THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY

KNOWLEDGE TRANSFER

ANNUAL REPORT 2009/10

to

University Grants Committee

30 July 2010

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Executive Summary

In response to UGC's call for proposal on Knowledge Transfer (KT) in May 2009, HKUST submitted an initial plan for the 2009/10 to 2011/12 triennium. The plan advanced a five year strategy to identify the University's intellectual strength and harvest intellectual products, to protect intellectual property and manage intellectual products, to strengthen entrepreneurship education to promote innovation and creativity, and to create an open KT platform to generate funding support for innovation and create business opportunities.

To achieve these strategic objectives, the University has, upon approval of KT funding in September 2009, deployed a three-year action plan which features a knowledge harvesting system, an open innovation and collaboration platform, a KT management system, and a proof of concept fund with matching support. In addition, the University has provided 2/3 funding for a new Entrepreneurship Center to facilitate entrepreneurship education, and is fully funding a KT Office at the Vice President's level to coordinate, plan, oversee, and drive University-wide KT operations.

New earmarked funding from UGC has imposed upon the University a much more disciplined, self-conscious, and structured approach to KT. It has also enabled the University to modernize and build important new capabilities in KT which were hitherto unfunded and therefore unavailable.

Upon conclusion of the short Year One, the University has by and large met or exceeded the numerical targets it has set for itself and is resetting some of them based on the performance review. The University has also learned a lot more about the myth and reality of its ongoing KT efforts as well as their relative strengths and weaknesses, and is determined to improve on how its KT efforts are being conducted, how performance ought to be evaluated, and what new measures to build to gauge their effectiveness, efficiency, and efficacy. The University will institute a more refine system to improve the KT performance measurement metrics and the overall KT performance evaluation process having the goal toward a versatile and high quality KT system at HKUST.

UGC's new initiative has spurred renewed excitement in KT on campus. The University has also included KT in its strategic planning process and will align its KT operation with the University's action plan over the next few years.

HKUST is grateful to the UGC support for the opportunity to enhance its capabilities to advance its mission: To contribute to the economic and social development of the nation as a leading University in China, and to play a key role, in partnership with government, business, and industry, in the development of HK as a knowledge-based society.

1. Introduction

1.1 Background

Apart from teaching and research, the so-called "third mission" of universities is frequently equated with knowledge transfer narrowly defined as licensing and commercialization of research results. UGC, however, has adopted a much broader definition for knowledge transfer as follow:

"The systems and processes by which knowledge, including technology, know-how, expertise and skills are transferred between higher education institutions and society, leading to innovative, profitable or economic or social improvements."

To strengthen knowledge transfer in tertiary institutions towards this definition, UGC has provided recurrent earmarked funding starting from 2009/10. This document is HKUST's first annual report on the progress of its KT initiatives funded by UGC for the 2009-2012 triennium.

1.2 Knowledge Transfer at HKUST

Knowledge transfer at HKUST is driven by the Office of the Vice-President of Research and Development (VPRDO). Currently, four units directly under VPRDO manage the different aspects of a chain of knowledge transfer functions:

  (a) The Office of Contract and Grant Administration (OCGA),

  (b) The Technology Transfer Center (TTC),

  (c) The Entrepreneurship Center (EC), and

  (d) The HKUST R and D Corporation Limited (RDC).

The management of knowledge transfer begins with OCGA. OCGA promotes and supports grant applications, negotiates the term of agreements, and maintains, monitors, and manages faculty research funds from RGC, Innovation and Technology Fund (ITF), and numerous other local and international research foundations and projects, basic as well as applied. OCGA is also the primary compiler and repository for institutional data on research activities.

TTC monitors University research expertise and liaises with industry and business. It also protects and manages intellectual property (IP) – a natural by-product of research activity. TTC is a proactive matchmaker between University technology and business and industry needs. TTC seeks technology licensing and contract research opportunities facilitates project development through the support of ITF, and develops corporate-

university joint laboratories, thereby forges bilateral knowledge transfer partnerships between town and gown.

EC is a newly created unit made possible by UGC's recurrent new funding to complete the University's KT cycle. EC supports and facilitates entrepreneurship education, promotes the entrepreneurial spirit, and manages the University Incubator on behalf of RDC. University students, faculty, staff or alumni who wish to utilize newly developed technology to form their own start-up companies could do so with the help (and if necessary, guidance and assistance) and support provided by EC to incorporate, to seek seed funding, and if they so choose, to incubate on campus.

RDC is the last mile of the University's KT chain, and is the only unit not included in the new KT funding by design. RDC as a limited liability company wholly owned by HKUST, and functions as the University's business arm responsible for all commercial agreements, contracts, consultancies, leases, and their use of University facilities and laboratory services. RDC serves as the exit point of the KT infrastructure at HKUST.

1.3 The "Old" KT Organization

HKUST has a strong tradition of technology transfer since its inception. Over the years, the University has built a substantial KT infrastructure covering collaborative research, contract research, consultancies, IP management, technology licensing, executive education, continuing education, professional training, and business incubation.

