

# Annual Report on Activities and Advancement of Knowledge Transfer

Supported by earmarked UGC Funding  
FY2014-15



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THE HONG KONG  
POLYTECHNIC UNIVERSITY  
香港理工大學

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## 1. Knowledge Transfer @ PolyU

### 1.1. Review of FY2012-15 Triennium

FY2014-15 signifies the end of the current triennium (FY2012-15) of UGC Knowledge Transfer (KT) Funding Programme. With dedicated funding support for KT and related activities, PolyU was able to initiate strategic developments in KT, commercialization and entrepreneurship activities, engaging partners and collaborators with discipline and transparency.

This report summarizes key KT activities and developments of PolyU in FY2014-15 with brief review of the overall performance and achievement over the last 3 years (as outlined in Appendix 4). Observations and suggestions from UGC in the past have been duly considered for improving related KT developments and practices.

For our core consultancy<sup>1</sup> and licensing activities, revenue grew from \$80 million in FY2011-12 to \$109 million in FY2014-15. Meanwhile, collaborative research funding from third parties increased to \$333 million in FY2014-15, from \$210 million in FY2011-12. As for innovation and entrepreneurship (I&E) programmes, 4 new funding programmes were added to the original PolyU Micro Fund with further backing from the Innovation and Technology Commission (ITC), the Social Innovation and Entrepreneurship Development Fund (SIE Fund), supporting over 100 startup ventures under the “Do Well Do Good” ethos in strategic partnership with various bodies in the I&E community

PolyU has clearly emerged as an institutional partner to industry and the I&E community at both local, national, and international levels, for example: PolyU’s expertise in space and aviation are being utilized in the first Chinese lunar landing mission; the Aviation Services Research Centre (ASRC), with strong industry partnership, offers cutting edge maintenance, repair and operations to sustain Hong Kong’s leadership in the regional aviation industry; the use of single yarn spinning technology has become a widely recognized textile product standard known as Nu-Torque yarn. Also, the integrated use of advanced optic sensor systems for both metro and high speed rail networks helps offer real-time monitoring for safe and efficient transport operations as a critical building block for developing smart cities. A more elaborate list of other cases exemplifying our KT commitments can be found in Section 2 of this report.

### 1.2. KT Culture, Strategies & Practice @ PolyU

#### Developing KT as a Major Strategic Direction

As an application-oriented university, PolyU has always kept KT as a core component in our mission to draw out the value of teaching and research for the community. To engage in KT in a systematic, disciplined manner, the University Council set up a KT Committee in 2010 to advise the management on the overall policy, governance, and strategic advancement of KT and entrepreneurship programmes and activities. Regarded as one of the core strategic areas in the University’s Strategic Plan, offices responsible for KT management are charged with the responsibilities to (i) achieve KT with good governance and, (ii) foster “Do Well Do Good” entrepreneurial endeavors to promote KT, innovation and technology development, as depicted by the key strategic goals in PolyU’s current Strategic Plan which is:

1. To implement KT with enhanced governance, discipline and recognition, in furthering the principles of the current KT policy.
2. To leverage participation from global business and community networks in enhancing the impact of PolyU’s efforts.
3. To create an ambience that values innovation, entrepreneurship and community service in motivating collaboration and sharing of best practices.
4. To provide continuing and life-long learning in fulfilling the strategic needs of the community.
5. To advocate social and ethical values in delivering entrepreneurship programmes and KT.

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<sup>1</sup> Excluding contract research and collaborative research

To achieve the above, the University has set aside further financial resources under its Strategic Action Plan for new entrepreneurship education and engagement initiatives. With notable achievements in the last few years, PolyU is now widely known as one of the leading institutions in Hong Kong and the surrounding region and is committed to creating community value and impact through various KT and entrepreneurship schemes.

### **Improving KT Governance, Practices and Mechanisms**

Under the guidance of the KT Committee, PolyU has been implementing various improvement measures to enhance governance without compromising the timeliness and time-to-market requirements of KT operations. Evaluation of the commercial potential of inventions and their downstream commercial exploitation involves both university executives and external experts from the industry in order to gain balanced and realistic views on patenting and licensing. Unlike conventional business operations, the emphasis in KT hinges on its potential value and impact on the use of certain technologies and know-how, instead of on maximizing financial return. As such, related policy makes provision for the free licensing of the University's intellectual properties if this is the best way to create positive impact for the community concerned. The University management is also encouraging individual departments and schools to come up with their own industry / discipline specific measures of KT performance as metrics for technology-related industries can be quite different from humanity / service-oriented industries, for example in the areas of design and multi-media. Additionally, with increased interest and support in commercializing research deliverables through technology ventures, relevant guidelines for staff involvement in startups are being revamped to provide proper mechanisms for staff and students to engage in ventures under sound governance free of potential encumbrances and conflicts of interest.

In 2013, The University's International Advisory Board (IAB) conducted a high level review of the University's existing KT policy and practices. Upon deliberation, members commended PolyU's efforts in conducting high impact applied research with high relevance to the industry and its achievements in downstream commercialization and expert services. The Board affirmed the directives laid down by the KT Committee, and added that partnering with Mainland Chinese universities in university-industry collaborative programmes would be an area of potential development given the national demand for innovation and technology from the higher education sector, and the unique position of PolyU as an internationalized player under the one country two systems policy.

## **2. Innovations & Impact**

Committed to serve both industry and the wider society, PolyU always emphasizes impact and value delivered in our KT activities rather than purely monetary return. Some of the new developments during the reporting period are highlighted below.

### **2.1. Raising Industry Standards & Competitiveness**

#### **(a) Automation Advances for the Aircraft Maintenance Industry**

The Aviation Services Research Centre (ASRC) is an industry-led non-profit making organization established by PolyU in 2013 in collaboration with Boeing Corporate, the Hong Kong Aircraft Engineering Company Limited and Hong Kong Aero Engine Services Limited. The Centre has been advancing the aviation industry with over HK\$70 million funding support from the Innovation and Technology Fund. One recently completed project is the "Laser Projected Drilling Templates and Robotic Drilling" which involved the design of an automated process using a portable laser drilling template to streamline the workflow for replacing outer skin parts of aircrafts. The new process is considered an industrial breakthrough as it automates a fully manual operation, with a substantial improvement in the accuracy and quality of the repair work. Other benefits include a three-to-four fold improvement in process time and labour hours for the structural repair work during aircraft maintenance.



## (b) Building Information Modelling for the Construction Industry

Building information modeling (BIM) provides a new dimension to conventional CAD for the design and documentation of building projects. The PolyU BIM research team has already provided its expertise to the Hong Kong Housing Authority for several public housing development projects using its own innovative proprietary BIM system. Through sharp graphical details and automatic generation of drawings and reports, design analysis, etc., the modeling system enables builders to make better-informed decisions, improve the efficiency and accuracy of building design and construction, as well as to optimize time and resources used.

## 2.2. Advancing Innovations and Technologies

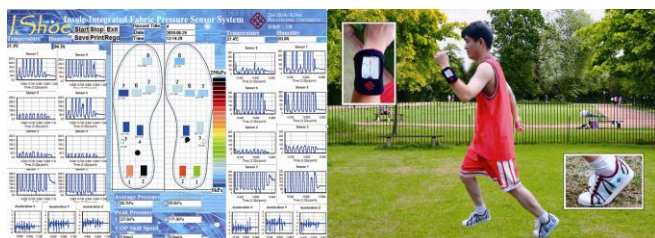
### (a) Flavonoid Dimers for Reversing Drug Resistance and other Cancer Research Projects

Identifying new and better therapeutic medication for cancer treatment is one of the top priorities for medical researchers. PolyU has successfully synthesized a special class of flavonoid dimers to address common multi-drug resistance (MDR) in cancer cells that hinders chemotherapy, by inhibiting undesirable drug efflux effects at the cell level. As polyphenolic compounds commonly found in food, flavonoids are good candidates for reversing MDR because of their low toxicity. This innovation was licensed to Kinex Pharmaceuticals (HK) Limited which will in turn support further research of flavonoid dimers for oncology indication and treatment.



In addition, given the side effects of the existing chemotherapy and radiation therapy, PolyU researchers have been working closely with a local biotech partner, NewSA Limited, on developing drug leads for cancer treatment. Up to now, 12 cancer related research projects have been carried out. The more prominent ones include mass spectrometry-based strategies for evaluation of serum auto-antibodies for the diagnosis of liver and lung cancers and studies on partner's products for their effects on cancer cells and stem cells.

### (b) Pressure Sensing Fabric



PolyU researchers invented a fabric pressure sensor with interlocking loops of yarns that demonstrate a change of resistance from conductive fibers when pressed. Characterized with high sensitivity and reliability, the fabric sensor can be used to develop pressure sensing textile products for sports and healthcare application, such as sportswear with sensing switches. In a related development by the same research team, another type of fabric sensor using elastic fabric coated with conductive composite materials was made with excellent elastic properties to function as a strain gauge. This versatile sensing technology can be applied to novel healthcare and medical products, such as wearable respiratory monitors and pressure sensing shoes for diabetics and have been licensed to Footfalls & Heartbeats Ltd. in New Zealand and locally to AdvanPro Limited for developing related applications.

### (c) Thermal Functional Textile with Conductive Materials

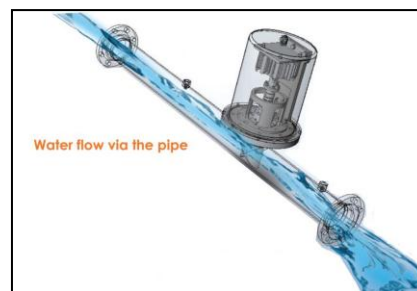
Common electrically-heated thermal textiles usually use metal wires as heating elements. By contrast, the thermal functional fabric developed by PolyU employs an integrated approach with conductive fibers directly knitted into the fabric using integrated knitting techniques to produce effective localized zone heating. With its unique stitch structure and density, electrical resistance at specific areas can be controlled to generate required temperature profiles. The precise localized heating ability enables the development of energy efficient and lightweight heated garments for indoor, outdoor and even healthcare application. Discussion on licensing this technology is underway with industry partners.



