

# Annual Report on Activities and Advancement of Knowledge Transfer

Supported by earmarked UGC Funding  
FY2013-14



**31 July 2014**

## Table of Content

<b>1. Knowledge Transfer @ PolyU .....</b>	<b>1</b>
<b>2. Innovation &amp; Impact .....</b>	<b>2</b>
<b>3. Collaboration &amp; Engagement.....</b>	<b>4</b>
<b>4. Social Innovation, Entrepreneurship &amp; Education .....</b>	<b>6</b>
<b>5. Performance Measure – Key Performance Indicators .....</b>	<b>8</b>
<b>6. The Way Forward .....</b>	<b>9</b>
<b>Appendix 1: Impact Case History .....</b>	<b>10</b>
<b>Appendix 2: Technology Marketing and Networking Activities .....</b>	<b>17</b>
<b>Appendix 3: Additional Measures for Related KT Activities.....</b>	<b>19</b>
<b>Appendix 4: Highlighted Cases of Funded Entrepreneurial Ventures .....</b>	<b>20</b>

## 1. Knowledge Transfer @ PolyU

### 1.1 Review of FY2013-14

FY2013-14 marked a fruitful year of Knowledge Transfer for PolyU, with flagship consultancy and licensing activities amounting to \$115 million in aggregate, whereas applied/contracted research funded by third parties totaled \$382 million. For programmes nurturing innovation and entrepreneurship, the PolyU Micro Fund and China Entrepreneurship Fund supported another 30 student start-ups for advancing their entrepreneurial endeavour. Our space devices were used in the first Chinese lunar landing mission, and the newly established Aviation Services Research Centre thrives to become the cutting edge maintenance, repair and operations for the regional aviation industry.

With strategic support from UGC through KT Fund, the University was able to embark new initiatives to enhance its KT practice, breaking new grounds through innovation and strategic development. Starting in FY2013-14, the earmarked Technology Transfer Fund (TT Fund) from the Innovation and Technology Commission (ITC) allowed further capacity building of the University's technology transfer infrastructure, with focus on IP management information system for improved effectiveness in patenting and commercialization.

This report summarizes key KT activities and developments of PolyU in FY2013-14. Observations and suggestions from UGC in the past have been duly considered for improving related KT developments and practices.

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

#### Developing KT as a Major Strategic Direction

PolyU has been striving for excellence in KT through continuous innovation and operations improvement. In addition to the strategic programmes made possible by earmarked government funding, the University has also committed its own financial resources to jump start related entrepreneurship education and engagement initiatives through its Strategic Plan 2012-18.

#### Improving KT Practices and Mechanisms

In November 2013, members of the PolyU's International Advisory Board (IAB) dedicated their annual meeting to review the University's existing KT policy and practice for the way forward.

Upon deliberation, the international experts commended PolyU's efforts in conducting high impact applied research with high relevance to the industry. The collaborations with strategic industrial partners in aviation service, textiles and food safety were exemplifying examples.

It was also noted that PolyU had strived to create impact in i) consultancy/applied research; ii) creating a conducive environment for entrepreneurship to thrive upon; and iii) continuous development of a good portfolio of intellectual properties and putting it to application. To make the efforts sustainable, PolyU should consider alternative ways to recognize and reward staff, alongside the emphasis on core values of scholarly teaching and research.

In nurturing of an innovation and entrepreneurial culture, the University was heading towards the right direction with the setting up of Micro Fund to support students and alumni in pursuing their own start-ups, some of which would inevitably involve the commercialization of PolyU technologies.

As all disciplines, including social sciences and humanities, could benefit from KT activities, PolyU would be looking for appropriate programmes to encourage a wider spectrum of activities beyond transfer and commercialization of technologies *per se*.

The international advisors also reckoned the importance to work with the Chinese Mainland in applied research and commercialization while upholding PolyU's core institutional values, bearing in mind the inherent cultural values, integrity, ethics that ultimately define the work of the University.

The world is constantly changing. PolyU should ride on the driving forces to serve as a bridge and platform for all stakeholders to work together on win-win propositions. To encourage KT by industries and expertise sectors, PolyU would make plans to allow individual departments and units to employ discipline-specific performance indicators to supplement those KPIs recommended by UGC.

## 2. Innovation & Impact

In driving its KT activities and efforts, PolyU has adopted a philosophy and approach to focus more on creating value and impact to society than generating monetary return alone. Such ethos is reflected in many programmes and projects highlighted in this Report.

### 2.1 Raising Industry Standards & Competitiveness

#### Aviation Services Research Centre (ASRC)

Jointly established in 2012 by PolyU, the Boeing Company (Boeing) and other local and regional supporting organizations, the Aviation Services Research Centre (ASRC) aims to develop new or improved aviation service technologies to benefit maintenance, repair and operations (MRO), serving the aviation industry in the region. The outcomes of ASRC projects will be in the form of working industrial implementations of advanced MRO technologies and methodologies for improving performance quality, throughput and efficiency in relevant aviation service works.

#### Study of Greater Pearl River Delta Region

PolyU was commissioned to carry out a research study on the latest economic and business trends and the policies guiding the development of the Greater Pearl River Delta region. The comprehensive study report in complimentary e-book format provides an important marketing tool for potential investors seeking new business opportunities in the region. Accessible in Invest Hong Kong's website, it serves as a good reference point for foreign consulates, chambers of commerce as well as business associations in Hong Kong to stay abreast of emerging developments in this sophisticated and dynamic region.

#### Application of Self-compacting Materials for Trench Backfilling in Hong Kong

Trench backfilling due to road works and maintenance has posed constant challenges to traffic and road servicing. PolyU recently conducted a research for the Highways Department, HKSAR Government to identify and develop suitable self-compacting materials for trench backfilling, with reference to review of overseas practices and identification of local materials that led to the eventual development of suitable self-compacting materials. If eventually adopted for use for local roads and highways, the impact to material costs and service down-time saving would greatly benefit both the road service operators and thousands of users alike.

### 2.2 Advancing Innovations and Technologies

#### Development of Self-sustainable Magnetolectric Sensor

Condition-monitoring sensors on electricity grids usually require active power supplies and signal conditioners to sustain their operations. PolyU's self-sustainable magnetolectric sensors are not only compact in size (only about 2cm long) but also enable live detections without additional power supplies and signal conditioners, thereby opening up new dimension for fault detection that would also revolutionize maintenance practices for power utility assets. One of the local electricity companies has planned in-situ installation of these novel sensors for early fault detection. Similar tests are also being run with electrical traction systems on trains in both Hong Kong and Singapore to detect early electrical faults that would potentially lead to critical operation down time.

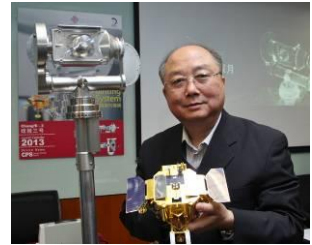


### **Space Exploration Devices and Systems**

Originally developed for EU's Phobos-Grunt Martian moon landing mission in 2011, our Soil Preparation System (SOPSYS) is a compact, ultra light-weighted, mission-critical space tool for sampling and processing samples of rocks and earth for in-situ analysis. Its critical technologies were used in the Camera Pointing System for Chang'e-3's successful lunar landing mission in December 2013. The System allowed the lander's camera to swivel vertically by 120 degrees and horizontally by 350 degrees for optimal viewing and image capturing under extreme conditions on the moon surface.