The organization structure of HKUST on KT until October 2009 is shown in Figure 1.1
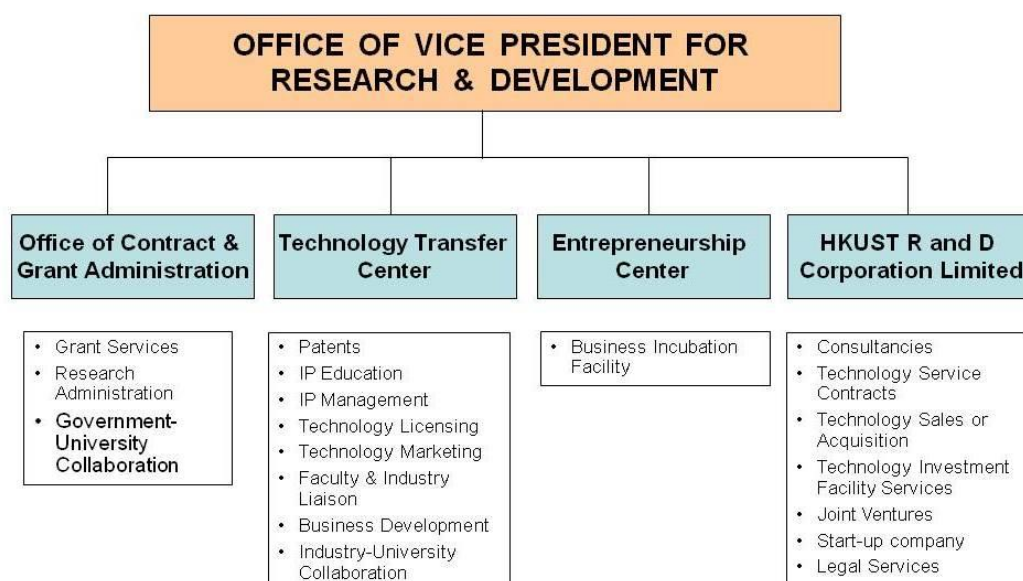
Figure 1.1 Organization Structure of HKUST on KT Prior to UGC Funding Support

1.4 Policies and Incentives

The University has a long standing policy which enables faculty members to conduct technology transfer activities on the basis of one day per week maximum. Faculty members may also apply for no pay leave by reason of professional development or entrepreneurship. Secondments to other universities, research institutions, government agencies or public interest groups occur routinely. The culture and tradition of KT at HKUST is long and strong.

Since 1998, there has been a steady stream of student entrepreneurship on campus, some of which form start-up companies together with faculty and/or staff members. University policy allows significant faculty ownership as long the interests are declared, and that the faculty members do not assume corporate executive positions.

2. Strategic Planning and Strategic Deployment

Strategic planning is conducted by the Vice President for Research and Development (VPRD) with the support of the Director of OCGA, the Director of TTC, the Director of the Entrepreneurship Center (EC), and Chief Operating Officer of the HKUST RDC (without KT funding). The strategic planning exercise is conducted periodically to ensure that in the course of enhancing and strengthening the current KT operation, the deployment of projects, programs, and policies stay focused on the vision and mission of HKUST.

2.1 Strategic Planning Process

A five-year strategic plan maps out the University's KT strategic deployment from 2009 to 2014. The strategic plan takes into account the best practices from current operations and from those of other leading institutions, and is sensitive to changes in its larger operational environment, particularly to the rapidly evolving close collaboration between Hong Kong and Guangdong.

The VPRD is actively in charge of the planning process and leads the effort to review the strategic deployment of the plan on a quarterly basis.

Per requirement of KT funding for the triennium, a three-year action plan was developed. The strategic deployment plan was reviewed and refined in a mini-retreat held in February 2010, and again extensively in a branch retreat held in May 2010.

In addition, an Advisory Committee on KT has been formed. The committee is chaired by the VPRD, and includes two seasoned external experts plus representatives from all of the Schools at HKUST.

2.2 Five-Year Strategic Plan

The strategic objectives of the University's KT operation per submission to UGC in July 2009 are recapped as follows:

- To identify intellectual strength and harvest intellectual products
- To protect intellectual property and manage intellectual products
- To strengthen entrepreneurship education for promoting innovation and creativity
- To create an open knowledge transfer platform to generate funding support for innovation and to create business opportunities

To strive towards these strategic objectives in KT, the University has officially adopted a new organization structure on KT, which is shown in Figure 2.1.
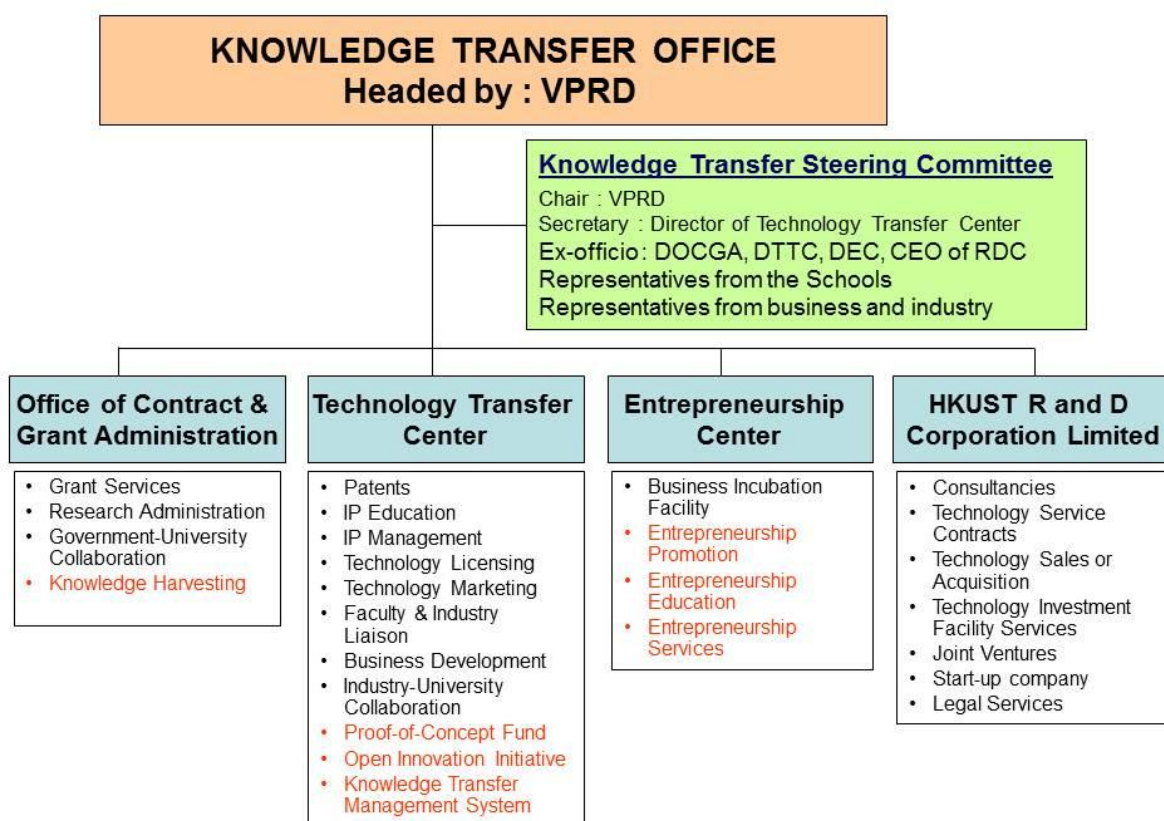
Figure 2.1 Organization Structure of HKUST on KT under UGC Funding Support