## 2.3. Fostering Sustainability & Green Life

### (a) Novel Way to Produce Electricity from a Building's Water Supply System

Sino Green in Hong Kong Limited worked with PolyU to explore the feasibility of generating electricity from fresh water supply pipelines in high-rise residential buildings. The study involved installation of a proprietary inline micro hydropower system jointly developed by PolyU and Water Supplies Department for in-depth performance tests on power generation in water supply pipelines. This small system is expected to harvest just enough hydro-energy for energy-efficient light bulbs. If successful, this scheme will pave way for greener buildings and encourage more green innovation to further cut our reliance on coal-fired electricity as well as provide cost savings to residential properties.



### (b) Reducing Air Pollution Levels in Hong Kong

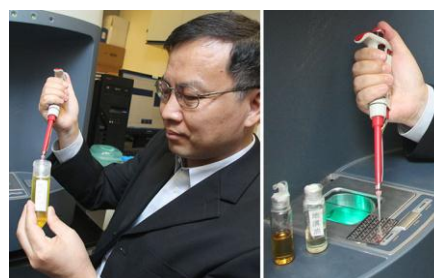
Rising air particulate pollutant levels continue to threaten Hong Kong despite government's various efforts to combat the photochemical smog from volatile organic compounds and nitrogen oxides. Initiated by the Environmental Protection Department in September 2014, our researchers kicked off a one-and-a-half year investigation on radical chemistry and air quality impact in Hong Kong. Their subsequent recommendations on the monitoring and control strategy for elevated ozone, secondary pollution, pollution precursors and radicals will positively contribute to the city's continuous effort to keep air pollutant levels in check.

Another recent air quality study and modeling project commissioned by PTC International Limited was carried out at Tai Mo Shan for investigating photochemical processes and ozone pollution in Hong Kong. The outcome of the study will lead to measurements of regional photochemical processes and a better understanding of ozone formation in the region.

## 2.4. Promoting Human Wellbeing

### (a) New Method for Rapid Authentication of Edible Oil and Screening of Gutter Oil

PolyU's Food Safety and Technology Research Centre has developed a novel technology for rapid authentication of edible oils and screening of gutter oils. Authentication of edible oils is a long-term issue in food safety, and has become a public challenge with the proliferation of the unethical use of gutter oils. A conventional analytical approach, which is labour intensive and time consuming, fails to provide an effective solution for screening gutter oils.



Using matrix-assisted laser desorption/ionization mass spectrometry (MALDI-MS), PolyU researchers have developed a versatile method to analyze edible oils with simple sample preparation and processing with reference to edible oil standards. The method is able to screen out non-referenced sub-standard oils within five minutes. The rapid and agile screening process will positively benefit the community by helping to protect consumers from health hazards induced by unethical and illegal oil recycling.

### (b) Medical Gel using Core-Shell Nanoparticles

PolyU has developed nanoparticles with amphiphilic core-shell morphology. Such nanostructures can then be engineered for various functional applications like coatings, adhesives, microcapsules, sorbent and solid supports. Core-shell nanoparticles encapsulating active pharmaceutical agents and cross-linked with polymer gel can also function as a drug carrier for topical medication, improving the physical properties of the resultant medical gel for better treatment administration. With anti-itching agents encapsulated, the medical gel can facilitate longer relief from itching during healing of post-burn scars. This technology is licensed to MJ Medical Gel Systems Limited.

### 3. Collaboration & Engagement

During the FY2012-15 triennium, PolyU stepped up its Integrated Marketing Communications (IMC) strategy to reinforce PolyU's message of commitment to innovation and technology advancement for the benefit of the community. In addition to reaching industry via various conventional marketing channels to explore collaboration and partnering opportunities, we also branched out into the more versatile online and social platforms to disseminate relevant information to the general public as well as targeted industrial and trade segments.

#### 3.1. Engaging Industries for KT Partnerships

Knowledge Transfer cannot be accomplished without collaborative partnerships with industry. At PolyU, working with partners like industry associations and other intermediaries has always been one of the top priorities to maximise the value and impact of our commercialization, innovation and entrepreneurship development.

##### (a) APAC Innovation Summit 2014 and International Knowledge Transfer Conference

The APAC Innovation Summit 2014 was a weeklong event focusing on innovation and technology with "Shaping the Future" as its theme. It was organized by the Hong Kong Science and Technology Parks Corporation (HKSTP), with key support from local universities and R & D centres. The summit comprised conferences, tech forums, business matching sessions and the Hong Kong Technology Showcase at IDT Expo.

Given its track record in organizing sector-wide KT conferences, PolyU served as the lead co-organizer of its first day event - the International Knowledge Transfer Conference. The event brought together over 600 KT practitioners and stakeholders from Hong Kong and around the world, to explore models and best practices in KT, social innovation and entrepreneurship. A well-received Presidents Forum was held where Presidents of local and overseas institutions, including PolyU, shared their experience and insights about driving university-industry Knowledge Transfer. At the IDT Expo, PolyU showcased a selection of applied technologies in the areas of textiles and clothing, pharmaceuticals, infrastructure and space exploration to demonstrate the University's commitment and achievements in creating applied value through research, innovation and KT.



##### (b) Industry-specific Approach to Promoting Technologies

A series of technology networking seminars and lab visits were organized to promote PolyU's research output to targeted industries and trade associations. They covered a diverse range of applications such as aviation services, smart monitoring and security systems, Industry 4.0, the Internet of Things (IoT), smart factories and manufacturing technologies, as well as technology-enabled innovations relating to holistic wellbeing.



##### (c) Exhibitions / Trade Shows

PolyU continued its participation in major exhibitions and trade shows both locally and internationally, featuring a plethora of prominent technologies reaching out to some 780,000 professionals and attendees.

At the Rail Solutions Asia 2015 held in Malaysia, PolyU showcased its cutting-edge railway technologies to government officials and railway stakeholders. These included the multi-award-winning "Advanced Fibre Bragg Grating Sensor Systems". In the Hong Kong International Medical Devices and Supplies Fair 2015, PolyU presented a number of the most influential healthcare and rehabilitation technologies including the "Posture Correction Girdle for Adolescents with Early Scoliosis" to industry players. A collection of ICT

technologies was also featured at the Hong Kong Electronics Fair 2014 (Autumn Edition) and Hong Kong ICT Expo 2015.

To improve the University's footprint in the Chinese Association of Science & Technology (CAST) framework, PolyU participated in the inaugural China Innovation and Technology Fair held in conjunction with the annual CAST assembly in Guangzhou. PolyU took this opportunity to introduce our award-winning "Intelligent Ship-bridge Anti-collision Surveillance System" along with other multidisciplinary applied research breakthroughs to Chinese state officials.

#### **(d) Promotion of Successful Commercialization**

To celebrate PolyU's KT achievements, three media events were organized to publicize the University's recently commercialized technologies: nanofibre filtration technology to combat micro particulate pollutants; apigenin flavonoid dimer for cancer drug development; and anti-heat stress work clothes for outdoor construction work. With dedicated press media sessions and partnership signing ceremonies, the events stimulated a great deal of interest from both industry and the wider community and generated extensive media coverage.

#### **(e) Business Matching and Partnership**

Leveraging the newly formed "University-Enterprise Collaboration Sub-committee" ( "校企合作委員會" ) running under the auspices of the CEO Club, a PolyU's established network of the corporate elite, PolyU continued to work with a committed group of successful entrepreneurs and industrialists to seek opportunities for the commercial exploitation of research output. Regular gatherings and talks involving PolyU experts as well as visits to our research facilities were held to facilitate information exchange and the facilitation of university-industry collaboration.

#### **(f) Publicity, Online Marketing and Publications**

Various marketing channels such as press conferences, media interviews and feature stories in trade magazines were utilized to communicate PolyU's technologies to targeted audiences with an aim of enhancing awareness of the University's research expertise to create KT collaboration opportunities. Meanwhile, PolyU's substantive innovations were regularly featured in Technology Frontier, a monthly e-newsletter, and PolyU's other printed or electronic publications. With the phenomenal growth seen in internet and mobile communities, we have stepped up our on-line marketing endeavours in trending platforms and social media such as Facebook, Weibo and WeChat.

### **3.2. Disseminating Knowledge for Community Benefits**

#### **(a) International Exhibition of Inventions of Geneva 2015**

PolyU took pride in its achievements at the 43rd International Exhibition of Inventions of Geneva with 15 awards for its 9 entries. In particular, the smart mannequin "i.Dummy" snatched the Prize of The World Intellectual Property Organization (WIPO), a coveted accolade in the event. All of the exhibiting teams were invited to a special government reception receiving formal recognition from the Chief Executive himself as well as both local and international media coverage.



#### **(b) House of Innovation**

Positioned as PolyU's research hall-of-fame, the House of Innovation (HoI) showcases the University's most notable inventions and scientific breakthroughs. To encourage visits from the industry and the general public, various awareness programmes were implemented. These included open days, special tours for trade associations, delegations and VIPs guided by both student ambassadors and KT administrators and a Snapshot activity launched on the HoI Facebook Fan Page. Our concerted effort in promoting technologies through various online and offline channels resulted in over 6,800 visitors to HoI and a surge in the number of fans on Facebook.



### (c) Thematic Campaign

In the past year, a thematic campaign on PolyU's contribution in aviation development and space research was launched in prominent events including InnoCarnival 2014, China Hi-Tech Fair 2014 and the "China's Lunar Exploration Programmes" exhibition in the Hong Kong Science Museum. In addition, a tech seminar on China's lunar exploration; the revamped "Space" corner in Hol; and award-winning "Stellar Steps" brochure on PolyU's space research breakthroughs were produced to enhance public awareness of the impact of our KT achievements.