In China's on-going lunar exploration programme, PolyU will continue to work with China Academy of Space Technology (CAST) to develop a "Surface Sampling and Packing System" for collecting material samples from the moon. PolyU's continuous involvement in the State Space Program will truly bring Hong Kong's technologies to the heart of national science programmes, exemplifying the University's commitment and capability in KT of strategic national impact.



## **2.3 Building a Sustainable Environment**

### **Research Institute for Sustainable Urban Development (RISUD)**

Established in 2013, the Research Institute for Sustainable Urban Development (RISUD) has partnered with industry and society on various collaborative research and knowledge transfer projects. Their past success stories include projects in life cycle performance of concrete structures; building energy efficiency; tackling regional air quality issues; sustainable urban renewal; and sustainable waste management such as the recycled building blocks project below.

### **Recycling and Reuse of Marine Mud to Make Building Blocks**

Based on its rich experience in recycled bricks, PolyU worked with the Environmental Protection Bureau of Macao SAR Government to research into recycling and reuse of Macau's marine mud for producing building blocks. A new manufacturing technique was adopted to suit Macau's local material condition for production with very satisfactory results in the physical properties of the bricks.



### **Contributing to the Wider Use of Electric Vehicle in Hong Kong and Mainland**

PolyU's research capabilities in EV were extended to the development of a 'Made by Hong Kong' electric light bus in collaboration with the Hong Kong Productivity Council. They were involved in constructing a prototype of a plug-in hybrid light bus for bench top testing, with a potential for large scale replacement of the diesel buses currently used in Hong Kong. Similarly, another research team supported a China-based international power supply corporation to evaluate potential grid impacts due to EV integration with impact analysis and forecast. The project provided the company with important guidelines in adjusting their power system planning at grid's level to accommodate EV charging in the country.

## **2.4 Living a Healthier Life**

### **Institute of Active Ageing (IAA)**

PolyU's Institute of Active Ageing (IAA) promotes active and healthy living for those aged over 50. Through the IAA Practice Centre, relevant research findings and education learning are used for service practice. The Centre currently has a membership of 1,050 senior citizens with 45 affiliated staff involved in interdisciplinary research and activities related to gerontology and ageing practice.

### Controlling Myopia Progression through Optical Interventions

As a well-established research hub for eye health, PolyU worked with Johnson & Johnson Vision Care, Inc to evaluate a new soft contact lens designed for slowing myopia progression for children from 7 to 12 year olds in comparison to spectacle lens wearers. The study involves monitoring of individual myopic progression over 3 years; its results would enhance industry’s knowledge towards the treatment of myopia and possible preventive measures.

### Cooling Measures for Workers Working in a Hot Environment

Construction/catering workers, outdoor cleaners, etc. are more prone to suffer from dehydration, heatstroke and elevated heart rate at work. In a bid to advance workers protection, PolyU was commissioned to study new ways to lessen the occurrence of heat-related illnesses. The study found that wearing cooling vests was most useful in providing cooling relief and restoring proper physical condition. The study outcome prompted the Labour Department, in collaboration with Occupational Safety and Health Council, to provide 1,500 cooling vests to 248 participating organizations from 4 industries for further testing.



## 3. Collaboration & Engagement

PolyU has adopted an Integrated Marketing Communications (IMC) strategy to enhance the awareness of PolyU’s applied research expertise and connect our innovations to targeted audiences, reinforcing our consistent messages across a variety of conventional and unconventional marketing channels in a comprehensive way. In the process, extra efforts have been made to accentuate PolyU’s technologies of substantial impact on industry and the community at large.

### 3.1 Engaging Industries for KT Partnership

#### Thematic Campaigns for Industry or Discipline-specific Applications

In the year under review, PolyU launched a thematic campaign on healthcare technologies with Salon Innovation Fair, publication of thematic marketing brochure on “PolyU Healthcare Technologies”, and a special area featuring healthcare technology exhibits in the House of Innovation (HoI), an on-campus exhibition hall dedicated to showcasing PolyU’s applied technologies, prototypes, and products.



#### Technology Seminars / Symposia



In addition to thematic campaigns, we also organized seminars / symposia on practical subjects such as software development, social innovation, Internet and mobile security issues, aviation, construction, engineering, textile technologies, botanical medicines and food safety. In particular, we collaborated with Hong Kong Science & Technology Parks in InnoAsia 2013, to host a Technology Forum on “Eco-City EcoMobility”, presenting the latest developments in smart grids, smart meters, smart vehicles and railway monitoring systems that are vital to sustainable urban infrastructures.

#### Trade Shows

PolyU’s presence in major trade shows both locally and internationally has helped connect PolyU’s innovations with industries and investors, as well as create KT opportunities around the world. In the reporting year, an array of PolyU’s cutting-edge technologies were exhibited in major trade shows, with an estimated overall reach to over 380,000 professionals and trade people.

At Rail Solutions Asia 2014 held in Malaysia, PolyU showcased its interdisciplinary research expertise and KT achievements on railway technologies to officials, railway operators, system providers and manufacturers.

The eminent technologies “Advanced Railway Monitoring System” and “Fibre Bragg Grating Liquid Level Sensor” continued to draw serious attention from the show participants.

To augment our thematic campaign in healthcare, selected advanced medical equipment and devices created by PolyU were exhibited in the Hong Kong International Medical Devices and Supplies Fair 2014, including assistive technologies and devices such as the “Brain Training Device”, the “Robotic Hand” and the “Rehabilitation Sleeve”.



To expand our presence in the Chinese Mainland, PolyU also participated in the 15th China International Industry Fair held in Shanghai, an influential annual event that attracts exhibitors from around the world. Our “Intelligent Ship-bridge Anti-collision Surveillance System” won one of the coveted 11 Creativity Prizes awarded by the organizer.

### **Business Matching & Partnership**

PolyU is keen on partnering with selected industries and business sectors to promote win-win KT opportunities. To encourage exchange, PolyU regularly organizes “Meet-with-PolyU-experts” gatherings with business executives. In addition, scheduled visits for industry associations and companies are arranged regularly for their better understanding of the University’s research strengths and KT accomplishments. These gatherings and visits not only facilitate closer communication and face-to-face discussions, but also open up serious follow up discussions on university-industry KT collaborations.

### **Publicity, Online Marketing and Publications**

PolyU works effectively with the media to communicate our research outcomes to targeted industries and the public, for both general awareness and generating leads to KT collaborations. Effective channels include press conferences, interviews and feature stories in prominent trade magazines. With the flourishing of on-line social media, we also market PolyU’s technologies and entrepreneurial achievements on YouTube, Weibo and Facebook to a broader base of on-line audience. A monthly e-newsletter *Technology Frontier* is circulated to nearly 5,000 business and industrial executives to keep them abreast of PolyU’s latest research development and applications. Similarly, the e-version of the book *Indistinguishable from Magic* (《科技創新變未來》) was published for readers around the world to look up our research achievements with on-line search. Other regular features of applied research and KT achievements are covered by the University’s major publications in both print and electronic forms.

## **3.2 Communication of KT for Community Benefits**

### **House of Innovation**

Regularly showcasing updated research breakthroughs developed by PolyU’s multidisciplinary expertise available for KT and commercialization, the House of Innovation (HoI) plays an essential role in promoting our innovations to potential partners and users. Close to 7,000 individuals visited the House of Innovation in the past year, featuring open days, freshman seminars, and special tours supported by student ambassadors for trade associations, delegations and VIPs.

### **InnoCarnival 2013**

In the InnoCarnival 2013, PolyU set up its pavilion as a professional health centre to display its healthcare innovations, winning the “My Favourite Booth” award from the public. The centerpiece of the PolyU pavilion was a live system deploying the “3D Ultrasound Imaging for Spine Scoliosis” technology that attracted many VIPs, visitors and media members. Most of the displays were successful cases of commercialization with good impact to the community.