In essence, the following changes have been made to the organization structure:

(a) A new KT Office has been created, with the VPRD serving as the Head. A senior staff member has been assigned to support the VPRD on KT matters on a full-time basis. The VPRD is advised on a periodic basis by a newly installed and well represented KT Advisory Committee.

(b) A new unit named the Entrepreneurship Center (EC) has been created. The new center is created to foster entrepreneurial spirit on campus, and is charged with the promotion, coordination, and support of entrepreneurship education. To facilitate entrepreneurship for members of the University community, the new EC also runs the University Incubation Center on behalf of the HKUST R and D Corporation (RDC).

(c) As a researcher himself, the VPRD takes an active interest in the development of a Knowledge Harvesting System. The system is expected to provide the University with a bird's eye view of its strength on knowledge creation. The Office of Contract and Grant Administration (OCGA), the University's primary arm for research administration, is charged with this undertaking.

(d) To provide concrete and timely support for technology transfer arising from the commercialization of IPs belonging to the University, the Technology Transfer Office (TTC) has launched three major initiatives, made possible by the new funding from UGC.

  (i)   A Proof-of-Concept Fund (PCF) to assist selected technologies with potential impact to take off;
  (ii)   An Open Innovation and Collaboration Platform (OICP) to promote and facilitate interaction between higher education institutions (HEIs) and industry;
  (iii)   A Knowledge Transfer Management System (KTMS) as an up-to-date knowledge base for IP documentation and management, with associated technologies and related transactions.

The key milestones of the five-year strategic plan are listed in Table 2.1.

Table 2.1 Key Milestones of the Five-year Strategic Plan

2009/2010	
Identify intellectual strength and harvest intellectual products	• Evaluate software platforms for building a publication analysis system (PAS) • Identify development partners (to allow us to obtain a more comprehensive and accurate publication data set of our faculty members)
Open innovation and collaboration platform	• Define the Open Innovation and Collaboration Platform (OICP) and develop a prototype of it • Review open innovation practices of leading universities, industrial leaders and KT organizations • Introduce open innovation practices to the research community at HKUST and solicit pilot members
IP protection and management	• Continue the good practices in IP management at HKUST • Enhance the existing IP and management infrastructure
Entrepreneurship	• Identify the current entrepreneurship education environment by conducting a survey on universities in HK, US and UK with major entrepreneurship activities • Build a local incubation and angel investment network
2010/2011	
Identify intellectual strength and harvest intellectual products	• Construct bibliographic data repository • Capture the latest publication data of our faculty members through a new web-based application
Open innovation and innovation platform	• Develop and deliver OICP • Develop HKUST as pilot driver for open innovation • Interface with international knowledge exchange and collaboration platforms • Solicit interest from industrial fund providers, challenge/ solution requesters and industrial leaders
IP protection and management	• Enhance the existing IP and management infrastructure • Expand IP management to software and IC design • Enhance IP commercialization through innovative collaborations and partnerships
Entrepreneurship	• Facilitate the setting up of new entrepreneurship courses in the

	Business School • Further expand the incubation and angel investment network into China; first location is Shekou in Shenzhen • Link up mentors, students and alumni by forming an Entrepreneurship Network • Facilitate the setting up of joint-venture companies by mentors, students and alumni with overseas companies via the Entrepreneurship Network
2011/2012	
Identify intellectual strength and harvest intellectual products	• Construct author data repository • Develop a search and retrieval interface for the PAS
Open innovation platform	• Expand OICP to cater for additional knowledge assets from selected partner institutions and organizations • Exchange best practices with the regional and international academic communities and explore partnership • Form research community networks through OICP
IP protection and management	• Expand IP management to more different categories of IPs • Enhance knowledge transfer and IP commercialization through innovative collaborations and partnerships
Entrepreneurship	• Facilitate the setting up of new entrepreneurship courses in the Engineering School • Set up regular seminars for different disciplines to share in the Entrepreneurship Network • To further strengthen the operation of the Entrepreneurship Network, e.g. arrange training courses for potential entrepreneurs and more matching/team building meetings between mentors, students and alumni • Expand the Entrepreneurship Network operation into other location, e.g. Shanghai or Suzhou • Expand the funding source to include venture capital
2012/2013	
Identify intellectual strength and harvest intellectual products	• Develop an application programming interface (API) for other systems to access the PAS • Integrate various components of the PAS and commence service
Open innovation and collaboration platform	• Further expand OICP to cater for additional knowledge assets from partnering institutions and organizations • Enhance open innovation practices with the regional and international academic communities and industry • Structure the knowledge transfer mechanism under OICP
IP protection and management	• Expand IP management to include a wider spectrum of knowledge assets • Liaise with international knowledge transfer agents • Continue to enhance knowledge transfer and IP commercialization through innovative collaborations and partnerships
Entrepreneurship	• Facilitate the setting up of new entrepreneurship courses in the Science School and the Humanity School that related to entrepreneurship • Build up a "train the trainer system" to maintain a sufficient flow of "ready to go" entrepreneurs • Expand the Entrepreneurship Network to other locations, e.g. Beijing
2013/2014	
Identify intellectual strength and harvest intellectual products	• Publication data harvesting, quality control and system maintenance of the PAS