At InnoCarnival 2014, the PolyU pavilion, with the theme "Soaring Skyward", received high commendations from the public and was voted the first Runner-up for the "My Favourite Booth" award. The novel prototype of the "Camera Pointing System", which was actually deployed in the Chang'e 3 mission, attracted the attention of many VIPs, media and the general public.

### (d) Partnerships with Other Organizations



To reach a wider audience, we collaborate with external organizations such as the Hong Kong General Chamber of Commerce to organize activities for different communities and industries on diverse professional and technological topics. In partnership with major trade associations and professional bodies, PolyU's technologies are regularly featured to targeted audiences via joint technology seminars and feature stories in trade magazines.

## 4. Social Innovation, Entrepreneurship & Education

### 4.1. Cultivating "Do Well Do Good" Entrepreneurship Practice and Education

Innovation and entrepreneurship development are now national priorities to drive the next wave of economic development in the Chinese Mainland. Preferential policies and huge amount of resources have been dedicated to encourage innovation and startups (大眾創業，萬眾創新). With this shift in the paradigm, Hong Kong, as part of China, faces the same opportunities and challenges to generate and sustain quality deal flows of new startups facing the well known local constraints of small market size, high rents and labor costs.

Over the last few years, PolyU has been contributing to the development of the entrepreneurial eco-system in Hong Kong through various innovation and entrepreneurship (I&E) programmes and activities for students and young graduates. As part of the University's educational aims, all I&E programmes run by the Institute for Entrepreneurship (IfE) are underpinned by three pillars, namely, Education, Practice and Communities, combined with an advocacy of a "Do Well, Do Good" ethos. Since 2011, IfE has been building a "Micro Funding Platform" with a disciplined yet open approach to collaborate with different like-minded partners. Under this scheme, a series of seed funding programmes are offered to young people, driving innovation and technology development and creating a pipeline of early stage start-ups that will eventually grow.

## (a) Entrepreneurial Practice – Micro Funding Platform

### PolyU Micro Fund Scheme

Since its inception in 2011, the Scheme has supported 85 startups from over 900 applications involving more than 2,000 participants. Sixty eight of these are still actively operating, which is equivalent to an 80% survival rate. In addition, some 30% of the startups secured further funding / incubation support in aggregate to \$42 million, a leverage of 800% compared to \$5.6 million disbursed so far through the Scheme.



In terms of community recognition, the Micro Fund recipients have won more than 30 awards, including Grand Award of the Social Venture Challenge Asia 2015 in South Korea. Other local awards include Hong Kong ICT Awards and the Hong Kong Social Enterprise Challenge. For interested readers, selected cases of Micro Fund recipients are presented in Appendix 3.

### STEFU-PolyU China Entrepreneurship Fund

In collaboration with the Shanghai Technology Entrepreneurship Foundation for Graduates (STEFU), the fund was established in 2013 to support PolyU students and graduates to set up businesses in China. Since its launch, 31 startups were supported out of a total of 130 applications. Most of the teams receiving awards have been making good progress in their business, attracting further funding totaling over RMB 40 million, with Tencent and the founder of Xiaomi among the investors.



### Tech Incubation Fund and Tech Launchpad Fund

Supported by the Innovation and Technology Commission (ITC) of the HKSAR Government under the “Technology Start-up Support Scheme for Universities”



(TSSSU), PolyU launched two new funding schemes in 2014: the HKSTP-PolyU Tech Incubation Fund (TIF) and the PolyU Tech Launchpad Fund (TLF).



In partnership with the Hong Kong Science and Technology Parks Corporation (HKSTP) and angel investors, the TIF supports early-stage technology startups by offering both seed funds (from PolyU) and incubation support (from HKSTP). The TLF however offers “scaled up” funding to accelerate the growth of qualified ventures by matching dollar-to-dollar investment made by investors up to \$2 million. To date, 8 technology ventures have been awarded under the TIF scheme.

### Good Seed

With the support of the Social Innovation and Entrepreneurship Development (SIE) Fund of the HKSAR Government, PolyU was commissioned, as one of the Fund’s Intermediaries, to launch a social innovation programme called “Good Seed” in early 2015. This three-year programme focuses on leveraging design thinking and technology to come up with innovative ideas for addressing poverty related issues in Hong Kong. It is open to students and graduates of all local higher education institutions and young people will compete for funding support to deliver a prototype based on their innovative idea. The programme aims to nurture 1,000 young people as social innovators and support 40 projects over 3 years, with 250 participants enrolled in the first cohort in 2015.



In addition to Good Seed, PolyU, through its Jockey Club Design Institute for Social Innovation, actively initiates community development through social innovation. Flagship activities like the “10-day Fest” successfully raised public awareness on social innovation. Other programmes, such as “Design Pilot”, provide further business and design support to social enterprises by connecting them to designers and business professionals in order to improve their product and service offerings.

## **(b) Entrepreneurship Education**

To augment conventional classroom learning with hands-on experience and exposure, IfE has been running, “out-of-classroom” education and learning engagements such as seminars, workshops, forums, visits and study missions both locally and outside Hong Kong.

### High Potential Entrepreneurial Leadership Programme (HiPEL Programme)

Since 2013, IfE has joined hands with Fudan University to launch the “High Potential Entrepreneurial Leadership” programme (滬港創業企業研習班-開發高潛質創業領導力) to enhance entrepreneurial leadership for young yet experienced entrepreneurs and to improve their business models for the next phase of the business growth of their enterprises. Over 3 years, the programme has been able to include close to 90 young entrepreneurs from Hong Kong and Shanghai, forming a “community of practice” with a strong bonding in peer learning and co-creation and motivation to “do well and do good” in their entrepreneurial journeys.



### Seminars, Entrepreneurship Bootcamp and Mentorship Support



To cultivate an ambience of entrepreneurial thinking and practice on campus, many seminars were organized with sharing by successful entrepreneurs such as the founders of Uber and GoGoVan. In addition, entrepreneurship bootcamps were run to help young students build their innovative ideas into feasible business propositions that can be pitched for funding support. Every summer, Micro Fund awardees can participate in a summer entrepreneurship bootcamp in Shanghai. Featuring intensive training and guided visits to start-up companies and incubators, the bootcamp brings together young entrepreneurs from both Hong Kong and Shanghai for a mutually enriching learning experience in a truly cross-cultural set-up.

As a regular practice, mentors are recruited from the pool of Poly-preneurs™, CEO Club members, affiliated business and industrial communities, startup veterans and angel investors, to advise Micro Fund participants and awardees about the challenges they face in their early stage entrepreneurial journey.

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### “From Research to Business: Nurturing Techno-preneurs” Programme

“From Research to Business: Nurturing Techno-preneurs”, is a programme targeted specifically at research students and staff with a “flipped classroom” approach. The programme was run again in early 2015 with over 40 participants making up 20 potential start-up teams. Using both online learning tools and face-to-face workshops, participants learned the way to commercialize their research outcomes. Four participating teams eventually went on to secure TIF and Micro Fund support for their startup plans.

### StartHub and Online Learning Tools

A new entrepreneurship portal; “StartHub@PolyU” ([www.starthub.hk](http://www.starthub.hk)) was launched in September 2014, as a one-stop on-line platform offering news, events, knowledge and resources related to entrepreneurship development in Hong Kong. To increase the audience reach of entrepreneurship training with limited resources, PolyU embarked on a strategic direction to develop online entrepreneurship learning materials as precursors for the existing line up of offline training programmes. The effectiveness of this combined “O2O” training approach will be continuously assessed and reviewed.



## **(c) Engaging Entrepreneurial Communities**

### Developing PolyU Entrepreneurs Network: Poly-preneurs™

With around 650 PolyU alumni entrepreneurs, Poly-preneurs™ represent a close network community supporting PolyU’s entrepreneurship development and education endeavours as mentors and judges. In addition, with the use of social media and channels, a good Community of Practice involving both online

and offline channels is emerging among student entrepreneurs, Micro Fund / TIF / CEF awardees, mentors, investors and related stakeholders.

#### Fostering the Development of Entrepreneurial Eco-system

PolyU has been actively involved with local startup / entrepreneurial communities, forging close partnerships with key stakeholders such as the Hong Kong Science and Technology Parks Corporation (HKSTP), Cyberport, Hong Kong Design Centre (HKDC), The Hong Kong Federation of Youth Group (HKFYG), Internet Society Hong Kong (ISOC HK), and the Junior Chamber International (JCI). Selected key I&E events organized by partnering organizations with material PolyU involvement are:

- Global Entrepreneurship Week China – Hong Kong (organized by Cyberport)
- Global Youth Entrepreneurship Forum (organized by HKFYG)
- Best ICT Startup Award (organized by ISOC HK)
- DBS-NUS Social Venture Challenge Asia 2015 (organized by National University of Singapore)
- The 19<sup>th</sup> Innovation and Entrepreneurs Award (organized by JCI City)
- Hong Kong Young Social Entrepreneur Contest 2015 (organized by JCI Jayceettes)

The close link between the University and the entrepreneurial community enables our students and young graduates to keep abreast of the latest developments in the entrepreneurial world.



During the reporting period, our students have actively participated in startup activities in Hong Kong, as well as two overseas missions to Singapore and Israel under the Techcracker Lab Programme organized and sponsored by the Li Ka Shing Foundation. The study mission to Israel, joined by chaperones and media representatives, attracted strong media attention including a TV documentary programme featuring the entrepreneurship pursuit of a Micro Fund awardee who was selected for the trip.