## Partnerships with Other Organizations

To extend the impact of our KT endeavours, PolyU partnered with external bodies such as the Hong Kong Trade Development Council and the Hong Kong General Chamber of Commerce to run various conferences and seminars targeted at different audiences in the community and industries. Topics ranged from business opportunities arising from the use of new technologies (e.g., 3D printing) to specific innovations and practices.

## 4. Social Innovation, Entrepreneurship & Education

### 4.1 Fostering Social Innovation



Since its soft launch in late 2013, the Jockey Club Design Institute for Social Innovation (J.C. DISI) organized many KT activities for community awareness and participation. The ten-day “Social Innovation Festival”, coined as the “10-day Fest” successfully drew public attention to social innovation’s immense potential in changing all walks of lives. Furthermore, J.C. DISI collaborated with Esquel Group to re-design the hawker stalls in Fa Yuen Street under the “Hawker Reload” project, aiming to forestall any future fire tragedy from the crowded market place, with new stall designs, fire tests and a series of stakeholder engagement workshops on the

subject.

### 4.2 Cultivating “Do Well Do Good” Entrepreneurship Practice through Funding

#### PolyU Micro Fund Scheme

Since its inception in 2011, the Scheme supported 66 startup projects selected from of 770 proposals submitted by over 1,600 participants. Among them, 54 are still actively operating, indicating a survival rate of over 80%. In addition, about 50% of them secured over \$22 million in aggregate investments or incubation / financial support. This “return” is more than five times of the HK\$3.9 million disbursed under the Scheme.



Highly regarded also by industry experts, a number of the Micro Fund awardees won a total of 24 awards (12 in FY13/14), including the Grand Champion of the Hong Kong Social Enterprise Challenge 2013, Best ICT Startup Awards, and GS1 Hong Kong RFID Award. The young entrepreneurs concerned continued to do well in different domains with their own innovative products / services, gradually building up their business while contributing to a better society. Selected cases are highlighted in Appendix 4.

#### STEFU-PolyU China Entrepreneurship Fund

In collaboration with the Shanghai Technology Entrepreneurship Foundation for Graduates (STEFU), PolyU established this parallel cross-border fund to support young graduates to practice entrepreneurship in the Chinese Mainland. Since its launch in 2013, the fund awarded 20 projects out of 86 applications with funding support of RMB 200,000 each.

### 4.3 Entrepreneurship Education

PolyU strives to educate youngsters to develop the “do well do good” entrepreneurship spirit through different “out-of-classroom” extra-curricular programmes offered by PolyU’s Institute for Entrepreneurship (IfE). In FY2013/14, several new programmes were launched to further develop the entrepreneurship capacity of different targeted audiences. In the summer of 2013, IfE joined hands with Fudan University to



launch the first “High Potential Entrepreneurial Leadership” Programme (HiPEL, 滬港創業企業研習班-開發高潛質創業領導力), drawing 30 young veteran entrepreneurs with diverse background from both Hong Kong and Shanghai to build a dynamic and spontaneous entrepreneurial group. The second cohort admitted 30 more high calibre participants to undertake a more refined 10-day programme with the initial session conducted in late June 2014 in Hong Kong, followed by the Shanghai session in August 2014.

For students on campus, different programmes were also organized for undergraduates and research students. A 3-day entrepreneurship training camp was designed to guide students to develop their entrepreneurial ideas /



projects with mentor support. Another month-long training programme: From Research to Business: Nurturing Techno-preneurs was organized specifically for research students with a “flip classroom” approach, using both online learning tool and face-to-face workshops. Participants appreciated the opportunities and what it would take to commercialize their research outcome.



PolyU will continue to develop different education programmes for young entrepreneurs. A new online entrepreneurship learning tool is being developed to augment the existing line up of training programmes. An entrepreneurship portal: “StartHub@PolyU” will be launched in late 2014 as a one-stop on-line platform offering news, events, knowledge and resources related to entrepreneurship development in Hong Kong and the Chinese Mainland.

#### 4.4 Fostering a better Eco-system by Engaging with Entrepreneurial Communities

##### Poly-preneurs

To strengthen the bonding among Poly-preneurs, various developmental and networking activities are organized. Meanwhile, this community of PolyU alumni entrepreneurs has been highly supportive of PolyU’s entrepreneurship development and education endeavours, involving themselves in flagship initiatives like HiPEL and the Micro Fund Scheme in various capacities.

##### Partnering with Stakeholders in the Community

PolyU has been actively involved with local startup communities, supporting events like Startup Weekend Hong Kong, Global Entrepreneurship Week, HKTDC Entrepreneur Day, etc. The University also offers support services to our partners like the HK-Shenzhen and HK-Guangdong Cyberport Creative Micro Fund (CCMF) Young Entrepreneurship Programme for the second year since 2012.



Innovation and Entrepreneurship (I&E) is an important cornerstone to drive Hong Kong’s future economic development. As an education institution, PolyU will continue to be a key player to nurture I&E in both its campus and the startup community, soliciting young talents, funding good innovations, and educating young students and graduates to be aspired into socially responsible entrepreneurs with the “do well do good” ethos.

## 5. Performance Measure – Key Performance Indicators

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

Performance Indicators	2013/14 Target	2013/14 Actual	2014/15 Target <sup>(Note 1)</sup>
<b>Patenting &amp; Licensing</b>			
No. of patents filed	40	67	62
No. of patents granted	50	46	46
No. of license granted	67	76	75
Income generated from IPR	\$5,000	\$2,932	\$5,000
Expenditure involved in generating income from IPR	\$6,000	\$5,501	\$6,401
<b>Consultancy, Collaborative / Contract Research &amp; Spin-off / JV</b>			
No. of collaborative researches and income generated	105 \$220,000	124 \$355,997	108 \$225,000
No. of contract researches and income generated <sup>(Note 2)</sup>	55 \$32,000	64 \$26,473	54 \$32,000
No. of consultancy projects and income generated <sup>(Note 2)</sup>	850 \$87,000	913 \$112,069	1,050 \$78,000
Number of economically active spin-off companies (with breakdown by type)	4	1	4
Net income generated (or net loss arising) from spin-off companies	(\$380)	(\$350)	\$18,100
<b>Other Knowledge Transfer / Dissemination Activities</b>			
No. of equipment and facility service agreement and income	700 \$8,000	679 \$7,831	950 \$9,500
No. of student contact hours for business or CPD needs	22,000	15,736	22,500
Income received from CPD courses	\$34,000	\$42,931	\$81,000
No. of public lectures / symposiums / exhibitions and speeches to community	300	413	480
No. of performances and exhibitions of creative works by staff or students	60	73	160
No. of staff engaged as members of external advisory bodies	360	196	380

Note:

1. The FY2014/15 targets were defined in the Initial Statement for Triennium 2012-15 submitted in 2012, which may not reflect the pertinent situation. As such, there are bigger variations as compared to FY13/14 actual figures.
2. The figures presented herein include income generated from non-academic units, whereas CDCF tables 63 and 73 exclude income from non-academic units.
3. Additional KPIs on other related KT activities are summarized in Appendix 3.


## 6. The Way Forward

The International Advisory Board, upon reviewing PolyU's KT philosophy and practice in November 2013, reassured the direction the Institution has been taking to embrace KT as an integral component of institutional core values. Beyond tangible KT activities such as consultancy, licensing and entrepreneurial start-up companies, PolyU's overarching KT policy aims to induce a negotiated community order whereby KT is regarded as a harmonious component of academic excellence. Such integration is facilitated by relevant performance measures, corporate and social expectations, job satisfaction and rewards.