Open innovation and collaboration platform	• Further enhance the open innovation practice with the regional and international academic communities and industry • Strengthen the knowledge transfer outputs from OICP • Demonstrate Hong Kong into <u>as regional center/hub of knowledge-exchange activities</u>
IP protection and management	• Strengthen IP management for a wider range of knowledge assets • Continue to enhance knowledge transfer and IP commercialization through innovative collaborations and partnerships • Demonstrate Hong Kong as a regional center/hub of knowledge transfer
Entrepreneurship	• Facilitate new entrepreneurship-related courses set up by different Schools • Further promote entrepreneurship in the HKUST community, an "Entrepreneur of the year" award is to be set up • Expand the Entrepreneurship Network to formally link up with more overseas universities to create more opportunities for HKUST communities • Further expand the Entrepreneurship Network to other location, e.g. Chongqing

3. Strategic Deployment and Action Plan

To bring the University's strategic goals in KT to fruition, four initiatives have been proposed to be implemented with the earmarked funding from UGC. These are:

  (a) Knowledge harvesting
  (b) Proof of concept
  (c) Open innovation and KT process management
  (d) Entrepreneurship education

A rolling three-year action plan with reference to the outputs specified in the original Initial Statement to UGC is currently being implemented. The following sections detail the progress of the implementation of the four initiatives.

3.1 Knowledge Harvesting

To systematically identify the areas of excellence in research, publication analysis is used to pro-actively seek out emerging star faculty members as well as leading experts to engage them in KT activities.

Knowledge harvesting offers the University an objective basis in its selection of potential areas and partners for intensive KT activities. As a result, the allocation of resources can be optimized to develop existing and emerging areas of excellence, which in turn maximizes the potential for quality IP products.

3.1.1 Publication Analysis System

With the KT funding, a Publication Analysis System (PAS) is being developed jointly with the University Library. The PAS is to be implemented within a three-year time frame. The following are the three key development tasks:

* Software platform evaluation and system design
* Bibliographic data repository construction
* Author data repository construction

Activities in the first year have been largely focused on software platform evaluation, PAS design, and initial construction of the bibliographic data repository. In building the bibliographic data repository, data is being collected both internally from various University databases, and externally from commercial proprietary databases and free web services.

Internally, publication data is being sourced from the annual research data submitted by faculty members to both the Office of the Vice-President for Academic Affairs

(VPAAO) and OCGA. To capture the data more effectively and efficiently, we will develop a new web-based application as a unified input interface for the two data collection activities. The data collected through this application will be the primary source for keeping our bibliographic data repository up-to-date. The application will be ready for use before the next Annual Activities Report submission in April 2011.

However, publication data submitted by faculty members do not contain citation data which forms a vital part of publication analysis. To achieve this, working relationship has been created separately with Elsevier (Scopus), Thomson Reuters (Web of Science), and Google (Google Scholar). Collectively, they provide an extensive (though not complete) coverage of the publications of our faculty members. To extract publication records from these sources and load them into the University Institutional Repository.the following steps have already been taken:

The PAS will be linked to the Open Innovation and Collaboration Platform (OICP), and the Knowledge Transfer Management System (KTMS). When fully developed, these software modules will operate under a unified system maintained and managed by the KT Officer in the Vice President's Office.   In turn, data thus generated will be fed into the University planning system.

3.1.2   Extending Research Opportunities

With the additional KT funding, OCGA has issued various calls for proposals involving 20 overseas funding agencies offering 27 programs in the past year. Programs from the Mainland were also announced and published. These include twenty national, regional, municipal and industrial funding bodies offering a total of 37 funding programs in different research areas. Faculty members and researchers at HKUST have been encouraged to participate in the proposed projects as principal investigators, co-investigators or collaborators.

OCGA has extended its contacts with international funding agencies, such as the EU Framework Programme and the AXA Research Fund, to secure additional funding source for HKUST. This will be a sustained effort, and all funding opportunities have been and will continue to be announced to faculty members and detailed on OCGA's website. OCGA is also adding new features to its website to enhance the dissemination of grant-related information.

3.2 Proof-of-Concept

The Proof-of-Concept Fund (PCF) at HKUST is a new program made possible by KT funding from UGC. It aims to enable, on a timely basis, pre-commercialization development of promising cutting-edge technologies emerging from the researches on campus.

The PCF operates in conjunction with the current Invention Disclosure process at the University. Candidates eligible for PCF application are usually selected after a background patent has been filed through the existing Invention Disclosure process at HKUST. The fund enables University researchers to demonstrate the industrial potentials of their inventions through prototype development, laboratory-scale demonstration, specialist testing, application validation, and field studies.

The PCF specifically targets technologies that are likely to be licensed out to the industries or has been adopted by start-up companies. It helps turn potential intellectual property into (intellectual/commercial) products. The PCF will typically recover its cost via repayments based on the revenue generated through successful commercialization of the invention or technology concerned.

A PCF Guideline has been developed and presented to the KT Advisory Committee at its first meeting in May 2010. The PCF Program was formally introduced to faculty members in early June 2010 with all the relevant information, including the Guideline which is also available on TTC's website. Six projects were short-listed and the Principal Investigators (PI) of each project was invited to an interview and to present at the PCF Review Meeting. Based on the criteria set forth in the PCF Guideline, the PCF Review Committee has approved 5 projects. All the funded projects are now in progress and the PCF fund for Year One has officially been fully committed.

3.3 Open Innovation and Collaboration Platform and KT Management System

The world is shifting from the closed innovation paradigm to the open innovation paradigm. Open innovation can be viewed as a collaboration along and across value-chains, which enables members in the ecosystem to respond in a quick and flexible manner to the changing environment, to remain competitive, and to stay abreast of latest technologies and practices. To this end, effective knowledge management is the indispensable foundation.