## 5. Performance Measure – Key Performance Indicators

A summary of the key performance indicators for various KT areas is presented in the table below, with figures expressed in HK\$'000:

Performance Indicators	2014/15 Target <sup>Note 1</sup>	2014/15 Actual	2015/16 Target
<b>Patenting &amp; Licensing</b>			
No. of patents filed	62	88	65
No. of patents granted <sup>Note 2</sup>	46	73	50
Accumulative no. of licenses granted	75	89	97
Income generated from IPR	\$5,000	\$6,882 <sup>Note 3</sup>	\$4,000
Expenditure involved in generating income from IPR	\$6,401	\$6,560 <sup>Note 4</sup>	\$6,888
<b>Consultancy, Collaborative / Contract Research &amp; Spin-off / JV</b>			
No. of collaborative research and income generated	108 \$225,000	114 \$333,230	110 \$330,000
No. of contract research and income generated <sup>Note 5</sup>	54 \$32,000	43 \$17,848	50 \$30,000
No. of consultancy projects and income generated <sup>Note 5</sup>	1,050 \$78,000	819 \$101,784	900 \$110,000
Number of economically active spin-off companies	4	1	1
Net income generated (or net loss arising) from spin-off companies	\$18,100	(\$337)	(\$340)

Performance Indicators	2014/15 Target <sup>Note 1</sup>	2014/15 Actual	2015/16 Target
<b>Other Knowledge Transfer / Dissemination Activities</b>			
No. of equipment and facility service agreements and income	950 \$9,500	648 \$7,990	650 \$8,000
No. of student contact hours for business or CPD needs <sup>Note 6</sup>	22,500	225,725	225,000
Income received from CPD courses	\$81,000	\$37,000	\$40,000
No. of public lectures / symposiums / exhibitions and speeches to community	480	497	500
No. of performances and exhibitions of creative work by staff or students	160	97	100
No. of staff engaged as members of external advisory bodies	380	293	300

**Note:**

1. The FY2014/15 targets were first projected in the Initial Statement for Triennium 2012-15 submitted in 2012. Over time, they no longer reflect the latest developments, resulting in higher variations between the actual (as of June 2015) and target (mid 2012) figures.
2. A detail list of patents granted are presented in Appendix 5
3. Among the \$6.882 million, \$3.35 million was generated by the licensing of trademarks
4. "Expenditure involved in generating income from IPR" includes patent expenditure for filing, prosecuting, maintaining and defending patents, including expenditure paid by the inventors' project funding and personal funding.
5. The figures presented here include income generated from non-academic units that are not included in related reporting under the CDCF tables 63 and 73.
6. The student contact hours are now defined to be the number of enrollments multiplied by the number of contact / course hours.
7. Additional KPIs on other related KT activities are presented in Appendix 6.

## 6. The Way Forward

Serving the community with our knowledge and expertise has been part of PolyU's tradition since its humble beginnings as a technical college training a vocational workforce some 70 years ago. Still very much committed to this heritage, the University has expanded its knowledge transfer operations in a disciplined manner under sound governance. Value-added university-industry collaboration in knowledge transfer has been one of the key third missions of the University to complement our striving for academic excellence in teaching and research. Realizing the complementary roles of the University, the industry and that of the other intermediaries in the community, PolyU has in the past triennium placed much emphasis in partnering with strategic stakeholders to multiply the impact of our KT and entrepreneurship endeavours. This spirit of partnership for impact has resulted in more licensing undertaking and a systematic expansion of our Micro Fund platform to include seed funding programs with special focus on Chinese Mainland market, technology incubation at the Science Park, and accelerated growth with angel investment. Equipping young people with entrepreneurial skills and hands-on experience is another challenge for us to nurture Hong Kong's next generation of "do well, do good" citizens and social leaders to play a leading role amidst the opportunities and challenges brought about by the rapidly changing regional development.

As a key stakeholder of the local and regional KT and I&E community, PolyU will continue to improve its portfolio of KT and entrepreneurship activities that are not only worth hundreds of millions in related revenue and operating budgets, but are also closely interlinked with the development of the knowledge-base economic sectors both in Hong Kong and the wider region. With such carefully planned partnerships we have every confidence in generating better value and impact for industry, the start-up community, and society in a sustainable way.

Ir Daniel Lai  
Interim Vice President (Administration)

## Appendix 1: Impact Case History

### Case 1: Novel Sensing Network for Railway

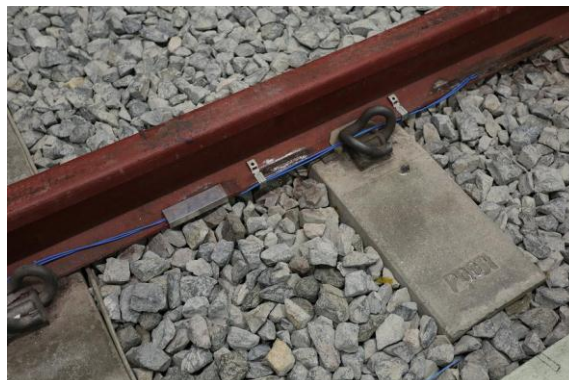
#### 1. Summary

With fast growing railway networks, operators have been working extremely hard to uphold the safety and reliability of mass transport systems. Developing railway monitoring system for hundreds or even thousands of kilometres of track is a mission-critical challenge, as tiny deviation such as a few millimetres of distortion in the track could seriously compromise the safety of the trains, potentially causing damage and casualties.

Based on the versatile capability of fiber Bragg grating sensors, the Photonics Research Centre of PolyU has been working with MTR to invent a novel sensing network system for railway monitoring about a decade ago. The monitoring systems have been installed in numerous railway lines in Hong Kong, India, Taiwan, and the Chinese Mainland, including parts of the 1318-km long high-speed rail link between Beijing and Shanghai. They monitor the condition of rails and trains, as well as subsidence of station platforms. Over the years, the system has evolved into an advanced diagnostic and prognostic system for railways, permitting real-time monitoring of the structural health and operating condition of tracks and trains, as well as providing operations data for scheduling trains. The system could be instrumental in setting up a new standard for railway safety monitoring, and promotes a safer railway industry with reduced maintenance costs and optimal performance.

The first system was installed in Hong Kong to monitor trains travelling along the East Rail Link in 2007. In early 2013, PolyU worked with MTR a research project to design and build the world's first citywide Fibre Optic Sensing Network to monitor all trains in Hong Kong. In 2015, PolyU secured a project in Singapore to monitor the condition of the SMRT North-South Line and the SMRT East-West Line. In collaboration with MTR, it has also secured a substantive project to design and construct a sensing network for the 38-km North-West Line in Sydney, Australia to monitor the operational condition of tracks, trains, pointing machines, as well as pantograph contact force and tunnel fans. The project will start in 2016 and the North-West Rail Link will be Australia's first driverless railway line.

The innovative use of fiber Bragg grating sensing networks to measure many different parameters of railway systems has received world-wide attention as well as several international prizes and awards, including the Third Prize at the prestigious 2014 Berthold Leibinger Innovationspreis Award. Berthold Leibinger Innovationspreis is a biennial event and is one of the highest remunerated international innovation prizes in the field of laser technology.



Installed sensor on railway

#### 2. Underpinning Research

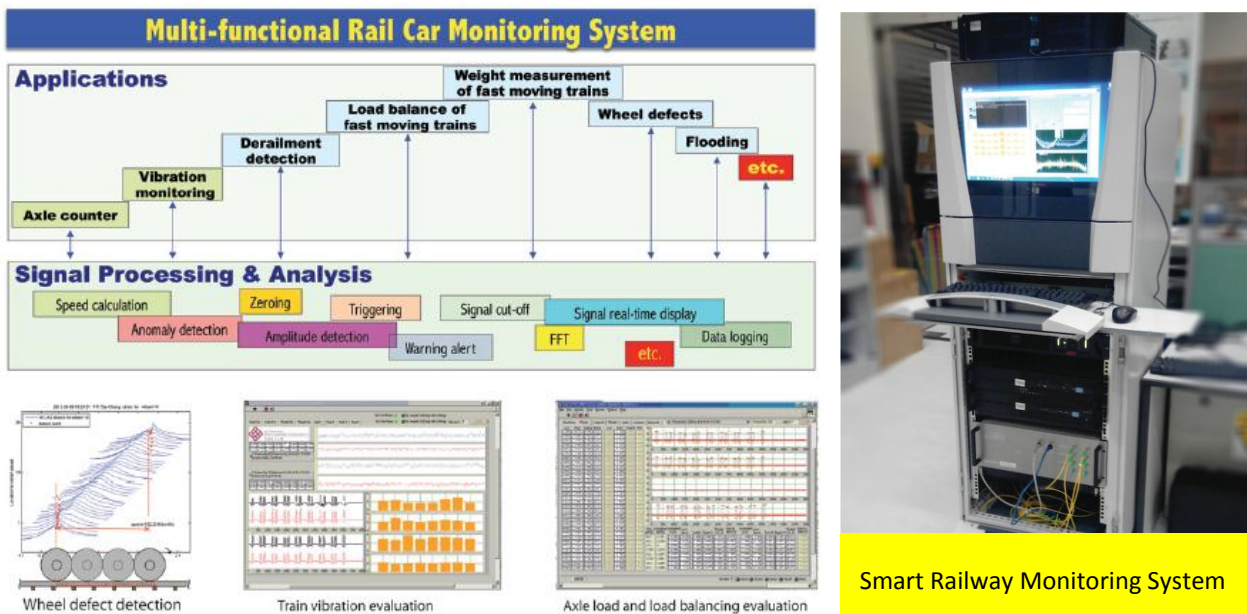
As one of a few universities in the world that possesses the capability to fabricate specialty optical fibers in silica as well as in polymeric materials, PolyU has been engaging in materials and device research relating to photonics sensors since 1994. Its research activities range from fundamental / basic knowledge to systems ready for full-scale deployment, particularly in the areas of fibre Bragg grating sensors. In 1995, PolyU was one of the first groups in Asia to succeed in making fiber Bragg gratings (FBG). Over the years,

the research team has set up several state-of-the-art laser platforms that allow fiber Bragg grating sensors to be inscribed in most commercial optical fibers.

