joined the First Aero Day at HKUST

The first Aero Day was organized by MAE and AIAA in HKUST, with aims to present the development of the aviation industry, both locally and internationally, and to allow students to understand the career opportunities offered in the industry. This event featured exhibitions and presentations by industrial partners ranging from airlines, maintenance and repair organizations, original equipment manufacturers, to government agencies and professional organizations, which gave students a comprehensive picture of the aviation industry. A highlight of the exhibition was the experience on riding flight simulator, set up by the HKUST Aeronautics Interest Group (AIG) with a flying game and control device.

Aero Day at HKUST on 24 Feb 2015

Open Innovation Workshop in Drug Discovery

A European multinational pharmaceutical company, who engages in the research and development, manufacturing and marketing of innovative therapeutic solutions, sponsored an open innovation workshop held in HKUST. The objective is to enhance knowledge exchange between the industry leaders and the top-notch HKUST scientists in drug discovery. This workshop has improved the understanding between the company's R&D needs and the research directions of HKUST members and researchers. Through this activity we have created mutual partnership with the company and collaborative projects were initiated with the support of the Innovation and Technology Fund.

Establishing Close Ties with Industry by SRI

SRI takes the initiative in organizing activities and major events to maintain close ties with industrial community, institutions and alumni. In June 2015, SRI invited SZMMA (深圳市新材料行业协会) to visit the University. They met with Prof. BZ TANG, Prof. Ricky LEE, Prof. WJ WEN, Prof. ZJ LI, and Prof. ZL LUO. They also visited their laboratories at Clear Water Bay campus. Moreover, HKUST Alumni Entrepreneurship Programs Exhibition and visit to Qianhai E-hub organized by SRI have attracted enthusiastic participations.

SRI invited SZMMA to visit University and some laboratories.

SRI was the co-organizer of the 2015 Pan Pearl River Delta Integrated Circuit Market Promotion and Innovation Development Summit Forum (2015 泛珠三角集成电路市场推介暨创新发展高峰论坛), where Prof. Patrick YUE gave a keynote speech to promote deeper among government, university and industries for IC industry.

2.2 Strategic Industrial Partnership

Collaboration Framework with a Chinese Multinational Electronics Company

A Chinese multinational electronics company with products including television sets and mobile phones etc., has agreed to establish a "Communication and Information Technology Research and Education Grants" at HKUST for three consecutive academic years starting in 2015. The grant will support HKUST's MSc students to pursue their excellence in open-innovation research and creativity in the areas of communication and internet technologies with industrial impacts. HKUST has also reached a framework agreement with the company to collaborate in next generation communication technologies. Further research collaborative projects in other

strategic areas will be developed in due course, towards the benefits of students, scholars, corporate and the local industry.

HKUST – Thales Collaboration
HKUST and French company Thales have entered into a collaborative framework agreement in 2014, marking a milestone in the joint efforts to boost innovation, nurture young engineering innovators, and serve the development of smart cities in the region. Since then, various discussions took place and both sides have identified an initial topic of mutual interest in Transportation in Smart Cities. Through the proposed collaborative research, both sides aim to address challenges associated with various aspects for transportation in smart cities. And both sides will continue to explore further collaborative projects with the goal to address smart cities related challenges.

HKUST – MIT Research Alliance Consortium
The HKUST-MIT Alliance aims to build the network and mechanism required for R&D collaboration between world class universities and technology companies and conduct industry-driven pre-competitive research. By the end of 2014/15, this Consortium has received a total of 9 new proposals from local universities, in which three were highly recommended and submitted to the Innovation & Technology Commission for funding application under the Data Science & E-Learning cluster.

The Semi-Annual Review of Projects in June 2015 at HKUST

Collaboration with Leading Equipment Producer in Wireless Communications
A leading producer of equipment with quality, precision and innovation in all fields of wireless communications donated equipment to HKUST to support the frontier research in Wireless, Photonics and Submicron High-speed Silicon IC Design at the university. By the introduction of the latest testing and instrumentation technology into engineering education and academic research, HKUST researchers will benefit from having the support of state-of-the-art equipment in their advanced research programs.