The Open Innovation Collaboration Platform (OICP) is created to embrace the open innovation concept. It is a platform set up to support innovation and creativity at HKUST, to facilitate inventor-consumer interactions, to market and accumulate technology know-how, as well as to distribute knowledge across the ecosystem. It is linked to the Knowledge Transfer Management System (KTMS) under development to channel appropriate information to users.

Management of knowledge and its transfer process are the foundation to an effective knowledge transfer operation. The KTMS will enhance the existing KT process by managing the KT tasks and their inter-linking relationship. It will track and manage KT activities throughout the KT process. The importance of the KTMS lies in its uncompromising requirement for thorough and readily accessible documentations related to a particular IP in a given KT process. HKUST is recognized by its commercialization partners for having good knowledge management practices on campus. The development of KTMS will further enhance our effectiveness in this operation. The KTMS also forms a key part of the quality assurance system in our KT operation. The greater accessibility of current documentations makes it possible to manage IP more efficiently and accurately.

HKUST intends to create an open innovation partnership with research institutions and industry. We hope that the successful implementation of OICP and KTMS will be a modest contribution towards positioning Hong Kong as a regional hub for knowledge exchange.

3.3.1 Key Features of OICP and KTMS

3.3.1.1 Key Features of OICP

An online system is currently under development. The current phase includes the development of features as summarized in Table 3.2. A preliminary prototype of the online OICP is currently under testing.

Table 3.1 Key Features of the OICP

Key Feature	Content or Functionality
Repository for University Technologies and Research Information	- Inventions, patents, non-patents specific inventions, and know-how - Copyrighted works - Software and digital content - Faculty profile - Publications - Research facilities - Project information - Library access
Secured Membership System	- Allow members and partners to register for OICP activities - Classify members based on areas of interest and contribution - Allow members to browse and search research information and to receive periodic notification on research news - Allow members to raise challenges/ issues and to respond to corporate challenges by providing solutions
Exchange of Technology/ Challenge/Proposal	- Allow members to receive and host specific challenges, propose / solutions, and make proposal requests - Allow members to direct communication and exchanges through the online system
Featured Solutions / Projects	- Collect members' solutions that respond to corporation's challenges - Allow members to organize contests in selected areas - Foster exchange of ideas and allows members to enter the next-level of exploration through collaborative projects
Carrier of Open Innovation Resources	Introduce open research resources from around the world to regional research communities
Social Networking	Expand the regional open innovation community through social networking tools (e.g. LinkedIn, Facebook)

3.3.1.2 Key Features of KTMS

KTMS is primarily a KT work flow recording and management system. KTMS tracks the KT activities and resulting information throughout the entire life cycle of any University-owned IP. The consolidated KTMS architecture is comprised of the following three modules:

- <u>Workflow and Operation Management (WOM)</u>: WOM captures KT activities and progresses through a workflow engine. It includes five modules namely, Invention,

Patent Application, Project Management, Event Management, Proof-of-Concept, with each being responsible for monitoring a particular aspect of the KT activities.

- Available Technology Website (ATW): ATW is the system that manages and releases research outputs to external parties and will later be combined with OICP.

- My IP Portfolio (MIPP): MIPP serves as an internal portal to provide faculty members with a personal account to access and manage his or her own inventions and all information related to the KT activities.

3.3.2 Implementation of OICP and KTMS

The specifications for both OICP and KTMS were finalized in December 2009. A three-year development package for both systems, including all the server hardware, system software, and the maintenance contract, was awarded to an external software company. Development started in March 2010. The VRRDO and TTC have formed a project task force to detail requirements and to hold bi-weekly project management meetings. Functional prototypes for both OICP and KTMS were delivered in mid-July 2010 for verification.

3.4 Entrepreneurship

The HKUST Entrepreneurship Center (EC) has been newly established to play an important and developing role in KT. Its mission is to advance high-technology entrepreneurship education, promote entrepreneurial spirit, and provide practical support for innovation through on campus business incubation.

By providing infrastructure support and basic incubation services, EC encourages and permits the direct participation of University students, faculty, staff, and alumni in the commercialization of technology and hit-tech business creation.

3.4.1 Entrepreneurship Education

According to the Global Entrepreneurship Monitor (GEM) 2010 report [1], entrepreneurship education forms a positive link to interest in entrepreneurship, higher business success rates, and economic growth. Currently, the offering of courses on entrepreneurship at HKUST lacks a master plan and has little coherence.   There are also cases of duplication in effort across different schools and programs. As part of its Phase I endeavors, EC has undertaken to survey, coordinate, facilitate, and support wherever the Schools and programs deem necessary and appropriate. Phase II will be heavily into coordination and facilitation.

EC works with experts within and outside the University to promote the entrepreneurial culture within the University. It communicates closely with the four schools regarding the development of entrepreneurship education and enhancement of existing courses. A survey on overseas entrepreneurship courses has been conducted (http://www.ec.ust.hk/course.doc) which can also serve as a guideline for the development of new cross-discipline programs to educate a new generation of entrepreneurs to develop the knowledge based economy of Hong Kong.

During July 2009- June 2010, there were 12 postgraduate and 5 undergraduate courses in entrepreneurship at HKUST. The total number of departments offering entrepreneurship courses was 9. EC communicates closely with the organizers of entrepreneurship courses to provide support for the course implementation. EC brought in a venture capitalist to be the judge for a business plan presentation in an undergraduate course; students were much enlightened by the experience of the investment industry specialist.

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[1] MartÍnez, Levie, Kelley, SÆmundsson and SchØtt, 2010, GEM Special Report: A Global Perspective on Entrepreneurship Education and Training

3.4.1.1 New Development in Entrepreneurship Education at HKUST

During July 2009 - June 2010, an entrepreneurship track was set up in the taught MBA program by the Business School. This track contains courses such as: Entrepreneurship and Small Business Studies, Implementing Strategy, International Growth, Venture Capital and Private Equity, Competitive Positioning, New Product Development, Information and Entrepreneurship Management, Developing Business Plan, and Family Business.