Investigation into the phenomena of fiber grating formation in silica and polymer optical fibers, and its applications in sensing, has resulted in more than 100 top-tier journal publications and over 30 invited papers / keynotes / talks at international conferences. Nine patents relating to fiber Bragg gratings and their applications were also awarded. Knowledge gained from this research effort has led to many consultancy projects for clients in Canada, the Netherlands, France, Taiwan and the Chinese Mainland, with exemplifying engagements such as the deployment of a photonic sensing network to monitor the structural health of the 610-m tall Canton Tower in 2010.

The University has supported the establishment of a strong cross-disciplinary research team to advance the use of FBG technology in different settings and applications. The key members from the Department of Electrical Engineering include Professor Hwa-yaw Tam, Chair Professor of Photonics and Head of Department, Professor Siu-lau Ho, Chair Professor of Electricity Utilization, Professor Kang-kuen Lee, and Dr Michael Shun-yeo LIU, Senior Scientific Officer. Members from other departments include Professor Yi-qing Ni and Professor Jian-hua Yin of the Department of Civil and Environmental Engineering, as well as Professor Li Cheng and Professor Li-min Zhou of the Department of Mechanical Engineering.

The PolyU FBG-based transducers to measure strain, temperature, acceleration, pressure, displacement and inclination were invented by Professor Tam and Dr. Liu. The advanced smart railway monitoring system developed together with MTR integrates these sensing parameters with PolyU's proprietary signal processing techniques to supply complete systems monitoring solutions to railway operators around the world.



### 3. References

- [1] (INVITED PAPER) Hwa-Yaw Tam, "Optical fibre sensing networks for railway monitoring," *Frontiers in Optics 2013/Laser Science XXIX: Symposium on Advanced Distributed Optical Fiber Sensor Systems for Security and Safety Applications*, Orlando, Florida, USA, October 6-10, 2013.
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#### **4. Corroboration of Impacts and / or Benefits**

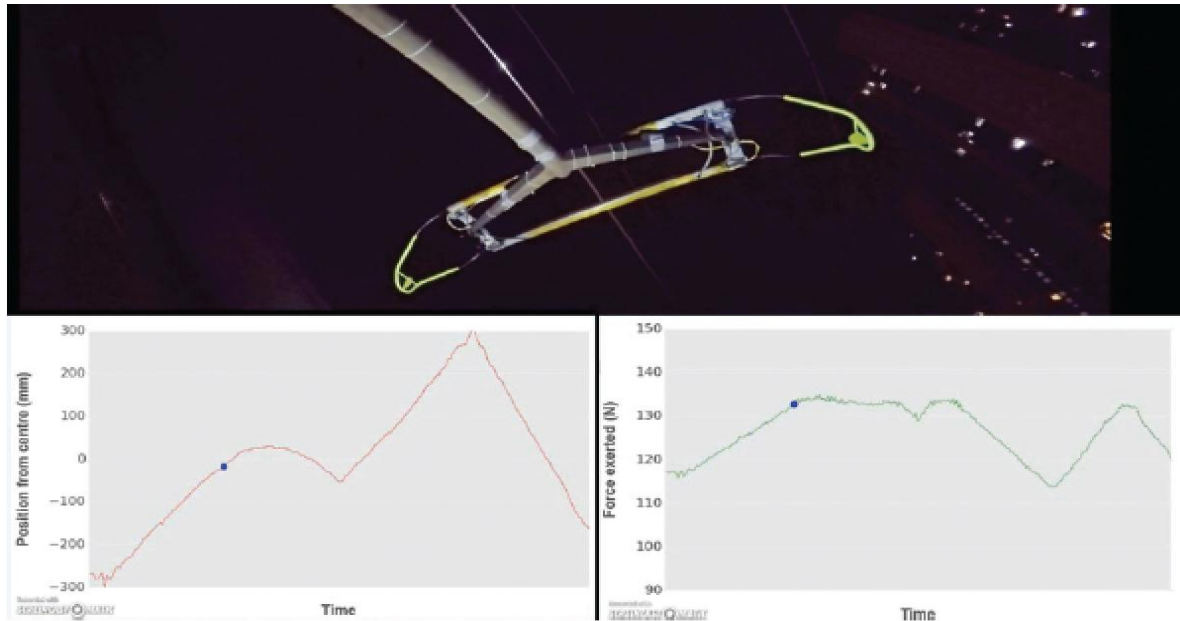
The advanced photonic sensing system is the world's front-runner in smart railway monitoring, with fiber Bragg grating sensors serving as the core optical nervous system to measure a multitude of critical parameters in rail tracks and trains for safety and maintenance purposes.

All the sensing points are passive optical fiber sensors and can be interrogated by a laser measuring system located up to 100 km away. A single system can handle several hundred sensing points, making it more cost-effective than conventional electrical monitoring systems. It is also much more reliable.

Unlike conventional sensors, fiber-optic sensors are made of glass, which acts as a good electrical insulator in monitoring contact positions and contact force between the 25kV contact line and the pantograph to ensure proper contact with reduced arching and abrasion. Furthermore, the ability of the Smart Railway Monitoring System to measure numerous critical components with EMI-immunity offers unique and low-cost safety and maintenance solutions for the railway industry. Conventional monitoring systems generally only monitor single parameters, requiring different measurement systems to be integrated into a combined monitoring system that is often costly and less effective.



With the unique multi-purpose features and ease of installation over lengthy track distances, the Smart Railway Monitoring System will help to revolutionize the railway industry and will herald a safer railway industry with optimal operating efficiency, reduced down time, enhanced preventive maintenance, all at lower cost.



## 5. References

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- [4] [http://www.osa.org/en-us/about\\_os/newsroom/news\\_releases/2013/optical\\_sensors\\_improve\\_railway\\_safety/](http://www.osa.org/en-us/about_os/newsroom/news_releases/2013/optical_sensors_improve_railway_safety/)
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## Case 2: Speech Therapy

### 1. Summary

In Hong Kong, an estimated 5-6 % of the population suffers from various kinds of speech impediments, also called speech and language disorders, with the most common examples being stuttering and lisping.

Speech disorders hinder daily communication, literacy development, as well as cognitive and social-emotional development. Serious speech impediments significantly erode self-confidence, create difficulties with socializing, and even adversely influence the individual's career path.

Speech Therapy (ST) is primarily engaged in the prevention, diagnosis, treatment and rehabilitation of communication, swallowing, or upper aero digestive disorders. In a variety of settings, including clinics, hospitals, schools and pre-school centers, speech therapists assess and treat individuals of all ages suffering from a wide range of speech disorders. In practice, speech therapy is usually carried out in conjunction with language therapy.

For children, speech and language therapy is particularly important because speech and language problems, if neglected in the early childhood, are likely to carry on into adulthood. Additionally, if related problems are addressed at their onset, patients will benefit from corrective techniques acquired in early throughout the rest of their lives. For subjects with speech disorders caused by diseases such as stroke and dementia, speech therapy is necessary to help regain, at least partially, lost speech and cognitive skills.

Presently, Hong Kong has only about 700 qualified speech therapists. The shortage of ST practitioners is acute with increasing demand for treatment. Speech therapy practitioners are even more sought after in the Chinese Mainland due to the growing awareness of the benefit of ST for children, while there is no formal training for speech therapy in the country.

Established in 2012, the Speech Therapy Unit (STU), affiliated with the Department of Chinese and Bilingual Studies (CBS) of the University, aims at creating a platform for education and research through the provision of ST services. Educationally, the STU is a practicum site for speech therapy students in the master's degree programme in ST. STU also organizes continuous professional development training for clinicians and professionals. For the community and out-patients, the unit provides a wide range of ST-related services including treatments for developmental dyslexia, autistic spectrum disorder, adult aphasia; and assessment for children's language and articulation capabilities.

The Speech Therapy Unit regularly organizes classes, workshops and seminars on ST. STU therapists also contribute regularly to newspaper columns to improve public awareness about speech disorders and therapy.



Speech therapy is important in early childhood

## 2. Underpinning Research

The Speech Therapy Unit serves as a research platform for multi-disciplinary collaboration. Theory-driven research outcomes are applied in speech therapy services so as to provide evidence-based treatment for those in need.

Research studies on Specific Learning Difficulties (SpLD), especially those on phonological decoding, morphological awareness and writing, have generated the following treatment programmes:

- ARA (Accelerated Reading Abilities)
- AMA (Accelerated Morphological Awareness)
- AWA (Accelerated Writing Abilities)

The other programmes include: “For Poly Kids – A multi-disciplinary parent training programme to support parents of preschool children with developmental delay” (FH Bureau project) and “Teaching Parents Language Facilitating Skills through Story Telling Activities” (Jockey Club funded project).

Led by Dr Man-tak Leung, Associate Professor of the Department of Chinese and Bilingual Studies of the University, the STU is staffed by experienced and qualified speech therapists. Dr Leung himself has considerable experience in conducting school-based speech and language treatment in Hong Kong. He has published articles, books, book chapters on corpus linguistics, reading and its relationship with cognitive, psychological and linguistic development, as well as on standardized assessment and treatment for dyslexia.