With KT becoming a second nature to research and learning, university-industry collaborative platforms would naturally be considered as logical extensions of conventional research centres that are otherwise common to most universities. Within the reporting year, we have seen great strides in such collaborative efforts resulting in high impact achievements in the aviation service industry, railway engineering, food safety, and even the lunar exploration programme commissioned by the State.

The recent surge of renewed interest to create a vibrant entrepreneurial eco-system gives another opportunity for the PolyU to evaluate its existing related entrepreneurship programmes. The PolyU student and alumni start-ups are much more connected both locally and regionally. This in turn brings in pipe-lining opportunities for technology commercialization. The University will certainly leverage on the new Technopreneurship Grant Scheme launched by the government this year to extend its I&E portfolio.

As a publicly funded institution, it is our intent to make our KT process more transparent, with actions and outcomes accountable to a wide range of stakeholders including staff, students, businesses, industries, and the community at large. On balance, stakeholder satisfaction could only be achieved with discipline, transparency, and clearly defined roles throughout the KT process. The PolyU shall continue to seek ways to further improve its KT process and effectiveness, under a conscientious effort to uphold the long time institutional tradition to support the industry with our capabilities and expertise. The support from UGC in its stance for KT and the actual provision of KT Fund remain a key enabler for our commitment in our developmental role for the society.



Nicholas Yang  
Executive Vice President

## Appendix 1: Impact Case History

### Platform Research for KT and Applications

#### Case 1: Space Exploration Programmes: Soil Preparation System and Camera Pointing System

##### 1. Summary

Over a decade, PolyU has been actively developing revolutionary tools and equipment for space exploration missions aimed at uncovering the mystery of outer space.

The first space tool, known as Holinser Forceps, consisting of 70 inter-connectable components, was developed back to 1995. The tool was adopted by the Russian Space Agency for use by astronauts in precision soldering.

Following this initial success, PolyU scientists further developed the Mars Rock Corer, which was carried onboard the Beagle 2 Lander in a spacecraft of the European Space Agency's Mars Express Mission in 2003. Mars Rock Corer is remarkable for its multi-functions and low energy consumption.

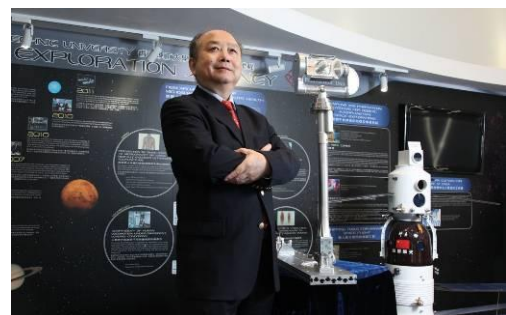
In the 2009 Sino-Russian Space Mission known as Phobos-Grunt Mission, PolyU was engaged to work with the Russian Space Agency on the design of a state-of-the-art space tool - the Soil Preparation System (SOPSY). Even though the spacecraft of the Mission launched in November 2011 was unable to reach the Mars orbit, the invaluable research experience paved the way for PolyU's participation in the Chang'e lunar exploration programme of China.

In the second phase of China's lunar exploration programme, PolyU and the China Academy of Space Technology (CAST) jointly developed the Camera Pointing System (CPS), which touched down on the moon's surface on 14 December 2013 with the soft landing of Chang'e-3 lander. CPS successfully came into operation for capturing images of the moon. Currently, PolyU is developing a Surface Sampling and Packing System for the third phase of the lunar exploration programme.

PolyU will continue to strive for excellence in strategic and significant space exploration programmes through our research capability and knowledge transfer efforts.

##### 2. Underpinning Research

The core team members of the space exploration programmes include Professor Kai-Leung Yung from the Department of Industrial and Systems Engineering and PolyU fellow Dr Tze-Chue Ng. All space tools developed by PolyU were fabricated in the well-equipped Industrial Centre of PolyU. With rich experience in making sophisticated space tools, Professor Yung is an expert member appointed by the China National Space Administration's Lunar Exploration Programme Centre for the third phase of China's lunar exploration programme.



##### SOPSY

SOPSY, a mission-critical space tool weighs only about 400 grams, was developed with specific features for grinding and sifting regolith of Phobos to a size of less than 1 mm in diameter intelligently under microgravity by micro impact grinding for sample fluidization with low power consumption. Its multi-intelligent functions can cope with

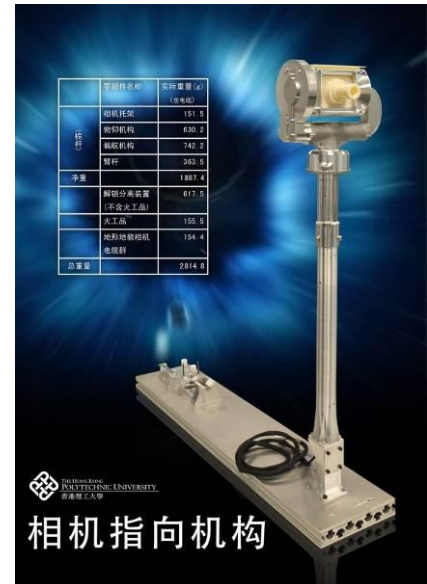
various unforeseen situations in the space environment such as power cut and jamming due to excessively hard rock fragments. Equipped with self-cleaning and un-grinded rock fragment disposal facilities, SOPSYS can minimize cross contamination between samples during in-situ analysis on Phobos for each rock sample handling. PolyU researchers worked closely with the Space Research Institute of the Russian Academy of Science and a Russian aerospace company NPO Lavochkin in testing the functionality of SOPSYS under extreme environment.

### Camera Pointing System (CPS)

In 2010, PolyU and CAST signed an agreement to setup a Joint Laboratory for Precision Space Mechanism Research with CAST donating RMB 5 million worth of equipment to the Laboratory at PolyU.

China's lunar exploration programme is broadly categorized into three phases - "Orbiting, Landing and Returning". The first phase has come to fruition. In the second phase of China's lunar exploration programme, PolyU and CAST jointly developed CPS, which successfully landed on the moon's surface on 14 December 2013, following the launch of the Chang'e-3 lunar probe.

CPS, a lightweight motorized device, can operate under extreme environment with a high degree of adaptability. It was installed in the upper part of the Chang'e-3 lander and was capable of moving vertically by 120 degree and rotating sideway by 340 degree to capture images of the moon and movement of the rover. The rotational and tilting movement of the camera is precisely controlled by the CPS. The camera serves the dual function of image-capturing of the lunar landscape and monitoring the progress of the lunar rover Yutu. PolyU is currently collaborating with CAST to develop a Surface Sampling and Packing System for the third phase of the lunar exploration programme.