2.3 Efforts Towards Community Engagement

Workshop for High School Students
HKUST Student Innovation for Global Health Technology (SIGHT) and the School of Engineering (SENG) co-organized a workshop for local high school students in April 2015, aiming to share the spirit of community service on global health with sustainable technology. The workshop not only demonstrated how life could be improved by technology, but it also raised the awareness of students on issues relating to global health, as well as the importance of taking part in community services.

HKUST organized a workshop for local high school students on 25 April 2015.

Strengthening Global & Community Engagement
Center for Global & Community Engagement" (GCE) is introduced as a co-curricular program to broaden HKUST students' international exposure, to engage them in making contributions to the community as well as to create and facilitate educational and leadership opportunities. GCE engages students in more than 20 international and local competitions, such as GE Foundation TECH Award, Asia Pacific Information & Communication Technology Awards, Smart City Competition, Red Hat Challenge@Labs Competition, Airbus Fly Your Ideas, HKICT awards, MATE ROV International Competition, and etc. GCE also initiate, develop and steer community-oriented technology projects with non-profit organizations and government departments. Just to name a few, there were Braille Embosser for the visually challenged, Embedded Cognitive Therapy in

Digital Photo Frame for the elderly, Mobile App for Médecins Sans Frontières (MSF) and the latest Mobile Tools for Hearing-impaired Children (with HK Society of Deaf through OGCIO's Digital Inclusion Funding Program). During the year 2014-15, there are certain nameable achievements: the Mobile App for Hearing-impaired Children won Gold Award in the Web Accessibility Recognition Scheme 2015; the HKUST Robotics Team won the 4 Top Awards in MATE International ROV Competition 2015, as well as the Champion of Robocon Hong Kong Contest for 5 consecutive years.

Exhibitions and Public Lectures

HKUST Library has supported the effort of knowledge transfer to the students, faculties and the community through conducting exhibitions and delivering public lecturers in 2014/15. It organized a series of nine exhibitions in its Galleries for the public. Scientific and technological displays included Discovering the Universe, Isomorphism of Humans and Nature, and Design Thinking. Gallery tours were led by the exhibitors and students. It had invited faculty members and guest speakers to deliver nine public talks to 700 attendees, covering topics on Gender Inequality in China, Science of Footwear, Human Rights in Zambian Mining, Art Book Publishing, Martial Art, Lingnan School of Chinese Painting, Learning English, Art from the Heart and Blue Moon.

2.4 Technology Dissemination and Marketing

International ICT Expo (13-16 April 2015)

The purpose of the App Zone Exhibition is to offer an opportunity for University faculties and students to display their mobile app projects in order to engage with the society and establish collaboration with the industry. Four Apps developed by HKUST faculties and students were showcased in the App Zone this year.

HKUST faculties and students showcased their mobile app projects at ICT Expo

China High-Tech Fair (16-21 November 2014)

China Hi-Tech Fair (CHTF) is one of the largest high-tech trade events in China. Since its inception in 1999, the fair has provided universities and high-technology sectors a platform for showcasing technology and enhancing publicity in the Mainland. HKUST organized the participation of our units to the 16th CHTF showcasing available technologies and research achievements, and seeking for networking opportunities and potential collaboration.

Golden and blue were chosen to be the colour theme of the booth to match with the university symbol

HKUST presented the latest research achievement to audience from overseas

**APAC Innovation Summit 2014 (1-6 December 2014)**

With the theme of "Shaping the Future", APAC Innovation Summit 2014 (AIS) kicked off with the International Knowledge Transfer Conference featuring speakers sharing views on current challenges and opportunities for the knowledge economy development in Asia. Prof. Tony Chan, President of HKUST, exchanged his view with other Presidents from Hong Kong and overseas universities on leveraging knowledge transfer for institutional advancement in "The President Forum". Prof. Patrick Yue, Associate Provost for Knowledge Transfer, chaired the panel session on "KT Models and Best Practices". Seven HKUST professors presented their research works to an extensive audience from local and overseas industries, academia, governments and investment community during the event. HKUST presented to both local and overseas enterprises our latest research outcomes ready for commercialization at Hong Kong Tech Showcase @ IDT Expo.