## 3. References to the Research

Publications generated as a result of the establishment of STU:

1. Leung, M-T. and Li, H-L. (in press). Hierarchical Phrase-based grammatical analysis of Language Samples from Cantonese-speaking Children with and without Autism. *Journal of Clinical Linguistics & Phonetics*.
2. Lau, K-Y. and Leung, M-T. (in press). Predicting the naming of regular-, irregular-, and non-phonetic compounds in Chinese. *Journal of Clinical Linguistics & Phonetics*.
3. 梁源, 劉啟欣, 梁文德. (in press). 拼音知識與漢字命名關係. *語言學論叢*, 52 輯.
4. Lau K-Y.D. and Leung, M-T. (2014) Relationship between Morphological Awareness and Chinese Reading Development: A Treatment Study. (Ed.) K. Chung, K. Yuen & D. McInerney. *Understanding Developmental Disorders of Auditory Processing, Language and Literacy across languages: International perspectives*. Information Age Publishing, Charlotte, NC.
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Grant awarded:

1. (QEF 2012-2015) School-based educational programme to foster strategies in reading Chinese words for Non-Chinese (South Asian) students in Hong Kong (HK\$590,000)



Participation of parents in the class



Language Training Workshop

#### 4. Details of Impact and / or Benefits

With various services and activities targeted towards Hong Kong and the Chinese Mainland, the STU has promoted ST to a wider public community. More and more parents of speech disorders sufferers have come to realize the importance and benefits of ST. Hitherto, nearly 2,100 people have taken part in the classes, workshops and seminars organized by the STU. At the time of writing, the Speech Therapy Unit has treated more than 1,000 patients with speech disorders, with over 85% of the subjects showing satisfactory improvement in communication, language proficiency, socializing and work performance.

In particular, the STU has launched its novel "train the trainer" initiative to educate PolyU students through service learning courses to assist in speech-language therapy under the supervision of professional therapists. This in turn enables the STU to provide services to more people in need and to reduce the cost of therapy in providing services to underserved patients. Scaling up its ST services, the STU is also training PolyU undergraduate students and master's degree students as supporting therapists. The first batch of 40 students will graduate in December 2015.

Through its master's degree program and various services and activities, CBS has successfully nurtured speech therapy professionals and raised public awareness about speech disorders. The combined education and service operation has pioneered a practice with long lasting impact in the speech therapy industry, on the patients concerned, and in the community at large

#### 5. References

##### STU staff as Columnists and Interviewees of Newspapers / Magazines

Category	Press Date	Author	Newspaper/Megazine	Topic
1 訪問	201301	/	經濟日報	言語治療師奇缺
2 訪問	201309	/	SmartParent	免費支援計畫助孩子讀寫無障礙
3 訪問	201309	/	SmartParent	父母放下忌諱 讓子女及早治療
4 訪問	201309	/	SmartParent	讀寫策略訓練 突破學習困難
5 訪問	201309	/	SmartParent	遊戲治療 抒發負面情緒
6 訪問	201309	/		理大研漢字形音義規律 新法助南亞裔學中文
7 訪問	201309	/	博學大道	言語治療師挑戰大 中港服務需求殷切
8 專欄	20140103	陳詠珊博士	信報	優良的家庭語言學習環境
9 訪問	20140113	/	China Daily Hong Kong Edition	Demand for Speech therapists on the rise
10 專欄	20140117	區穎思	信報	兒童聲線障礙
11 專欄	20140225	梁文德博士	信報	中風和失語症 (一)
12 特輯	20140227	/	明報	研究生及碩士課程特輯—學士生修習助轉型
13 專欄	20140314	梁文德博士	信報	中風和失語症 (二)
14 專欄	20140328	劉啟欣博士	信報	讀寫障礙物個案 (一)
15 專欄	20140418	劉啟欣博士	信報	中文比英文難學?
16 專欄	20140509	劉啟欣博士	信報	缺乏適當評做工具
17 專欄	20140523	何章琳博士	信報	兩文三語一音一體迷思
18 專欄	20140606	何章琳博士	信報	中風年輕化
19 專欄	20140620	梁文德博士	信報	多元智能 (上)
20 專欄	20140704	梁文德博士	信報	多元智能 (下)
21 專欄	20140718	劉啟欣博士	信報	「親子閱讀」三部曲
22 專欄	20140801	游小君	信報	幼兒言語能力篩查
23 專欄	20140815	區穎思	信報	食物列印機
24 專欄	20140829	譚慧詩	信報	「高才生」的迷思 (一)
25 專欄	20140912	譚慧詩	信報	「高才生」的迷思 (二)
26 專欄	20141003	譚慧詩	信報	友共情
27 專欄	20141017	楊浩欣	信報	寶寶把物件放進口中
28 專欄	20141031	游小君	信報	活得快樂 說得快樂
29 專欄	20141128	鄧寶儀	信報	另類溝通
30 專欄	20141212	麥悅心	信報	腦癱兒的一口氣
31 專欄	20150109	何章琳博士	信報	「看不見」的中風後遺症
32 專欄	20150123	楊浩欣	信報	贏在語言發展起跑線
33 專欄	20150206	林幸澄	信報	智障兒的「無聲溝通」
34 專欄	20150227	區穎思	信報	人不可以貌聲
35 專欄	20150313	何章琳博士	信報	口吃 (一)
36 專欄	20150403	何章琳博士	信報	口吃 (二)
37 專欄	20150417	游小君	信報	淺談小學階段言語治療 (一)
38 專欄	20150515	游小君	信報	淺談小學階段言語治療 (二)
39 訪問	201405	/	HealthAction	中風後遺症 "口不對心" 認識失語症

## Workshops and Seminars on ST Organized by STU

Category	Date	Title	No. of Enrollment
小組	Summer 2014	手舞足「道」講我心-溝通訓練小組 1-2.5 歲	8
小組	Summer 2014	童話、故事 Talk Talk Talk - 言語小組 3.5-5歲	2
小組	Summer 2014	感言至叻星 1 & 2 - 溝通感統活動小組 3.5-5歲	4
小組	Summer 2014	你言我語 1 & 2 - 言語小組 2.5-4歲	4
小組	Summer 2014	千奇百趣：人物篇 - 心智解讀訓練小組 5-6 歲	0
小組	Summer 2014	有商有量少年報 - 社交溝通訓練小組 小一、小二	0
小組	Summer 2014	友誼聯盟 - 社交溝通訓練小組 小三、小四	0
小組	Summer 2014	解難有辦法 - 社交溝通思考小組 4-5.5歲	5
小組	Summer 2014	「你一言我一語」親子言語小組 2.5-3.5 歲	4
小組	Jul-Aug 2014	親子故事工作坊	21
言語治療專題講座 2014 Speaker: CA	Aug 2014	幼兒雙語：家長的常見問題	36
言語治療專題講座 2014 Speaker: CA	Aug 2014	聲線問題及有效用聲技巧	58
言語治療專題講座 2014 Speaker: CA	Aug 2014	中風後的溝通困難	36
言語治療專題講座 2014 Speaker: CA	Aug 2014	中國語文閱讀及書寫的困難	53
言語治療專題講座 2014 Speaker: CA	Aug 2014	如何提升自閉症兒童的社交思考角度	77
言語治療專題講座 2014 Speaker: CA	Aug 2014	免唇裂顎的言語及發音	27
言語治療專題講座 2014 Speaker: CA	Aug 2014	「語」兒同行 - 促進嬰幼兒語言發展技巧	53
言語治療專題講座 2014 Speaker: CA	Aug 2014	二至六歲兒童的語音展及訓練	38
小組	Sep-Oct 2014	手舞足「道」講我心 - 溝通訓練小組 1 1-2.5 歲	4
小組	Sep-Oct 2014	手舞足「道」講我心 - 溝通訓練小組 2 1-2.5 歲	0
小組	Sep-Oct 2014	「你一言我一語」親子言語小組 1 2.5-3.5歲	4
小組	Sep-Oct 2014	「你一言我一語」親子言語小組 2 2.5-3.5歲	3
言語治療專題講座 2014 Speaker: CA & MST Student	Nov 2014	幼兒語音發展及口部肌肉訓練	25
言語治療專題講座 2014 Speaker: CA & MST Student	Nov 2014	寶寶學說話：促進 0-2 歲嬰幼兒溝通發展	25
言語治療專題講座 2014 Speaker: CA & MST Student	Nov 2014	啟發 2-6 歲幼兒的語言能力	25
小組	Nov 2014	牙牙學語樂「遊遊」 - 溝通訓練小組 1-2.5歲	4
小組	Nov 2014	齊齊來聽聽講講 - 溝通訓練小組 1 2.5-4歲	0
小組	Nov 2014	齊齊來聽聽講講 - 溝通訓練小組 2 2.5-4歲	3
小組	Nov 2014	齊齊來聽聽講講 - 溝通訓練小組 3 2.5-4歲	4
小組	Dec 2014	手口並用擺滿 "Fun" 1 3-4.5歲	4
小組	Dec 2014	手口並用擺滿 "Fun" 2 4.5-6歲	0
個別訓練 CP for MST Student	Jan-Apr 2015	學童言語治療訓練 2015年 1-4 月	44
小組	May-Jul 2015	提升讀寫能力系列 - 認讀訓練療程 (第一班)	13
小組	May-Jul 2015	提升讀寫能力系列 - 認讀訓練療程 (第二班)	10
小組	May-Jun 2015	「你一言我一語」親子言語小組	15
個別訓練 CP for MST Student	May-Jun 2015	中風、腦創傷言語治療課程 2015年 5-6月	15
個別訓練 CP for MST Student	May-Jun 2015	學童言語治療訓練 2015年 5-6 月	81
小組	May-Jun 2015	學童言語治療訓練 2015年 5-6 月	53
小組	May-Jul 2015	APA	4