### 3. References to the Research

Selected publications relating to PolyU's research and development on space tools are listed as follows:

1. Weiss, P.; Yung, K. L.; Koemle, N.; et al., "Thermal drill sampling system onboard high-velocity impactors for exploring the subsurface of Europa ", ADVANCES IN SPACE RESEARCH, Volume: 48, Issue: 4, Pages: 743-754, 2011
2. Weiss, P.; Yung, K. L, "Feasibility study of a lunar landing area navigation network deployed by impacting micro-probes", PLANETARY AND SPACE SCIENCE, Volume: 58, Issue: 6, Pages: 893-903, 2010
3. Weiss, P.; Leung, W.; Yung, K. L., "Feasibility study for near-earth-object tracking by a piggybacked micro-satellite with penetrators", PLANETARY AND SPACE SCIENCE, Volume: 58, Issue: 6, Pages: 913-919, 2010
4. Weiss, P.; Shi, Wen-Zhong; Yung, Kai-Leung, "Attribute uncertainty modelling in lunar spatial data", INTERNATIONAL JOURNAL OF REMOTE SENSING, Volume: 31, Issue: 1, Pages: 197-211, 2010
5. Weiss, P.; Yung, K. L., "Mission architecture decision support system for robotic lunar exploration", PLANETARY AND SPACE SCIENCE, Volume: 57, Issue: 12, Pages: 1434-1445, 2009
6. Kueppers, Michael; Keller, H. U.; Kuehrt, E.; et al., "Triple F-a comet nucleus sample return mission", EXPERIMENTAL ASTRONOMY, Volume: 23, Issue: 3, Pages: 809-847, 2009
7. Koemle, Norbert I.; Weiss, Peter; Yung, K. L., "Considerations on a suction drill for lunar surface drilling and sampling: I. Feasibility study", ACTA GEOTECHNICA, Volume: 3, Issue: 3, Pages: 201-214, 2008
8. Weiss, P.; Yung, K. L.; Ng, T. C.; et al., "Study of a thermal drill head for the exploration of subsurface planetary ice layers", PLANETARY AND SPACE SCIENCE, Volume: 56, Issue: 9, Pages: 1280-1292, 2008

9. Yung, K. L.; Ko, S. M., "Weight optimization of sampling instruments for ESA Mars Express Mission", ENGINEERING COMPUTATIONS, Volume: 24, Issue: 1-2, Pages: 97-109, 2007
10. Richter, L; Coste, P; Gromov, VV; et al., "Development and testing of subsurface sampling devices for the Beagle 2 lander", PLANETARY AND SPACE SCIENCE, Volume: 50, Issue: 9, Pages: 903-913, 2002
11. Sims, MR; Pullan, D; Fraser, GW; et al., "Performance characteristics of the PAW instrumentation on Beagle 2 (The astrobiology lander on ESA's Mars Express mission).", SPIE Proceedings of Instruments, Methods and Missions for Astrobiology, Volume: 4859, Pages: 32-44, Published: 2002
12. Yung, KL; Ng, TC; Yu, CH; et al., "Design compromises of multi-function tools for both in-situ detection and particle return from asteroid", SAMPLE RETURN MISSIONS TO SMALL BODIES, Volume: 25, Issue: 2, Pages: 323-328, 2000
13. Yung, KL; Ng, TC; Chan, CC; et al., "Passive self-adapting end-effectors for blind grappling on Mars soil", Proceedings of CNES 7th European Space Mechanisms & Tribology Symposium, Volume: 410, Pages: 145-150, 1997

#### **4. Details of Impact or Benefit**

SOPSYS is a mission-critical space tool that enables in-situ soil sample analysis, a crucial step in understanding the evolution of the universe and in the search of signs of extraterrestrial life through the Sino-Russian Space Mission. The Mission marked the first strategic interplanetary exploration by Russia and led to historical attempts to land on the Martian moon Phobos in 2011.

CPS, which is the lightest of its kind, costs less than similar space tools deployed in spaceships developed by European countries and the United States. This sophisticated space tool is able to withstand the extreme temperature and environment on the moon. CPS is the first Hong Kong-made and developed instrument being deployed for lunar exploration programme of China since its launch in 2007. PolyU will further collaborate with CAST to develop a Surface Sampling and Packing System for China's first space mission to collect surface sampling from the moon.

PolyU's wealth of experience in developing sophisticated space tools provides great solutions to the daunting challenges that space explorers have faced for many years. While PolyU's endeavours help in turning man's space exploration dreams into reality, the participation in space programmes with "Made in Hong Kong" devices actually onboard spaceships not only shows the research capability of PolyU, but also exemplifies PolyU's contributions to the advancement in science and technology through our technology transfer endeavours.

#### **5. References to the Corroboration of Impact or Benefit**

##### Awards received for Mars Rock Corer

1. Gold Award, Brussels Eureka 2001 – the 50th World Exhibition of Innovation, Research and New Technology (November 2001)
2. The Most Innovative Award in the "Election of 10 Engineering Wonders in Hong Kong", jointly organized by the Hong Kong Institution of Engineers and the Leisure and Cultural Services Department (1999)

##### Awards received for SOPSYS

1. Gold Medal with the Congratulations of Jury – 42nd International Exhibition of Inventions of Geneva, Switzerland (April 2014)
2. Prize of the Legal Company "Gorodissky & Partners" – Russia (April 2014)

##### Media References relating to SOPSYS and CPS

1. Media Release, [www.polyu.edu.hk](http://www.polyu.edu.hk), 1 November 2011  
PolyU-made space tool sets for inter-planetary mission  
[http://www.polyu.edu.hk/cpa/polyu/index.php?search=SOPSYS&press\\_section=&press\\_category=All&](http://www.polyu.edu.hk/cpa/polyu/index.php?search=SOPSYS&press_section=&press_category=All&)

[press\\_date=&mode=pressrelease&Itemid=223&option=com\\_content&page=1&order=desc&orderby=news\\_date&press\\_id=2177&lang=en](http://www.polyu.edu.hk/cpa/polyu/index.php?search=camera%20pointing%20system&press_section=&press_category=All&press_date=&mode=pressrelease&Itemid=223&option=com_content&page=1&order=desc&orderby=news_date&press_id=2177&lang=en)

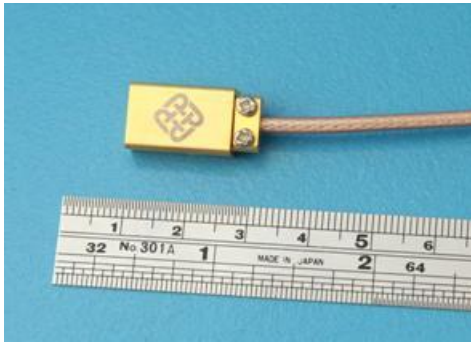
2. Media Release, [www.polyu.edu.hk](http://www.polyu.edu.hk), 17 December 2013  
PolyU-developed space tool starts lunar exploration  
[http://www.polyu.edu.hk/cpa/polyu/index.php?search=camera pointing system&press\\_section=&press\\_category=All&press\\_date=&mode=pressrelease&Itemid=223&option=com\\_content&page=1&order=desc&orderby=news\\_date&press\\_id=2665&lang=en](http://www.polyu.edu.hk/cpa/polyu/index.php?search=camera%20pointing%20system&press_section=&press_category=All&press_date=&mode=pressrelease&Itemid=223&option=com_content&page=1&order=desc&orderby=news_date&press_id=2665&lang=en)
3. South China Morning Post, 4 December 2013  
Hong Kong engineer's camera heads for the moon on board Chang'e-3  
<http://www.scmp.com/news/hong-kong/article/1372148/hong-kong-engineers-camera-heads-moon-board-change-3>
4. [www.innovations-report.com](http://www.innovations-report.com), 1 December 2008  
PolyU gears up for Sino-Russian Interplanetary Space Mission  
<http://www.innovations-report.com/html/reports/physics-astronomy/polyu-gears-sino-russian-interplanetary-space-123422.html>