3.4.1.2 Seminar and Networking Events

HKUST has always been active in entrepreneurship seminars and networking events. It has also been very successful in recruiting seasoned industrial practitioners and entrepreneurs to act as lecturers and mentors.

During July 2009 – June 2010, the Entrepreneurship Center organized seminars on entrepreneurship. They received enthusiastic participation by university students and staff in Hong Kong. The other seminar took place in Shenzhen, meant primarily for mainland based alumni, and turned out to be a most popular and effective networking event.

In addition, networking events were held and open to all students and staff at the University.

3.4.1.3 School Participation

Students who participated in the entrepreneurship events were drawn from the four Schools during July 2009 - June 2010. A majority of the participants in the April 2010 seminar were non-business undergraduates from the School of Science and the School of Engineering.

3.4.1.4 Entrepreneurship Network

The Entrepreneurship Network provides a platform for HKUST students (undergraduates & postgraduates), alumni, faculty, companies, and industry professionals to connect and exchange ideas. An online communication channel of the Entrepreneurship Network was established in May 2010 at LinkedIn, a social networking media for professionals worldwide.

3.4.2 Entrepreneurship Program

To provide a platform for entrepreneurial practice, an entrepreneurship program with clear guidelines was created to support the commercialization efforts of alumni, students and faculty members. The prime function of the program was to provide those

who are ready and willing to become entrepreneurs a facility for on campus business incubation. The program is a practicum for entrepreneurship education.

EC manages the University Incubator – the incubator owned and previously also operated by HKUST R and D Corp. (RDC). The support of the new KT funding from UGC has made it possible for EC to employ professionals and deploy the University Incubator as a practicum for entrepreneurship education. This included a comprehensive review of processes and procedures as well as active engagement of HKUST entrepreneurship as well as spin-off companies to provide mentorship to University students and aspiring entrepreneurs.

Spin-off companies are those economically active companies that have successfully completed the three-year incubation program. During July 2009 – June 2010, one of the spin-off companies, Perception Digital Ltd., became listed on the Growth Enterprise Market of the Stock Exchange of Hong Kong Limited. Among the 21 economically active spin-off companies, Giant Innovation Ltd. is a newly spun off company.

Existing startup companies are companies that are currently in and within three years of joining the entrepreneurship program. They are only classified as companies in the entrepreneurship program after signing the Shareholder Agreement. During 2009-10, three startup companies joined the Entrepreneurship Program. As HKUST is active in research and development, university students, faculty, or alumni may be interested in forming their own companies with the University's newly developed technologies. One of the three startup companies uses HKUST's technology, thus realizing the very idea of knowledge transfer through application.

Over the last four months, EC has provided business consultation to companies, students, and faculty in the entrepreneurship program in areas such as collaboration with the University, business development, fund raising.

3.4.3 Entrepreneurship Infrastructure

Entrepreneurship Infrastructure is a coordinated system of programs and resources. It includes business network, professional guidance and mentoring support, professional training, and collaboration that can ultimately help to grow new technology ventures.

To maximize the incubatee's chance for success in today's competitive world, EC works closely with the entrepreneurship community in both Hong Kong and the mainland to create the best entrepreneurship setting. EC encourages University incubatees to look beyond administrative borders for business opportunities and competitive advantages,

and wherever possible and appropriate, assists them in cross border incubation activities.

3.4.3.1 Collaboration with External Organizations

HKUST has ongoing collaboration with the HK Science and Technology Parks (HKSTP), the HK Applied Science and Technology Research Institute (ASTRI), and various research institutions in Hong Kong and beyond. HKUST is open to all forms of collaboration with any willing partner, local or international, to engage in the pursuit of innovation. During July 2009 – June 2010, the University has built partnerships with two external organizations to run joint incubation programs. These include both local and regional partners opening up more opportunities for development in China.

The University has teamed up with the Hong Kong Venture Capital Association (HKVCA), Hong Kong Science and Technology Parks (HKSTP), University of Hong Kong (HKU), Chinese University of Hong Kong (CUHK), and Hong Kong Polytechnic University (PolyU) to form the Hong Kong Business Angel Network (HKBAN), through which the startup companies have gained fundraising opportunities.

3.4.4 Benchmark

Education

As a first-year KT undertaking, EC conducted a campus Entrepreneurship Education Survey. Survey results have revealed a number of areas in entrepreneurship education which are not well covered in our existing curriculum. In particular, they are: Small Business Consulting, Business Case Studies, Corporate Entrepreneurship, Global/Regional Entrepreneurship, and Entrepreneurship Marketing and Law.

Program

Compared to some entrepreneurship programs overseas, the infrastructure for our program is relatively weak. EC could use additional resources to support startups or perhaps also potential startups on business planning, start-up fund raising, IP due diligence, and incorporation.

4. Performance Measurement – Key Performance Indicators

4.1 KT Performance

4.1.1 IP Management

HKUST monitors on a continuous basis inventions, discoveries, copyrights, and technical information arising from faculty research, and provides IP protection for the discoveries and technologies through a carefully managed process of patent review and application. TTC has paid particular attention to those research activities that respond to current industrial challenges and works closely with the researchers at project initiation stage to monitor progress.

Our efforts have also extended beyond inventions and patent to include software, IC-designs, digital contents and courseware developed at HKUST into our IP portfolios. Identification, sanitization and categorization of such IPs are under way and will continue in the new reporting year. Necessary legal framework to facilitate opening to and utilization by industry of such IP resources is being prepared and reviewed. Towards the end of the new reporting year, selected software and IC designs will be posted in our website for transfer and licensing purpose.