Total: 762

## Appendix 2: Technology Marketing and Networking Activities

### (a) Highlights of Special Publicity Events

Event Date	Technologies Promoted	Photo
Oct 2014	<p><b>Nanofibre Filtration Technology</b></p> <p>A signing ceremony was held to publicize the licensed nanofibre filtration technology. It attracted substantial media coverage.</p>	
Nov 2014	<p><b>InnoCarnival 2014</b></p> <p>The PolyU pavilion featured the University's space research achievements and aviation expertise, and was widely covered by the media across electronic, digital, online and print platforms.</p>	
Dec 2014	<p><b>China Hi-Tech Fair 2014</b></p> <p>PolyU's endeavours and contributions in driving aviation development and space exploration, as well as development in PolyU Shenzhen Base were showcased in this Fair in Shenzhen, which attracted interest from the TV, radio and print media for interviews.</p>	
Feb 2015	<p><b>Apigenin Flavonoid Dimer</b></p> <p>A signing ceremony was held to commemorate the licensing and further development of Apigenin Flavonoid Dimer as a multidrug resistance inhibitor for cancer patients.</p>	
Apr 2015	<p><b>The 43rd International Exhibition of Inventions of Geneva</b></p> <p>Nine PolyU inventions entered into this internationally acclaimed exhibition and won 15 awards in total, garnering intense media attention and coverage. All of the winning research experts were honoured at a special reception hosted by the Chief Executive soon after their return to Hong Kong.</p>	

<p>May 2015</p>	<p><b>Hong Kong International Medical Devices and Supplies Fair 2015</b> A collection of PolyU's remarkable healthcare and rehabilitation technologies were exhibited in this fair, drawing attention from VIPs, and the media as well as industrial visitors interested in potential collaboration.</p>	
<p>May 2015</p>	<p><b>The 1st China Innovation and Technology Fair</b> At this inaugural event supported by the Chinese Association of Science and Technology during their annual assembly in Guangzhou, PolyU's impressive "Intelligent Ship-bridge Anti-collision Surveillance System" and other research breakthroughs attracted the attention of the national leaders, drawing substantial media coverage across the country.</p>	

### (b) Major Exhibitions and Tradeshows Participated

Exhibitions / Tradeshows Participated	Location	Disciplines / Items promoted
1. Exhibition on China's Lunar Exploration Programmes	Hong Kong SAR, PRC	Space exploration
2. International Conference & Exhibition of the Modernization of Chinese Medicine & Health Products (ICMCM) 2014	Hong Kong SAR, PRC	Food safety technology and Modern Traditional Chinese Medicine
3. Electronics Fair 2014 (Autumn Edition)	Hong Kong SAR, PRC	Welding monitoring system, biometrics security systems, etc.
4. Eco Expo Asia 2014	Hong Kong SAR, PRC	Green projects and sustainability
5. InnoCarnival 2014	Hong Kong SAR, PRC	Space exploration, aviation research, PolyU's aviation education, etc.
6. China Hi-Tech Fair 2014	Shenzhen, PRC	Space exploration, aviation research, PolyU's aviation education, services of PolyU Shenzhen Base, etc.
7. Hong Kong Technology Showcase at IDT Expo	Hong Kong SAR, PRC	Textiles, biotechnology, infrastructure, space exploration, etc.
8. Inauguration of The Hong Kong Polytechnic University Foundation	Hong Kong SAR, PRC	Cancer drug, railway technologies, Camera Pointing System, etc.
9. Star Research Exhibition	Hong Kong SAR, PRC	Cancer drug, railway technologies, Camera Pointing System, etc.
10. 43rd International Exhibition of Inventions of Geneva	Geneva, Switzerland	Robotic mannequin, green biodiesel catalyst, IoT-based parking navigation system, stroke rehabilitation training device, functional textiles and garments, etc.
11. ICT Expo 2015	Hong Kong SAR, PRC	Smart helmet, mobile apps, network performance assessment system, 3D scanning and printing, etc.
12. Rail Solutions Asia 2015	Kuala Lumpur, Malaysia	Railway monitoring system, FBG sensors, etc.
13. Hong Kong International Medical Devices and Supplies Fair	Hong Kong SAR, PRC	Functional garments, rehabilitation training devices, occupational therapy system, stroke detection system, etc.
14. Entrepreneur Day 2014	Hong Kong SAR, PRC	Entrepreneurship development at PolyU, funding awardees' projects, Poly-preneurs™, etc.
15. 第一屆中國創新科技成果交流會	Guangzhou, PRC	Structural monitoring system, functional garment, green biodiesel catalyst, food grade capsule, etc.

## Appendix 3: Highlighted Cases of Funded Entrepreneurial Ventures

### Technological Innovation for Better Quality of Life

#### AdvanPro

##### Background:

Founded by a PhD student from the Institute of Textiles and Clothing, AdvanPro was awarded funding from the PolyU Micro Fund in 2012.

It aims to develop innovative wearable mobile monitoring terminals and solutions based on the SOFTCEPTOR™ sensors technology developed by PolyU. SOFTCEPTOR™ is a new electrically-conducting fabric which can sense strain and pressure. As a superb alternative to metal electronic sensors, SOFTCEPTOR™ can be stretched and draped around our body comfortably.

AdvanPro has been working with experts from rehabilitation science and computer science in building cutting-edge computer applications for health analysis and alert since then. In a recent project with The Hong Kong Research Institute of Textiles and Apparel (HKRITA), the pressure-sensitive fabric was made into shoe insole to detect pressure from walking movements. The smart shoes will send alerts to the wearer against over exercise. Working with the Kwong Wah Hospital and PolyU, AdvanPro aims to develop a unique method of foot health assessment by profiling foot pressure.

##### Current Stage:

AdvanPro has completed IncuTech Programme of the Hong Kong Science and Technology Parks Corporation (HKSTP) and joined its LEAP Programme.

In 2014, after securing HK\$1.6 million under the Small Entrepreneur Research Assistance Programme (SERAP) from the Innovation and Technology Commission (ITC), AdvanPro successfully raised about HK\$15 million (US\$1.9 million) from angel investors.

##### Awards:

- First runner-up of 2014 Innovation Nanshan “Entrepreneur Star” Competition
- Excellence Prize of ASPA (Asian Science Park Association) Awards 2014



#### Talk-now

##### Background:

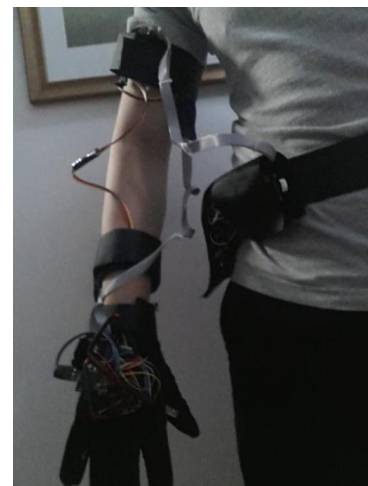
Being awarded PolyU Micro Fund in 2014, Talk-now is a pioneering wearable communication device for the deaf and mute people to vocalize or visualize sign language. With motion sensors built into a smart glove, Talk-now can detect the movements of arms and fingers and translate them into voice or text.

##### Current Stage:

Talk-now has joined the HKSTP IncuTech Programme and is developing a prototype and related algorithm.

##### Awards:

- 1st prize (Innovative Applications Groups) of Asia Pacific Entrepreneurship Competition 2014
- Finalist of Google Empowering Young Entrepreneurs Program (EYE Program) 2014
- Semi-finalist of DBS-NUS Social Venture Challenge Asia 2015





## Innovative Product Design

### Umbrella Here

#### Background:

Umbrella Here was founded by 4 young designers and awarded PolyU Micro Fund support in 2014.

With a vision of building a caring community with interaction design, their signature product, Umbrella Here, is a smart LED lighting device that can be attached on top of an umbrella.

When the umbrella light is on, it signals that the umbrella is available for sharing. Incorporated with the mobile application of the same name, Umbrella Here also provides weather information by changing colours and alerts its owner if he/she leaves the umbrella behind. Furthermore, the mobile app allows users to exchange their social media accounts and track their umbrella-sharing experience, creating a virtual community among the like-minded.

#### Current Stage:

Umbrella Here have successfully raised US\$15,813 on Kickstarter, the top crowd-funding platform in US. The team is now in collaboration with a start-up in Shenzhen to bring their products to the Chinese Mainland. Their unique products are up for sale online now, reaching young people who are open to new ideas and cool gadgets.

#### Awards:

- Gold Award of Best Digital Entertainment (Interaction Design) at the Hong Kong ICT Awards 2014
- Champion of Entrepreneur Arena (創業擂台) in Entrepreneur Day 2014
- Merit Award of Asia Pacific ICT Alliances Award 2014
- First-Class Honor of China University Business Challenge 2014
- New Zealand's Best Interactive Design 2014



## Innovative Product Design

### Run2Tree

#### Background:

Run2Tree was founded by 2 designers in 2013 and was awarded PolyU Micro Fund in 2014. It is a social and sustainable design house with the mission of raising public awareness about the problem of food waste problem and of encouraging the use of eco-friendly products and materials.

#### Current Stage:

HK SOAP, the flagship brand of Run2Tree, is a series of hand-made soap products using food residuals. Run2Tree also holds regular upcycling workshops, sets up social art projects and collaborates with corporations on social responsibility projects.

#### Awards:

- Spot Design Award 2015 in Singapore
- 1 Merit Award and 1 Judge Award in Hong Kong Smart Gift Design Award 2015
- Champion of Entrepreneur Arena (創業擂台) in Entrepreneur Day 2015



## Social Enterprise Promoting Green Environment

### Easy Green

#### Background:

Easy Green is a social enterprise founded by 4 PolyU undergraduate students. Awarded PolyU Micro Fund in 2015, Easy Green aims at promoting environmental sustainability and a green lifestyle to the schools, as well as popularizing hydroponic technology and horticultural therapy among the next generation.

#### Current Stage:

Its products include both innovative modular desk-top hydroponic and aquaponic grow tube "EasyIN" and its outdoor version "EasyOUT". Tutorial workshops will also be bundled into service packages for corporate clients. It has already set up a hydro-planting rooftop farm in PolyU and has worked with 500 participants from PolyU and 10 primary schools.