## **Case 2: Self-sustainable Magnetolectric Sensor**

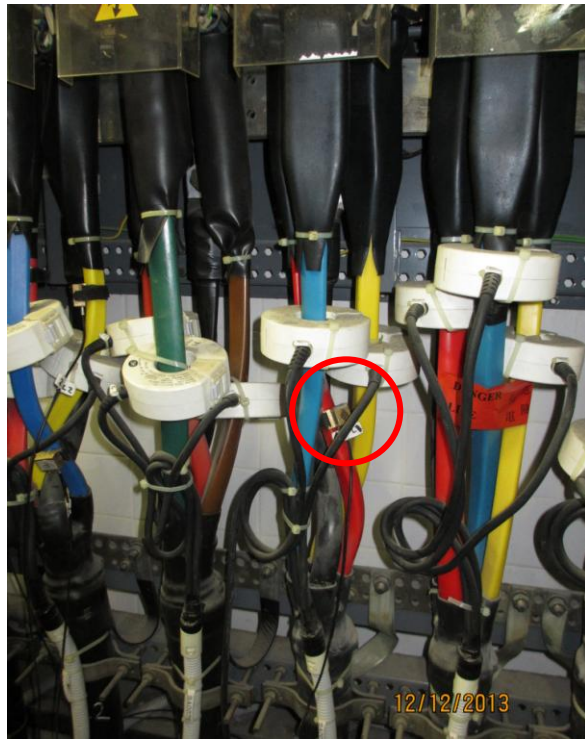
### **1. Summary**

Ensuring reliable and consistent electricity supply is a crucial and critical mission of electricity supply companies. At present current sensors are used for early detection and notification of any abnormality, which however require active power supplies and signal conditioners for corrected output signals. The operating challenge is huge under high voltage, heavy current and strong electromagnetic field environments. PolyU's researchers achieved a breakthrough in developing passive sensing and energy harvesting technologies, which allows current sensors to operate without power supplies and signal conditioners as well as functioning as electromagnetic energy harvesters. These new generation current sensors have opened up new opportunities for fault detection and will have a high impact and change the maintenance practices in the power industries.

Recently, PolyU's research team worked with CLP Power Hong Kong Limited (CLP Power) to install, test and commission a bulk supply of self-sustainable magneto-electric sensors to facilitate current measurement of LV cable circuits at 5 of their substations. The outcome will ensure early fault detection for a smooth and reliable electricity supply in Hong Kong. In addition the smart wireless sensors are also being tested in electrical tractions systems on trains in both Hong Kong and Singapore to provide in-situ monitoring of traction conditions and to detect electrical faults that may interrupt or stop the train services.



*Self-sustainable Magnetolectric Sensor*



*Self-sustainable magnetolectric sensor was installed on 3-phase cable*

## **2. Underpinning Research**

The research has been carried out by the team led by Professor Siu Wing Or of the Department of Electrical Engineering, Faculty of Engineering, since 2003. Prof. Or started the Smart Materials and Systems Laboratory in 2008 and took up the leadership of “Electricity Utilization, Condition Monitoring and Asset Management” Research Area in 2009, High Voltage Engineering Laboratory in 2009, and Electrical Engineering Laboratory in 2013. Prof. Or’s research mainly focuses on the practical applications of various smart materials, such as “magnetostrictive”, “magnetolectric” and “piezoelectric” composites, etc.

The research on the self-sustainable magneto-electric sensors was supported by CLP Power. The result of the research and development is very promising. The passive nature and energy harvesting properties of the sensors have overcome the traditional challenges for sensors requiring active power supply and operating in high voltage, heavy current and strong electromagnetic field environments.

## **3. Reference to the Research**

### **A. Research Projects**

1. Self-Powered Smart Current Monitor with E-Paper Display and Wireless Transmitter for Self-Sustainable Electrical Condition Monitoring
2. Research on the Fabrication and Application of Magnetolectric Composites
3. Magnetolectric Composites for Magnetic Field Sensor Applications
4. Smart Sensors for High-Speed Rail Monitoring
5. Development of a Novel In-situ Dynamic Stress Monitoring Technique for Steel-based Transportation Engineering and Large-span Space Structures Based on Smart Magnetic Sensors
6. Development of Novel Three-Ply-Structured Multiferroic Ceramic Composites for High-Frequency Magnetolectric Sensor Applications
7. Magnetolectric Condition Monitoring System for Electrical Power Distribution



## **B. Research Publications**

### **Patents:**

1. Siu Wing Or and Helen Lai Wa Chan-Wong, "Magnetolectric devices and methods of using same".
  - United States Patent, No. US 7,298,060 B2 (20 November, 2007)
2. Siu Wing Or and Helen Lai Wa Chan-Wong, "Magnetolectric devices and methods of using same".
  - United States Patent, No. US 7,199,495 B2 (3 April, 2007)

### **SCI Journal Papers (selected):**

1. G. L. Yuan and Siu Wing Or, "Enhanced piezoelectric and pyroelectric effects in single-phase multiferroic  $\text{Bi}_{1-x}\text{Nd}_x\text{FeO}_3$  ( $x=0-0.15$ ) ceramics", *Applied Physics Letters*, Vol. 88, Issue 6, Article 062905 (February 6, 2006)
2. Yanmin Jia, Siu Wing Or, Helen Lai Wa Chan, Xiangyong Zhao, and Haosu Luo, "Converse magnetolectric effect in laminated composites of PMN-PT single crystal and Terfenol-D alloy", *Applied Physics Letters* Vol. 88, Issue 24, Article 242902 (June 12, 2006)
3. G. L. Yuan and Siu Wing Or, "Multiferroicity in polarized single-phase  $\text{Bi}_{0.875}\text{Sm}_{0.125}\text{FeO}_3$  ceramics", *Journal of Applied Physics*, Vol. 100, Issue 2, Article 024109 (July 15, 2006)
4. G. L. Yuan, Siu Wing Or, J. M. Liu, and Z. G. Liu, "Structural transformation and ferroelectromagnetic behavior in single-phase  $\text{Bi}_{1-x}\text{Nd}_x\text{FeO}_3$  multiferroic ceramics", *Applied Physics Letters*, Vol. 89, Issue 5, Article 052905 (July 31, 2006)
5. G. L. Yuan, Siu Wing Or, Helen Lai Wa Chan, and Z. G. Liu, "Reduced ferroelectric coercivity in multiferroic  $\text{Bi}_{0.825}\text{Nd}_{0.175}\text{FeO}_3$  thin film", *Journal of Applied Physics*, Vol. 101, Issue 2, Article 024106 (January 15, 2007). [Impact Factor=2.171; Grade A]
6. G. L. Yuan, Siu Wing Or, and Helen Lai Wa Chan, "Raman scattering spectra and ferroelectric properties of  $\text{Bi}_{1-x}\text{Nd}_x\text{FeO}_3$  ( $x=0-0.2$ ) multiferroic ceramics", *Journal of Applied Physics*, Vol. 101, Issue 6, Article 064101 (March 15, 2007)
7. G. L. Yuen, Y. Yang, and Siu Wing Or, "Aging-induced double ferroelectric hysteresis loops in  $\text{BiFeO}_3$  multiferroic ceramic", *Applied Physics Letters*, Vol. 91, Issue 12, Article 122907 (September 17, 2007)
8. Min Zeng, Siu Wing Or, and Helen Lai Wa Chan, "Magnetic field-induced strain and magnetolectric effects in sandwich composite of ferromagnetic shape memory Ni-Mn-Ga crystal and piezoelectric PVDF polymer", *IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control*, Vol. 57, No. 10, pp. 2147-2153 (October 2010)
9. Hongfang Zhang, Siu Wing Or, Helen Lai Wa Chan, and Fang Yang, "Formation and characterization of three-ply-structured multiferroic  $\text{Sm}_{0.88}\text{Nd}_{0.12}\text{Fe}_{1.93}\text{-Pb}(\text{Zr}_{0.53}\text{Ti}_{0.47})\text{O}_3$  ceramic composites via a solid solution process", *Journal of the European Ceramic Society*, Vol. 31, Issue 9, pp. 1753-1761 (August 2011)
10. Long Zhang, Siu Wing Or, Chung Ming Leung, and S. L. Ho, "DC magnetic field sensor based on electric driving and magnetic tuning in magnetostrictive/piezoelectric bilayer", *Journal of Applied Physics*, Vol. 115, Issue 17, Article 17E520 (May 7, 2014)