4.1.2 Licensing and Commercialization

The KT staff at HKUST puts major efforts in seeking technology transfer channels and arranging licenses with suitable technology receivers. A variety of licensing arrangements are available to cater to different needs, such as evaluation agreements, option agreements, non-exclusive license agreements, and exclusive licenses. Depending on the nature of the technology receivers and intended use of the technology concerned, the license could be fee- and/or royalty-bearing, paid-up or no fee-bearing. Field of use and geographic coverage for a license vary from deal to deal. As of 30 June 2010, HKUST through RDC is managing in total 33 active licensing agreements. We would like to point out that in line with the efforts to promote and make available to the public a wider range of IP created at the University, such as know-how and software, we have also recorded 32 active agreements on know-how transfer and 5 agreements on software.

4.1.3 Contract Research and Consultancy

During 2009/10, HKUST, through RDC, has successfully concluded 172 research projects, 62 consultancy projects and 377 testing service projects with industrial partners, of which there is a good mixture of local companies, regional companies, and

multinational companies. There is also a notable increase in the number of the consultancy projects with various departments of the Hong Kong Government. The key technology areas include drug development, information technology, wireless communication, civil and geotechnical engineering, material science, new energy, healthcare products, RFID, among others.

4.1.4 Marketing and Promotion

With KT being the third mission of HKUST, one of the major goals of our KT activities is to increase the public's understanding and awareness of the technological progress being made within the University. In particular, progress made in frontier technology areas, should be promote in a timely manner to facilitate partnerships and collaborations. In the past year, HKUST has maintained an active schedule of open house, workshops, forums, sharing sessions and regular informal contacts with key corporations, academia, and general-interest audiences.

4.1.5 Joint Institution Collaboration

HKUST has numerous on-going collaborations with partners in Hong Kong and overseas. Under the new KT Initiative for 2009-2012, promotion and outreach of academic collaborations through university-to-university and university-to-research institution linkages remains a top priority. Additional efforts have been deployed to strengthen links between HKUST members and local and international institutions to enhance the knowledge transfer network and partnerships.

4.2 KT Training for Professional and Academic Staff

4.2.1 IP Seminars and Best Practice Sharing

HKUST has a tradition of partnering with renowned law firms and professional companies to hold IP seminar(s) to educate/ inform the HKUST community on IP protection and management, patenting strategy and IP commercialization. In November 2009, TTC organized the IP seminar — "US Patent Prosecution Strategies – A Smart Way to Deal with Patent Examiner" featuring speakers from The Nath Law Group of USA. In addition to the IP seminar, TTC has been actively holding briefing sessions for individual faculty members or groups on patent application procedures, IP protection, collaboration modes and so on. TTC also offers strategies for effective IP protection.

Best practice sharing is one of the core building blocks and driving forces for optimizing HKUST's KT strengths by exchanging wisdom with key players in the KT arena. Best practice sharing meetings or sessions have been arranged with KT professionals of wide-ranging entities such as KT offices of universities, major key players in the IP industry, government, quasi-government bodies, NGOs, IP legal firms, professional bodies and other KT channels locally and worldwide.

4.2.2 Conferences and Seminars Attended by KT Staff

In order to stay abreast of the best practices for and latest trends in knowledge transfer, KT professionals at TTC are strongly encouraged to participate in conferences and seminars.

4.2.3 Memberships of Professional Organizations

Colleagues are encouraged to become members of a variety of professional associations. In 2009/10, KT staff joined a number of local and international professional organizations in areas such as IP administration, biotechnology, medical sciences, and environment technology, etc. to facilitate business networking and technology marketing activities.

Our KT professionals are members of the following:

- Association of University Technology Managers (AUTM)
- Licensing Executives Society China, Hong Kong Sub-Chapter (LES)
- American Chemical Society
- Modernized Chinese Medicine International Association Limited (MCMIA)
- Hong Kong Medical and Healthcare Device Industries Association (HKMHDIA)
- Hong Kong Biotechnology Organization Limited

- IEEE Engineering in Medicine and Biology Society Membership
- IEEE EMBS (HK Chapter) Executive Committee
- Other IEEE societies

4.3 Key Performance Indicators

Output of the 3-year KT Initiative has been and will continue to be closely monitored through the use of the Key Performance Indicators (KPIs). The KPIs are tabulated as follows:

Table 4.1 KPIs for Present Activities

Performance Indicator	2009/10 (target)		2009/10 (achieved)	
Number of patents filed in the year	125		148 [Note 1]	
Number of patents granted in the year	35		33 [Note 2]	
Expenditure involved in generating intellectual property right	$3.5m		$3.7m [Note 3]	
Number of licenses granted	30		7	
Income (on cash basis) generated from intellectual property rights	$5.5m		$9.6m	
Number of collaborative researches, and income thereby generated	36	$70m	50	$94.3m
Number of contract researches (other than those included in "collaborative researches" above), and income thereby generated	170	$40m	172	$60.5m
Number of consultancies, and income hereby generated	35	$8.5m	62	$12.5m
Number of pro bono research or consultancies	NIL		NIL	
Number of equipment and facilities service agreements, and income thereby generated	350	$5.3m	377	$5.8m
Number of jobs created through the new Knowledge Transfer funding	11		11	
Number of student contact hours in short courses or e-learning progammes specially tailored to meet business or CPD needs	63,700 hrs		68,440 hrs	
Number of economically active spin-off and startup companies	No projections in proposal		28	
Companies with institutional ownership and using IP from HKUST	No projections in proposal		7	
Companies with institutional ownership but not using IP from HKUST			21	

[Note 1] CDCF Table 65: The number of patent filed for the year 2009/10 is 148 and the number of inventions involved is 80.

[Note 2] CDCF Table 66: Patents Granted for the year 2009/10 is 33 and the number of invention in the reporting year is 26.

[Note 3] The actual budget allocated for 2009/10 by the University is $3m. The shortfall of $0.7m was offset by revenue generated through commercialization of IPs in the previous years.