International Knowledge Transfer Conference

HKUST's Booth at the HK Tech Showcase @IDT Expo
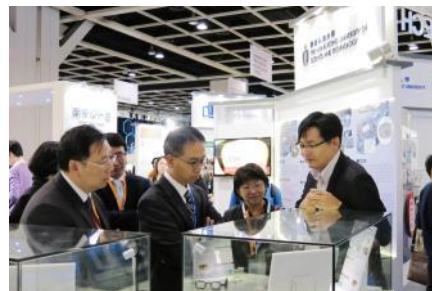
HKUST representatives presented the latest research achievements

Nature Science Café Asia organized by the Nature Publishing Group (5 March 2015)

This is a biotech science and investment forum organized by the Nature Publishing Group, providing a networking opportunity with biotech entrepreneurs and government funding agent. Similar event have been held in the United States frequently, and it is the first time to hold this event in Asia. This innovative event allows attendees to be active players in the development of a strong biotech investment environment in Asia and connects rising stars in biomedical research with regional and US investment communities. Prof. Nancy Ip has been invited to present her latest EphA4 drug discovery program and investors have shown interests to further develop this technology.

3. Fostering Entrepreneurial Culture and Ecosystem

3.1 Incubation of Startup Company

Entrepreneurship Program (EP)
Start-up incubation has been actively pursued and supported through the Entrepreneurship Program (EP) to assist faculty members, staff and students in the establishment of technology-based start-up companies. Through the Program, RDC continued to nurture the birth and growth of new enterprises by helping them identify their value propositions and formulate compelling business models. The Program currently is incubating 10 companies, bringing the total number of active companies to 39. 3 new start-up companies were admitted to the EP out of 5 applications during the reporting year.

Technology Start-up Support Scheme for Universities (TSSSU)
In response to the Technology Start-up Support Scheme for Universities ("TSSSU") launched last year by ITC, HKUST has strengthened its support to our faculty, students, staff, and alumni who plan to set up startup company. Led by OKT, TTC and RDC offer assistance in translating new ideas into business opportunities, in preparation of

TSSSU 2014/15 Start-up Awardees attended the Signing Ceremony on 3 Feb 2015.

TSSSU 2015/16 Start-up Awardees attended the Signing Ceremony on 4 June 2015.

their business proposal, in their budget planning as well as year-end evaluation with individual start-up company. This scheme successfully launched in HKUST has attracted respectively 13 and 23 applications in the government financial year of 2014/15 and 2015/16. Among these applications, TSSSU funding has been awarded to 7 start-ups for 2014/15 and 9 start-ups for 2015/16.

3.2 Major Entrepreneurship Activity

One-Million Dollar Business Plan Competition
The 5th annual HKUST One Million Dollar Entrepreneurship Competition was held on 3-4 June, 2015. This year a new award "International Team Award" was created and the winner of this prize was Shantou University. Through the formalizing of the award mechanism, this year the Competition had strengthened the application of HKUST technology and enhanced the cooperation of students from different discipline. Totally, there are 100 teams participated the Competition.

President Tony Chan (right) presents the award to 2015 Competition champion - "Parle"

Inno China Entrepreneurship Competition (創業中國)
Striving to encourage and support development of technology startups in

The PiCode team received the first place award

Hong Kong, HKUST took the role of organizer for Hong Kong region by collaborating with Hong Kong Science and Technology Parks Corporation for the Inno-China Entrepreneurship Competition 2015. The Competition was initiated by Shanghai Jiading Advanced Technology Innovation & Business Incubator. This year, the Competition took place in 3 regions: Hong Kong, Shanghai and United States. The competition in Hong Kong region was held on 22 May 2015. Six finalists were selected for the final round presentation in July, Shanghai. The PiCode team using the IP generated from Prof. Wai Ho Mow's lab has won the

first place award.