#### Award:

- First runner-up and Most Popular Project of Hong Kong Social Enterprise Challenge (HKSEC) 2015



## Appendix 4: Achievements over the Triennium FY2012-15

### Output / Outcome versus Targets

The following table summarizes the overall achievements and impacts of PolyU's KT activities in the Triennium (FY2012-15) against the expected outcomes stipulated in the Initial Statement submitted for the KT Fund in 2012:

	Targets in Initial Statement	Output / Outcome in FY12-15
<b>Consultancy Service &amp; Contract Research</b>	\$95 million average annual turnover with around 600 projects per year	Average <b>\$128 million</b> annual turnover (consultancy and contract research) with average around <b>900 projects</b> per year
<b>Technology Licensing</b>	\$5 million annual income with around 13 licensing transactions per year	<b>40 new licensing cases</b> / transactions, with <b>\$12 million income</b> generated from licensing of IP
<b>Entrepreneurship Funding for Startups</b>	45 startup ventures with 15 KT cases through the startup ventures	<b>91 new startup</b> ventures supported in the triennium, with 11 startup ventures commercializing PolyU patents / technologies / research deliverables, and a further of 12 turning final year projects / class projects into commercial ventures
<b>Entrepreneurship Engagement / Activities</b>	30 entrepreneurial education / activities per year with over 3,000 participants	<b>134</b> entrepreneurship education / training workshops and related events with around <b>12,000</b> participants in total
<b>Patenting</b>	182 patent applications and 144 granted	<b>197</b> patent applications and <b>177</b> granted
<b>Technology Marketing &amp; Promotion</b>	Marketing & promotional events, publications and online promotion, annual technology marketing events such as Geneva Invention Expo, China Hi-Tech Fair, KT Management Forum, etc.	<p><u>Geneva Innovation Expo</u> Participated in Geneva Invention Expo (2013, 2014 &amp; 2015) and won <b>36 awards</b> with 23 innovative projects:</p> <ul style="list-style-type: none"> <li>• 16 Gold Awards</li> <li>• 6 Silver Awards</li> <li>• 1 Bronze Award</li> <li>• 13 Special Awards (including Special Awards from the World Intellectual Property Organization and from China Patent Information Centre, among others)</li> </ul> <p><u>Organization of KT Forums:</u> Forums with different themes related to KT management, innovation, technology and entrepreneurship development. Speakers were invited from overseas and the region to share their experience and insights on KT models, practices and governance:</p> <ul style="list-style-type: none"> <li>• “East Meet West – KT Models &amp; Practice” (Nov 2012)</li> <li>• “University Intellectual Property Management” (Oct 2013)</li> <li>• “Global and Regional Innovation: Vision and Practice” (May 2014)</li> <li>• “University Venture Management &amp; Regional Innovation” (Nov 2014)</li> <li>• International KT Conference (Dec 2014)</li> <li>• “PRC Scientific Research Management Reform” (May 2015)</li> </ul>

## Appendix 5: List of Patents Granted in FY2014-15

Patent Title	Country
1. Lens for optical treatment	United States Of America
2. Railway Monitoring System	United States Of America
3. Substrate Coating with Aqueous-Based Multifunctional Core Shell Particles	United States Of America
4. Method of Treating a Rheumatic Disorder Using Combination of Transcutaneous Electrical Nerve Stimulation and a Ginsenoside	United States Of America
5. Automated Testing for Palpating Foot of Diabetic Patient	United States Of America
6. Insect Repellent Fabrics Having Nanocapsules with insecticide	United States Of America
7. Vertical Microinjection Machine	European Procedure (Patents)
8. 聚合物粘合的磁性材料	China
9. 溫度補償光纖應變儀	China
10. A Method for using dual indices to support query expansion, relevance/non-relevance models, blind/relevance feedback and an intelligent search interface	United States Of America
11. 形狀記憶中空纖維的製備方法	China
12. Method and System for Beamforming Using a Microphone Array	United States Of America
13. Electronic Stimulation Textile for Traditional Chinese Medicine Therapy	United States Of America
14. 精氨酸酶的定向位點聚乙二醇化及其作為抗癌和抗病毒試劑的用途	China
15. SITE-DIRECTED PEGYLATION OF ARGINASES AND THE USE THEREOF AS ANTI-CANCER AND ANTI-VIRAL AGENT	Japan
16. SITE-DIRECTED PEGYLATION OF ARGINASES AND THE USE THEREOF AS ANTI-CANCER AND ANTI-VIRAL AGENT	Australia
17. 一種交互式搜索的處理方法	China
18. Method and system for bonding electrical devices using an electrically conductive adhesive	United States Of America
19. A Three-dimensional (3D) Ultrasound Imaging System for assessing scoliosis	United States Of America
20. 用於評估脊柱側凸的三維(3D)超聲成像系統	China
21. 一種呼氣分析裝置和方法	China
22. 一種利用拋光生成結構型表面的方法	China
23. Flavonoid Dimers and Their Use	United States Of America
24. 一種智能壓力衣墊	China
25. A Method and System for Retarding the Progression of Myopia	United States Of America
26. 兼容 BD 和 CBHD 讀寫的物鏡、光學頭以及光盤讀寫裝置	China
27. 用於防紫外綫紡織品的中性二氧化鈦溶膠的製備方法	China
28. 一種處理織物的方法	China
29. 不同形態絲素的製備方法	China
30. 蠶絲脫膠液中絲膠含量檢測系統及檢測方法	China
31. Method and Apparatus for Personal Identification Using Finger Imaging	United States Of America
32. 一種復合壓電振子及其製備方法	China
33. 一種冷水機組的控制及診斷方法	China
34. 基於小波分析的風電場短期風速預測方法	China
35. 基於數據驅動的風電場短期風速預測方法和系統	China
36. 基於混合神經網絡的風電場短期風速預測方法和系統	China
37. 空調冷凍水流量控制系統和方法	China
38. 逆向回流消除裝置及方法	China
39. 用於真菌感染的每日藥物治療的衣物	China
40. 一種帶 C 形定子鐵心的開關磁阻發電機	China
41. 一種導電紡織品及其製作方法	China

Patent Title	Country
42. Method of Mass Production of Tetrakis (P-Nitrophenyl)Porphyrins	United States Of America
43. 感知網絡計費方法、系統及服務器	China
44. 一種預認證和預配置方法及其系統	China
45. 一種分組調度方法及系統	China
46. 環狀陣列超聲波內窺鏡探頭及其製備方法和固定旋轉裝置	China
47. 購物袋綜合力學性能的測試儀器及其測試方法	China
48. 角蛋白肽膠飾的聚乙醇水凝膠、其製備方法與應用	China
49. 高彈性導電纖維及其製備方法	China
50. 被動式磁懸浮軸承及其組件	China
51. 一種紙尿褲的智能監控系統及方法	China
52. 一種空心石墨碳納米小球原位修飾無定形碳納米纖維或碳納米管及其製備方法	China
53. 融合空間信息及光譜信息的遙感圖像的分類方法及裝置	China
54. Method for measurement of asymmetric network capacities	United States Of America
55. Method of on-pot synthesis of water-soluble nanoparticles exhibiting up-conversion luminescence	United States Of America
56. 一種氣動 - 磁流變液集成型隔振系統	China
57. Contactless 3D biometric feature identification system and method thereof	United States Of America
58. Highly Conductive Nano-structures incorporated in Semiconductor Nanocomposites	United States Of America
59. USES OF INDOLE-KETONES OR INDOLIDONES AS NEURO-PROTECTIVE DRUGS	China
60. Semiconductor gallium arsenide compatible epitaxial ferroelectric devices for microwave tunable application	United States Of America
61. 門把形握姿人手圖像採集裝置及握姿人手圖像識別系統 (utility model)	China
62. 一種天綫及手機	China
63. 被動隔振平臺	China
64. Signal receiving device and signal receiving method based on microwave photonics technologies (Co-owned with Huawei)	European Procedure (Patents)
65. Signal receiving device and signal receiving method based on microwave photonics technologies (Co-owned with Huawei)	United States Of America
66. Signal receiving device and signal receiving method based on microwave photonics technologies (Co-owned with Huawei)	France
67. Signal receiving device and signal receiving method based on microwave photonics technologies (Co-owned with Huawei)	Germany
68. Signal receiving device and signal receiving method based on microwave photonics technologies (Co-owned with Huawei)	United Kingdom
69. 譯碼裝置 (Co-owned with Huawei)	China
70. 信號發送方法、接收方法、無源光網絡 PON 設備和系統 (Co-owned with Huawei)	China
71. 一種外腔激光器 (Co-owned with Huawei)	China
72. 內聯閉式水力發電系統	China
73. 直流配電電路	China

## Appendix 6: Additional Key Performance Indicators

Performance Indicators	2014/15 Target	2014/15 Actual	2015/16 Target
<b>Marketing &amp; Outreaching</b>			
Outreach to industry -			
• No. of Exhibitions / Conference and Forum attended	39	40	40
• No. of people reached <sup>Note 1</sup> ('000)	963	1,014	1,000
No. of innovations / technologies being promoted / marketed	120	189	130
<b>Innovation and Entrepreneurial Activities Enabling KT</b>			
Accumulative no. of startup ventures supported / created by students, graduates or staff <sup>Note 2</sup>	137	116	159
Accumulative no. of PolyU innovations / technologies / knowledge transferred through startups by students / alumni / staff <sup>Note 3</sup>	23	23	35
• No. of Micro Fund applications	150	164	160
• No. of students & alumni involved	400	392	400
• No. of Micro Fund entrepreneurial projects supported	20	17	20

**Note:**

1. Includes both people from industry and the general public.
2. The figures include both awardees under the Micro Fund, China Entrepreneurship Fund Schemes, TIF and TLF schemes.
3. With the TIF and TLF schemes, it is anticipated that more technology ventures with PolyU technologies / innovations will be created and funded.