5. Summing up Year One

5.1 Initial Proposal

In response to UGC's call for proposal on Knowledge Transfer in May 2009, HKUST submitted an initial plan for the 2009/10 to 2011/12 triennium. The plan advanced a five-year strategy to:

- Identify the University's intellectual strength and harvest intellectual products
- Protect intellectual property and manage intellectual products
- Strengthen entrepreneurship education to promote innovation and creativity
- Create and open knowledge transfer platform to generate funding support for innovation and create business opportunities

To achieve these objectives, an action plan with a three-year rolling horizon (per funding schedule) with a comprehensive offering focused on quality growth had been crafted, with specific programs in:

- Knowledge harvesting
- Open innovation
- Pre-commercialization technology validation
- Entrepreneurship education
- Process management and quality assurance

Upon their successful implementation, these programs will greatly enhance the capability of the existing KT infrastructure, and will enable HKUST to offer a forward-looking and comprehensive KT environment, friendly to students, faculty, staff, alumni, and to their partners in business and industry.

5.2 Year One at a Glance

Upon arrival of the new KT funding from UGC in October 2009, HKUST immediately launched its action plan.   At a glance, HKUST has

- Created a KT Office, headed by the VPRD
- Created a KT Advisory Committee chaired by the VPRD, with full representation from all schools plus two seasoned external experts
- Crafted a new Entrepreneurship Center (reporting directly to the VPRD) responsible for entrepreneurship education and management of the University Incubator
- Designed, vetted, and started development of the knowledge harvesting system in collaboration with the University Library (PAS)

- Designed, vetted, and started development of the Open Innovation and Collaboration Platform (OICP)
- Designed, vetted, and started the development of the Knowledge Transfer Management System (KTMS)
- Launched the Proof–of-Concept Fund (PCF) with 1:1 matching from HKUST R and D Corporation
- Seeking collaboration and sharing best practices with international parties such as the Guangdong Provincial IP Office, World IP Organization, Isis Innovation, Tokyo Institute of Technology, Korea Advanced Institute of Science and Technology
- Conferences, seminars, international collaboration, staff training, etc.
- Quarterly review and annual retreat on KT processes and outcome

The VPRD's KT Office (not funded by KT) has enabled the University to consolidate major KT functions, conduct better planning and review, drive large projects, provide institutional coordination, consolidate data, and strengthen alignment of processes to strategic goals.

The development of a knowledge harvesting system (PAS), an open innovation platform (OICP), a KT process management system (KTMS) and the establishment of the Entrepreneurship Center (EC), all contribute towards the building of new, long term capabilities of the University in KT. The PAS will help align the University's future research strategy. In particular, OICP and KTMS have built-In functions for process monitoring and review to ensure quality throughout. Once in full operation, they will enable on line monitoring of KT processes with real time feedback to TTC.

The introduction of the Proof-of-Concept Fund (PCF) by TTC, leveraging on 1:1 matching from RDC, has spurred immediate interest among technology leaders at HKUST. TTC expects the immediate success of the PCF to attract considerable business interest and generate new, external participation in PCF funding for HKUST technology in the near- to medium-term future.

5.3 Lessons and Opportunities

New earmarked funding from UGC has imposed upon the University a much more disciplined and self-conscious approach to KT in areas of planning, implementation, benchmarking, and review. As a result, during the short Year One (9 months) of the KT exercise, HKUST has discovered deficiencies and inaccuracies in its old measurement system (e.g. KPIs on student contact hours in self-finance programs), lack of automation (being addressed by PAS, OICP, KTMS), and paucity in staff professional development. These deficiencies and inadequacies are being addressed across the board while new initiatives are being launched.

Traditional KT units at the University have served their purposes well, but their efficiency and effectiveness have been largely limited to their pre-defined mission. Leveraging on partial support from the new KT funding, the new Entrepreneurship Center was created in anticipation of emerging developments. Yet, even our most forward looking plan has been found lagging behind developments.

HKUST views this as an opportunity to reorganize its KT structure and operation to build a modern, versatile, and high quality KT system.

5.4 Environmental Scanning and Change

In his report to the Council, the President included entrepreneurship as one of the key directions in which the University will contribute to the development of HK as a knowledge-based society. The School of Business Management at HKUST has made entrepreneurship one of its major themes in faculty recruitment for 2010/11. As the newly established EC is being formed and tuned, it will be overwhelmed if not overrun by a sea of demand when Fall Semester begins.

The School of Engineering is in the process of retaining an established seasoned KT professional to spearhead cross border entrepreneurship in engineering. This is a challenge to, and also an opportunity for EC. Albeit well-versed in the significance of the Pearl River Delta to the economic well-being of HK, EC still must address the cogency of its action plan with a sense of urgency. It must quickly make the necessary adjustments in its action plan to accommodate the huge surge in interest in entrepreneurship -- an area of great relevance to the usefulness of EC.

HKUST is undergoing sweeping changes in its top leadership: Our President arrived just last Fall; a new Provost will join the University in September; a new Vice President for Research and Graduate Studies (with Graduate Studies being a new function of the Office) will arrive in November; and a new Vice President for Institutional Advancement (brand new post) is currently under active recruitment. While the institutional strategic goals remain unchanged, with significant new funding under new management, it is entirely conceivable that some refinement and adjustment in the action plan could occur during the next fiscal year.

5.5 Measuring up to the Strategic Plan

Technology transfer has been a central concern with HKUST since its inception and has been well attended to throughout the years. Still, the new funding has generated much excitement and made some dreams appear achievable. This is particularly true of knowledge harvesting, proof of concept, open innovation, KT process management, and entrepreneurship. It also helps to expand the traditional focus on technology transfer to

KT covering addition areas in copyrights, software, policy, business research, consultancy, and the like. The fact that every single item in the three-year action plan is well underway during Year One speaks strongly for the extraordinary enthusiasm with KT.

The University is grateful for the unique opportunity accorded to it by UGC so that it may offer a full range of KT support services for its students, faculty, staff, alumni, and partners in business, industry and government.   We have exceeded most of our targets set for ourselves in Year One. We intend to improve in areas we have found wanting. With determination and perhaps also some luck, we seek to complete our five-year strategic objectives sooner than expected by striving to conclude most of our projects in the three-year action plan.