Manufacturing Innovation Technology (MINT)
Manufacturing Innovation Technology (MINT) program has been planned to provide rigorous design thinking and design for manufacturing (DFM) services to allow startups to develop manufacturing capabilities by accessing Shenzhen/Pearl River Delta supply chain and industrial design ecosystem. Inaugural summer program was held in July 2015 with teams from HKUST, MIT/SUSD, Waterloo participating, supported by HKUST through a Li Ka Shing Foundation grant, MIT MISTI grant, and the Shenzhen Design Institute, with Brinc as manufacturing and accelerator partner.

Venture Entrepreneur Network (VEN)
VEN is a cross-disciplinary student entrepreneurship network that focuses on various entrepreneurship initiatives, including running the programs of Venture Mentor Services (VMS) and Techlink. VEN created a full featured website portal integrating all entrepreneurial activities and resources in HKUST and HK (http://www.ven.ust.hk/) and hosts various events that connect students and faculty across the different schools, most notably SENG and SBM. VEN organized the first and largest entrepreneurship festival held on campus last May, 2014 that sparked a lot of new entrepreneurship initiatives.

3.3 HKUST Entrepreneurship Workshop and Seminars

Entrepreneurship Week (E-Week)
Two E-Weeks were being held in Oct 2014 and March 2015 to enrich students' knowledge and preparedness for realizing their entrepreneurship initiatives. Inspired talks and interactive exhibition were organized to enable students to gain some insights, to learn how the entrepreneurs overcome the challenges and make their dreams come true.

Friday Dreamer's Workshop
To complement existing seminars, Friday Dreamer's series was implemented in the format of 6 interactive sharing with invited guests. It aimed to offer participants an industry specific insight on the most-concerned entrepreneurial themes of investment, resources, technology, and market strategies.

Seminars
Build Your Own Business (BYOB) seminar series and CEO Seminars were organized throughout the year to share entrepreneurial

Entrepreneurship Week @ HKUST, 23-30 Mar 2015

knowledge and skills. Invited speakers include seasoned business entrepreneurs, alumni and faculties. This year 3 of the 5 BYOB seminars supported Professional Development Courses 6770 to provide RPG training in entrepreneurship area.

Innovation & Entrepreneurship Training Camp
The Innovation & Entrepreneurship Training Camp was an annual event with 50 participants from HK, China, Africa, Russia, Taiwan and Macau. It aimed to aspire pre-entrepreneurs and young entrepreneurs to shape their business idea into executable and fundable business plan. Participants were given a systematic training aimed at providing in-depth knowledge on issues, concepts and skills unique to the need of an innovative or entrepreneurial project.

UG Students Consultations

Regular consultation services which included face-to-face and online consultation were provided to UG students to address their concerns and queries on start-up and related issues. This year we totally devoted 600 contacts hours to this consultation services.

4. Executive Summary (End of Triennium 2012-2015)

Supported by UGC's KT fund in the 2012/15 Triennium, HKUST has made fruitful achievement in each of its proposed strategic goals set out in the Initial Statement submitted 3 years ago. The table below summarizes the overall progress made by HKUST over the period:

Invention Disclosures	New Patent Applications Filed	New Patents Granted
341	542	253
No. of License Granted (As of June 2015)	Licensing Income Generated	No. of Active Spinoff Company
54	HK$12.4 million	47
Collaborative Research Projects & Income Generated	Contract Research & Income Generated	Consultancy Projects & Income Generated
223/ HK$437.1 million	437/ HK$152.0 million	163/ HK$42.3 million
Equipment & Facility Service & Income Generated	No. of Public Lectures/Events	Income Generated from CPD Courses
1461/ HK$7.0 million	789	HK$52.9 million
No. of Projects Reviewed for Proof-of-Concept Fund	No. of Project Funded by Proof-of-Concept Fund	Total Amount of Proof-of-Concept Fund
49	21	HK$3.8 million
No. of ITF Proposal Submitted	No. of ITF Project Approved	ITF Funding Received
212	75	HK$271.8 million
Entrepreneur Social Activities	Entrepreneur Seminars/ Workshops	Competition Participation
3,850 partipants	17,350 contact hours	1,500 students

HKUST's KT strategy for the 2012–15 triennium is to conduct mission-oriented research that flows through our KT platform with greater coupling to industry, government and society. Research funding is a key to this strategy. HKUST has been doing very well in applied research and related technology transfer. The number of Innovation and Technology Fund (ITF) proposals submitted by HKUST has risen by leaps and bounds over the years, from just 57 in 2008-09 (pre-KT funding), to 138 in the first triennium, and further to 212 in the second triennium. The total amount of ITF funding received in the second triennium was HK$271.8 mil for 75 projects. Numerous large-scale mission-oriented projects that are cross disciplinary in nature received funding in the 2012/15 triennium. During this period, HKUST was awarded two Theme-based Research Scheme projects, two Areas of Excellence projects, nine Collaborative Research Fund projects, one Partner State Key Laboratory supported by ITF and three 973 projects (via the Shenzhen Research Institute).

The HKUST-MIT Research Alliance Consortium was officially inaugurated in January 2014 for the 2012-15 triennium. This "flagship" KT initiative of HKUST aims to build the network and mechanism required for R&D collaboration between world-class universities and technology companies to bolster global innovation with an emphasis on intelligent living technology—internet infrastructure, cloud computing, smart green buildings and biomedical systems.

There is a number of strategic collaboration in major theme areas coordinated. One area that is currently involving particular attention from industrial stakeholders and university leadership is Aerospace Engineering. With increased efforts on both research and education in aerospace engineering, HKUST initiated a cluster of aerospace engineering projects of five by partnering with the Aviation Industry Corporation of China and other supporting companies and organizations. Other major collaborative partnerships include industrial leaders in the areas of telecommunications, semiconductor, pharmaceutical and electronics etc. A number of industrial based contract research projects were signed out of these collaborations. In the past three years, RDC has signed a total of 398 research and consultancy agreements worth a combined of HK$225.1M. It is also worth noting that the large scale trial project on the innovative SANI® wastewater treatment technology in Shatin Sewage Treatment Works, the first of its kind in Hong Kong, 2013 has been successfully completed early this year. This technology has been shortlisted as one of the candidate technologies for relocation of Shatin Sewage Treatment Works into the cavern.

As an important part of the KT value chain, the Proof-of-Concept Fund (PCF) has effectively provided gap funding to enable pre-commercialization development of promising, cutting-edge technologies emerging from the University's research. The university has received a steady increase in the number of PCF applications in the triennium 2012-15, indicating the university community sees the fund as a good opportunity for research teams to further develop their invention. Overall, the outputs from 7 PCF projects have been licensed out and 5 of them are being negotiated with potential licensees. There were also a number of the funded projects that have led to further funding for development or undergoing collaborations with external parties. In addition, the new Technology Start-up Support Scheme for Universities (TSSSU) being successfully launched in HKUST for both 2014 and 2015 government financial years has not only strengthened the funding support to start-ups and inspired the entrepreneurial spirits among students, it has also provided a perfect downstream funding to PCF to commercialize the outcomes from PCF projects their ideas into business opportunities. 11 startup companies have been set up with the support of TSSSU in the past year, of which 8 have been supported by PCF for prototyping and trial. Overall the economically active spin-off companies have been brought up from 34 in the beginning of the triennium to 47 by June 2015.