### **4. Details of Impact or Benefit**

Based on years of research on smart materials and through collaboration with CLP Power, Prof. Or and his research team has successfully developed a self-sustainable magnetolectric sensor which can provide an early detection and notification of any abnormality in electricity supplies. The passive sensing and energy harvesting technologies have enabled current sensors to operate without power supplies and signal conditioners, a breakthrough of the sensing technology in power industry. With the installation and application of these innovative sensors widely in the power distribution network, the power supply company not only can monitor the conditions of their power supplies network timely and accurately, but also can detect possible faults in advance so as to ensure and provide reliable services to the public users. This innovative and novel invention will revolutionize the maintenance practice of the power industries.

An on-going outline agreement by CLP Power to supply and commission over 2,000 power supply-free, miniature smart current sensors at some hundred distribution substations represents the first in the world of deploying the innovative and advanced class of self-invented passive current sensors in power distribution systems for self-sustainable current condition monitoring.

Another on-going research funded by a European company will lead to the commercialization of the proprietary energy-harvesting materials and devices for electrical circuit protection that can be widely used in the aerospace, railways, automotives, watercrafts, power, energy, telecommunications, and process automation industries.

Since May 2013, Prof. Or and his research group (Smart Materials and Systems Laboratory) have been listed as an International Collaborator of the National Science Foundation (NSF) Engineering Research Center (ERC) for Translational Applications of Nanoscale Multiferroic Systems (TANMS) in the US ([www.tanms.ucla.edu](http://www.tanms.ucla.edu)) over the next decade in recognition of their outstanding research achievement in multiferroic materials and devices as well as the strong synergy between the TANMS center and their research interests. This is an internationally prestigious professional appointment of sufficiently high academic, research, and professional standing.

## **5. References to the Corroboration of Impact or Benefits**

### Innovation Award

Bronze Award for *Self-Sustainable Magnetoelectric Smart Sensors*, The 58th International Ideas, Inventions and Innovations Trade Fair (IENA), Nuremberg, Germany (November 2006).

## Appendix 2: Technology Marketing and Networking Activities

### (a) Highlights of Special Publicity Events

Event Date	Technologies Promoted	Photo
Sept 2013	<p><b>Anti-erasing (ATE) Ink for anti-counterfeit of food packaging</b></p> <p>PolyU has developed an innovative Anti-Erasing Ink for use in various kinds of fast-moving consumer goods packaging. China Mengniu Dairy Company is using the ATE Ink in their production lines.</p>	
Nov 2013	<p><b>PolyU Healthcare Pavilion at InnoCarnival 2013</b></p> <p>The PolyU pavilion showcased an assortment of healthcare technologies and medical devices invented by PolyU research experts across various disciplines. These internationally recognized research accomplishments had attracted numerous media coverage, including digital, online and print media.</p>	
Nov 2013	<p><b>The 15th China International Industry Fair</b></p> <p>The “Intelligent Ship-bridge Anti-collision Surveillance System” was awarded one of the 11 Creativity Prizes and attracted some media coverage.</p>	
Apr 2014	<p><b>PolyU’s Achievements at the 42nd International Exhibition of Inventions of Geneva</b></p> <p>The 7 award-winning projects had drawn extensive media coverage and attracted industrial interests.</p>	
May 2014	<p><b>Hong Kong International Medical Devices and Supplies Fair</b></p> <p>Selected advanced medical equipment and devices developed by PolyU were exhibited in this fair. They successfully attracted attention of media and potential partners.</p>	

(b) Major Exhibitions and Tradeshows Participated

Exhibitions / Tradeshows Participated	Location	Disciplines / Items promoted
1. International Conference & Exhibition of the Modernization of Chinese Medicine & Health Products (ICMCM) 2013	Hong Kong, PRC	Food Safety and Technology Research Centre
2. RecycleBANK Fun Fair 2013	Hong Kong, PRC	Sustainability
3. Electronics Fair 2013 (Autumn Edition)	Hong Kong, PRC	Manufacturing systems
4. Eco Expo Asia 2013	Hong Kong, PRC	Sustainability
5. HK International Lighting Fair (Autumn Edition)	Hong Kong, PRC	LED Display System
6. InnoCarnival 2013	Hong Kong, PRC	Healthcare technologies (diagnostic technologies, treatment methods, monitoring systems), and elderly education, etc
7. 15th China International Industry Fair	Shanghai, PRC	Anti-erasing ink, monitoring systems, textile, and building energy, etc
8. China Hi-Tech Fair 2013	Shenzhen, PRC	Healthcare technologies (diagnostic technologies, treatment methods, monitoring systems), structure monitoring, and services of PolyU Shenzhen Base, etc
9. Smart City Expo at Barcelona	Barcelona, Spain	Railway monitoring system and waste water treatment
10. Inno Design Tech Expo 2013	Hong Kong, PRC	Textile
11. BIP Asia Forum 2013	Hong Kong, PRC	Textile
12. 廣州國際創新博覽會	Guangzhou, PRC	Anti-erasing ink, monitoring systems, textile, and building energy, etc
13. Asia Pacific Rail 2014	Hong Kong, PRC	Railway monitoring system, FBG sensors, etc
14. 42nd International Exhibition of Inventions of Geneva	Geneva, Switzerland	Space exploration tool, food grade capsule, nano-filter, occupational training system, and functional textiles, etc
15. Electronics Fair (Spring Edition)	Hong Kong, PRC	Manufacturing system
16. ICT Expo 2014	Hong Kong, PRC	3D printer, structure monitoring system, security systems and logistics systems, etc
17. Entrepreneur Day 2014	Hong Kong, PRC	Entrepreneur activities of PolyU
18. Rail Solutions Asia 2014	Kuala Lumpur, Malaysia	Railway monitoring system, FBG sensors, etc
19. Hong Kong International Medical Devices and Supplies Fair	Hong Kong, PRC	Stroke rehabilitation training devices, nano-filer, hygienic socks and occupational training system, etc

### Appendix 3: Additional Measures for Related KT Activities

Performance Indicators	2013/14 Target	2013/14 Actual	2014/15 Target
<b>Marketing &amp; Outreaching</b>			
Outreaching to industry -			
• No. of Exhibitions / Conference and Forum attended	37	38	39
• No. of people reached ('000)	970	1,205	963
No. of innovations / technologies being promoted / marketed	115	141	120
<b>Innovation and Entrepreneurial Activities Enabling KT</b>			
Accumulative no. of startup ventures supported / created by students, graduates or staff (Note 1)	60	82	55
Accumulative no. of PolyU innovations / technologies / knowledge transferred through startups by students / alumni / staff (Note 2)	8	11	23
• No. of Micro Fund applications	180	181	150
• No. of students & alumni involved	400	477	400
No. of entrepreneurial propositions supported (Note 3)	16	22	20

**Note:**

1. The figures include both awardees under Micro Fund, China Entrepreneurship Fund Schemes and FY2014/15 target for the new Technology Start-up Support Scheme for Universities (TSSSU).
2. With the new TSSSU fund, it is anticipated that more technology ventures with PolyU technologies / innovations will be created and funded.
3. The target no. of applications for FY14/15 is lower as student innovation stream under Micro Fund Scheme will be discontinued.