HKUST continues its restless efforts to engage students in making contributions to the community with knowledge transfer in the mind. In particular, the University has initiated, developed and steered community-oriented technology projects with non-profit organizations and government departments. Just to name a few, there were Braille Embosser for the visually challenged, Embedded Cognitive Therapy in Digital Photo Frame for the elderly, Mobile App for Médecins Sans Frontières (MSF) and the latest Mobile Tools for Hearing-impaired Children by collaborating with HK Society of Deaf through OGCIO's Digital Inclusion Funding Program.

Promoting entrepreneurship education is also a core activity in HKUST over this triennium. In the building of campus culture, HKUST pioneered the formation of student-led/university-guided student organizations in an effort to give students greater ownership and participation in driving and stimulating entrepreneurship culture from a grass root level in 2013. The first such pilot organization was launched as the E-Academy, and in 2014 another group called the Venture Entrepreneur Network (VEN) was launched aiming at the more senior student population, which have successfully led to a stronger tie between the students and the University. Besides culture building activities, HKUST has also made significant progress in working closely with society, government and industry in Hong Kong as well as in China. In this area, an important direction that the Entrepreneurship Center has pushed was to strengthen its bond with the professional investment community in Hong Kong and China as well as to coordinate competitions with China so as to enrich our students' overall opportunities to forge closer bonds with their contemporaries in China.

In this triennium, HKUST has significantly expanded its sphere of innovations beyond Hong Kong. Our Mainland platforms in Shenzhen, Nansha and Foshan have outdone themselves in extending the University's research and training opportunities during this period. The four Mainland platforms together have won 114 projects totaling RMB130.9M from some of the biggest funding agencies in China — the Ministry of Science and Technology, Ministry of Agriculture, National Natural Science Foundation, and Chinese Academy of Sciences to name but a few. Integrated with the cutting-edge research achievements of HKUST and the needs of PRD industry, FYTGS has been focusing on four areas of technology transfer namely Internet of Things, Advanced Manufacturing and Automation, Advanced Materials, and Green Building & Environment. Striving to align with HKUST KT strategies, FYTGS coupled its research efforts with the society's needs. Over the past 3 years, FYTGS has secured 156 commercial contracts with industry counterparts, with the amount over RMB41M. It has provided a unique technology transfer platform for over 90 HKUST faculty members to channel their energies into KT activities. It has been proactively developing partnerships with other universities and industries to enhance its KT capability, including the University of Bayreuth in Germany, the University of Waterloo in Canada, and Midea Electric Appliances.

In addition to achieving the proposed KT activities, HKUST has further strengthened its well-established KT infrastructure in the last three years, with a view to expanding its capabilities for new initiatives. The establishment of Office of Knowledge Transfer (OKT) in April 2014 has facilitated overall coordination among the KT Units at HKUST and the Mainland platforms in China. The new FYTRI campus building at Nansha opened in December 2014, which equipped with advanced laboratories and facilities for research and education, has made our Mainland platform to be more readily in capturing further opportunities that are emerging in China. In addition, a new Technology Marketing and Incubation Office (TMIO) was set up in early 2015 to escalate the marketing capability in China. Based on the KT backbone built in the past, together with the new entrepreneurship activity center (the "BASE") in place by August 2015, HKUST is going to enhance its campus culture more proactively and significantly which is conducive to innovation on an efficient and proactive knowledge transfer platform.

5. Looking Forward

HKUST will continue its existing KT endeavors, while putting further efforts in fostering the entrepreneurship culture and support on campus, and in strengthening the collaboration with industry, government and other educational institutions.

Looking forward, HKUST is keen on integrating its existing and new infrastructures both in HK and Mainland China, and to synergize existing resources to bring our KT capability to the next level. The University would continue its effort in linking the industrial collaboration, education, and research, with a view to contributing to HK's economic growth.