## Appendix 4: Highlighted Cases of Funded Entrepreneurial Ventures

### Promoting Sustainable Environment and Society

#### Alchemist

##### Background:

Alchemist Creations is founded by 3 young designers in 2012 with the motto “Turn Neglect Into Shine”. Awarded PolyU Micro Fund in 2012, the company aims to remind people the beauty of the mundane and turn trash into valuable and elegant goods by utilizing social resources to create innovative sustainable products.

One of the product series is to make use of the soda can base and unused leather pieces from sofa manufacturers to transform them into different products, including the CAN Lighting and CAN Watch, with the labor support from the underprivileged of sheltered space at St. James Settlement. This world’s first soda can watch, due to its creativity and social innovation concept behind, was awarded the Red Dot Design Award Best of the Best 2013. The watch is now on sales in several retail spots locally and in other countries, and the company is currently supported by the design incubation programme offered by the Hong Kong Design Centre.

##### Achievements:

Red Dot Best of the Best Design Award 2013  
40 Under 40 – by Perspective Global



#### ATB Auto Art

##### Background:

ATB is founded by 2 designers in 2011 and was awarded PolyU Micro Fund in 2013. ATB specializes in designing and producing high-end art furniture and accessories transformed from recycled vehicle parts found in Hong Kong, in order to reduce waste pollution through design creativity. The company is currently under the incubation programme offered by the Hong Kong Design Centre.

ATB offers furniture that combines artistic, functional, environmental and sentimental values. In 2011, ATB used BMW discarded auto parts to produce furniture sets, which were successfully sold at a Charity Auction held at the BMW Wan Chai showroom. ATB’s art pieces are also rented for exhibition by shopping malls to advocate upcycling with creativity.

Besides, ATB also endeavors to raise the awareness of upcycling and organizes numerous workshops to schools, NGOs, and companies. Recently, they



provided an upcycling training course to a group of secondary students with impressive design out of used bicycles.

**Achievements:**

Champion of Hong Kong Social Enterprise Challenge (HKSEC) 2011



**Building Integration Perfection**

Both founders of Building Integration Perfection Ltd (BIP) are PhD candidates from departments of Computing and Building Service Engineering. The Sustainable iBuilding Management Platform (SiMP), built upon their research outcomes, is a one-stop energy solution to building facility managers, energy experts and building owners.

SiMP gears up the building performance by utilizing the pragmatic tools and integrating the data pool of various systems, including building chilled water distribution network system and electrical sub-metering system and facilitates fulfilling the Energy Audit Code (EAC) and ISO 50001:2010. PolyU Micro Fund awarded in 2012 supported the development of SiMP in the early stage and helped the team attract media attention.

Highly appreciated by the building owners and engineers of the field, the team now further extends their services to include upgrading existing Building Management System (BMS) and Manufacturing Monitoring System (MMS) to reduce energy wastage. In 2014, BIP completed from the Cyberport Incubation Programme (2012-2014) and is now operating with a team of 10 staff.

The screenshot displays the SiMP software interface with several key components:

- Navigation Bar:** Home, Glossary, Trend Logs, Power Manager, Site Map.
- Reporting Tools:** Metering Report, Power Breakdown, A/C Load Profiles.
- A/C Load Profiles Form:** Includes Date Selection (Begin Date: 2010-05-01, End Date: 2010-05-05) and checkboxes for Total Chiller Load Cooling (RM5), Main Riser Instant Cooling Load (RM45), Water Side Cooling Load (RM), and Air-side Cooling Load (RM5).
- Trend Log Table:** A table showing data for various equipment (20F PAU-01 Supply Air, 20F PAU-01 Supply Air, 20F PAU-01 Chilled W, 20F PAU-01 Chilled Wat) from 2010-05-12 00:00:00 to 2010-05-12 01:50:00. The table includes columns for Date/Time, and numerical values for each equipment type.
- BMS Data Line Graph:** A line graph titled 'BMS Data Line Graph (2010-05-12 - 2010-05-13)' showing Supply Air Temp. Measured, Supply Air Temp. Set Point, Chilled Water Return Temperature, and Chilled Water Supply Temperature over time.

## Helping to tackle Poverty

### UNSuspended

#### Background:

UNSuspended 溫待 is a platform using coupons to help the underprivileged groups. UNSuspended is founded by five PolyU final year students and was awarded PolyU Micro Fund in 2014.

The social enterprise aims to co-operate with local restaurants to offer meal coupons at cost for consumers to purchase online and then forward to the targeted underprivileged groups through NGOs.

Inspired by the free meal giver, Ming Gor, the team aims to promote the sharing culture, which would not only help the poverty but also bring extra business to the small local restaurants.

#### Achievement:

Champion of Hong Kong Social Enterprise Challenge (HKSEC) 2013



## Educating the Next Generation

### Worldwide Exchange Development Organization (WEDO Global)

#### Background:

WEDO is a social enterprise founded in 2012 by 5 students who envision a racial-barrier-free society. It aims to enhance cultural awareness and understanding towards South Asians by launching WEDO Discovery - a structured responsible travel programme co-created and co-implemented with regional coordinator(s) in different countries.

WEDO Discovery @ Sri Lanka is one of its flagship journeys aiming to nurture social leaders by offering opportunities to explore Sri Lanka. Day trips to local minority neighborhood, such as Sri Lanka, Islamic and Nepal communities in Hong Kong, are also well received. With PolyU Micro Fund awarded in 2012, the team expanded its offerings and reached more young audience to advocate cultural harmony. In March 2014, WEDO was awarded the "Most Popular Project" of Hong Kong Social Enterprise Challenge (HKSEC) 2013.

#### Achievements:

Most Popular Project, Hong Kong Social Enterprise Challenge (HKSEC) 2013



日期：二零一二年四月十六日 來源：星島日報·港聞版  
<http://www.wedoglobal.com> | 查詢任何查詢，請致電電郵至：info@wedoglobal.com | WEDO GLOBAL





## Intercultural Education (ICE)

### Background:

ICE was founded in 2009 and awarded PolyU Micro Fund in 2013. The company operates as a social enterprise and believes engaging with international activities would broaden students' global perspectives.

ICE aims at connecting multi-nationals with local schools to provide intercultural education services. They bring non-locals to youth to broaden global perspectives, while increasing students' international competitiveness through intercultural and interactive training.

ICE also cooperates with other organizations to make global day camp. Global Refugees Day Camp is a one day programme partnered with UNHCR during which participants would meet refugees, go through their experience, practice communication skills and better understand social issues relevant to the refugee community.

### Achievements:

Champion of Hong Kong Social Enterprise Challenge (HKSEC) 2009  
Asia Social Innovation Award (SVHK) 2010  
Young Social Entrepreneurship (JCI) 2011



## 十年樹人

### Background:

Originated from a research project of Department of Applied Social Sciences (APSS), 十年樹人 (Future Game) is a two-day experiential learning programme for primary students (P4-6) to experience their future 10 years by life simulation games, organized by a team of 10 students.

The programme provides school-based life-learning education that fits in the General Studies Curriculum for primary schools with profound impacts for students, families, schools and the society to build the sense of direction at an early age. Four local primary schools tested the programme with 84% of 246 participating students reporting positive feedbacks.

Awarded by PolyU Micro Fund in 2014, the team is actively promoting the programme to more schools including both primary and secondary schools.