Appendix A – Key Performance Indicators

Performance Indicator	2013/14 (Achieved)		2014/15 (Projection provided in Initial Statement)		2014/15 (Achieved)	
Number of patents filed in the year	195		148		198 [Note 1]	
Number of patents granted in the year	80		54		93 [Note 2]	
Number of licenses granted	41		34		54	
1. Exclusive license	23				27	
2. Non-exclusive license	18				27	
3. Option	0				0	
Income (on cash basis) generated from intellectual property rights	$4.3M		$5M		$5.3M [Note 4]	
Expenditure involved in generating income from intellectual property rights [Note 3]	$6M		$4M		$6.3M	
Number of economically active spin-off companies (with breakdown by type)	35 (26 spin-off, 9 start-up)		No projection		47 (29 spin-off, 18 start-up)	
Companies with institutional ownership and using IP from HKUST	7				17 [Note 6]	
Companies with institutional ownership but not using IP from HKUST	28				30	
Number of collaborative researches, and income thereby generated	69	$111.5M	76	$74M	84	$163.0M
[Note 5] With local collaborating organizations	55	$85.1M			49	$105.8M
With Mainland collaborating organizations	38	$51.1M			45	$70.7M
With overseas collaborating organizations	40	$51.6M			48	$85.4M

[Note 1] CDCF Table 65: The number of patents filed is 198 and the number of inventions involved is 154 in the 2014/15 period. Starting from 2013/14, the number reported also including patents filed by satellite campus.

[Note 2] CDCF Table 66: The number of patents granted is 93 and the number of inventions involved is 61 in the 2014/15 period. Starting from 2013/14, the number reported also including patents granted by satellite campus.

[Note 3] The expenditure involved was used to support new patent applications in the reporting year and the expenses for all cumulative active patent applications and patents over the years.

[Note 4] It includes both licensing incomes from patent via RDC and copyright of courseware via the University.

[Note 5] These figures do not add up as some projects may involve a combination of local, Mainland, and/or overseas collaborating organizations.

[Note 6] The number of spin-off companies has included the companies funded through the Technology Start-up Support Scheme for Universities (TSSSU) during 2014/2015.

Performance Indicator	2013/14 (Achieved)		2014/15 (Projection provided in Initial Statement)		2014/15 (Achieved)	
Number of contract researches (other than those included in "collaborative researches" above), and income thereby generated	154	$50.6M	140	$52M	165	$48.9M Note 7
Local (Hong Kong)	87	$18.9M			103	$26.7M
China	48	$22.2M			46	$17.9M
International (excluding China)	19	$9.5M			16	$4.3M
Number of consultancies, and income thereby generated	53	$14.2M	80	$16.5M	35	$9.4M Note 8
Number of equipment and facilities service agreements, and income thereby generated	524	$2.6M	400	$5M	495	$2.2M
Number of student contact hours in short courses or e-learning programmes specially tailored to meet business or CPD needs	30,468 hours		53,498 hours		26,288 hours	
Income received from Continuing Professional Development (CPD) courses	$22.6M		$20.3M		$18.3M	
Number of public lectures / symposiums / exhibitions and speeches to a community audience	201 Note 10		200 Note 9		240	
Number of performances and exhibitions of creative works by staff or students Note 10	49 Note 10		20		51	
Number of staff engaged as members of external advisory bodies including professional, industry, government, statutory or non-statutory bodies	404		170		392	

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Note 7 The total number of new contract and contract value for contract researches agreements signed in the 2014/15 period is 108 and HK$76.7M.

Note 8 The total number of new contract and contract value for consultancy agreements signed in the 2014/15 period is 16 and HK$6.3M.

Note 9 The numbers for 2013/14 and 2014/15 have been revised to 200 after submission of the Initial Statement to reflect a more realistic projection.

Note 10 The total number of attendee from all events and income from chargeable events in the 2013/14 period have increased by 73% and 3 times respectively when compared with the figures in 2012/13.

Note 11 The numbers reported only include events held at museums and galleries owned by HKUST (as per the Common Data Collection Format (CDCF) requirements).