

LEVEL 7 ASSESSMENT SPECIFICATION

Student name:	Hok Ming KWAN	Student ID number:	2031099
Programme:	DBA		
Module:	Visions for the Future – Theoretical Perspectives on Management		
Module code:	HKBM7006	Contribution to Overall Module Assessment (%):	100%
Lecturer:	Dr Eddie Yu	Internal Verifier:	
Assignment Title:	Essay	Word count (or equivalent):	6,784
Submission deadline:	9 August 2021	Return date of provisional marks & written feedback:	8 September 2021
Submission method:	All written assessments, where practical and possible, must be submitted via Turnitin unless otherwise instructed by the Lecturer. (Please DO NOT put this assessment specification into Turnitin or it will match many similarities with other students' submissions.) Alternative submission method (if applicable): Late submission of the assessment will result in a late penalty mark. Penalties for late submission: Up to one week late, maximum mark of 50%. Over one week late, 0%. Only the Extenuating Circumstances Panel may approve a change to submission dates.		
Academic honesty / referencing:	Academic honesty is required. In the main body of your submission you must give credit to authors on whose research and ideas your work is based. Append to your submission a reference list that indicates the books, articles, etc. that you have used, cited or quoted in order to complete this assessment.		

Contents

From Uphill to Downhill: Theorising the Technology Transfer Performance of PolyU with the 3H Framework.....	2
Introduction	2
The impact of technology transfer to the society.....	2
The functions of technology transfer units in universities.....	3
Performance indicators for technology transfer	4
Technology transfer in The Hong Kong Polytechnic University 2007-2009.....	5
3H Framework – heart-, head- and hand-oriented factors on management analysis.....	7
The Case	9
Applying 3H Framework to analyse The Hong Kong Polytechnic University’s strategies in technology transfer in Year 2010 – 2012	9
Analysis and Discussions	10
H1. Heart-oriented leadership strategies supporting the University’s commitment to technology transfer	10
H2 Head-oriented effects on organisational structure and policies	12
H3 Hand-oriented operational strategies and procedures on facilitating technology transfer.....	15
An integrated view of the 3H domains.....	16
Limitations.....	19
Conclusion.....	20
References:	21

From Uphill to Downhill: Theorising the Technology Transfer Performance of The Hong Kong Polytechnic University with the 3H Framework

Introduction

Universities and other tertiary education establishments have a vital role in encouraging original research and innovation that benefit the industries and the wider community. Technology transfer has been adopted as the third mission of universities alongside teaching and research. Technology transfer between universities and industry is considered an essential driver of technological advancement, inventions, and the social economy. It fosters the commercialisation of discoveries and new knowledge with community partners (Bercovitz and Feldmann *et al.* 2006; Mowery and Nelson *et al.* 2004). Most universities in Hong Kong have set up their internal technology transfer unit to support faculty members in taking part in technology transfer.

The Hong Kong Polytechnic University is the second university in the city to set up the technology transfer unit. After ten years of establishment, its technology transfer system underwent significant reform in 2010 led by a new senior management structure. Before the reform, The Hong Kong Polytechnic University is one of the leading universities in Hong Kong in terms of technology transfer system and impact. However, the reform had brought the University's technology transfer performance downhill for several years. This article attempts to identify the critical factors of success and failure of the reform using the 3H Framework (Yu, 2020), from the perspective of leadership strategies, organisation architecture and operation practice. It also discusses the required conditions and resources to overcome or achieve the factors.

The impact of technology transfer to the society

Technology transfer is the dissemination and evolution of technology from the place of its research and invention to the markets around the world. This diffusion can occur through market transactions, strategic alliances, joint ventures, licensing or else (Grosse 1996). Technology transfer is an essential step in making good use of society's investment in universities. It is also the foundation of building up the new innovation and technology-driven economy. Riding on its competitive edge as an international financial hub, Hong Kong needs to develop an innovation and technology strategy to ensure its sustainable development. According to the World Economic Forum 2015-16 Global

Competitiveness Report, Hong Kong ranks a respectable No.7 in overall competitiveness but fares significantly lower in the metrics of innovative capacity and availability of scientists and engineers. Hong Kong's total spending on R&D is 0.73% of GDP, lower than that of Singapore's 2.1%, Korea's 4.2%, China's 2.1% (including 4% for Shenzhen and 6% for Beijing) and the OECD average of just over 2%. Several studies point out the positive impact of R&D investment on long-term economic growth (Tsui *et al.*, 2020).

A good eco-system of technology transfer can create and upgrade the career prospects of science, technology, engineering and mathematics graduates, which are traditionally considered less attractive than professions such as business and finance, let alone medicine and law. Technology transfer is also a channel to boost start-up activities. The eco-system of early-stage investments is yet to mature. Some success stories will help inject a sense of confidence into young people and nurture social attitudes and support towards entrepreneurship (Tsui *et al.*, 2020).

The functions of technology transfer units in universities

Universities and tertiary education institutions have an obligation to transfer their research outcome, innovations, and technologies into real business and daily life applications. Their stakeholders, including the commercial sector, industrial sector, and the governments, can use the knowledge to support economic development (Eric 2020, Brennenraedtset *et al.*, 2006; Sharifiet *et al.*, 2014; O'Reillyet *et al.*, 2019). Universities and institutions aim to foster the growth of entrepreneurship and economic development. They are increasingly proactively committed to the interactions with external parties to commercialise or implement their research results, which has been in general known as technology transfer, and are widely called their third mission (Huyghe *et al.*, 2014; Etzkowitz 2003; Rasmussen *et al.*, 2006).

There are two main technology transfer models in the world: European and American. According to the American model, technology transfer units operate outside universities. However, it is very important for European academic society to build up the trust between technology transfer officers and scientists, so European universities have technology transfer offices inside universities (Stankeviciene *et al.*, 2017). Typically, technology transfer units are within the universities in Hong Kong.

The technology transfer unit is the central support unit for fostering technology and knowledge transfer in its institution. This unit forges connections and collaborations between the institution and

the wider community (Coupe *et al.*, 2003). Internally, the technology transfer unit supports academics and applied research centres and advises them on developing intellectual property and research with widespread applications, patent registration and promotion. Externally, it reaches out to potential partners to initiate technology transfer collaborations and commercialisation of research and development projects. The technology transfer's activities create new parameters on the criteria of expertise in the fields of technology development and innovation, improving the efficient allocation of resources and incentives, acting as the innovation promoters of a nation or region (Beltran-morales, 2020).

The unit plays a crucial role in reinforcing the institution's technology transfer activities. The unit strikes the right balance between having sufficient understanding of the technology and providing the complementary expertise to develop it commercially (Huyghe *et al.*, 2014). It establishes a solid infrastructure for developing, protecting, and licensing intellectual properties, cultivating outside recognition of research efforts, and, ultimately, helping to forge a new technology transfer culture in the community.

Performance indicators for technology transfer

The performance results of technology transfer indicate efforts, competences and experience on the self-motivation of the universities' academics to push them to work closely with industry (Stankeviciene *et al.*, 2009). Integrating several studies, the standard indicator to measure universities' performance for technology transfer should consider: the amount of resources allocated by partners to collaboration and contract works; the number of international patents; the number of company innovations resulting from commercial licensing and collaboration with the university; establishment of strategic university-business cooperation and partnerships; services for industry and also realising intellectual properties, expertise and knowledge (Albats, *et al.*, 2018; Bigliardi *et al.*, 2015; Stankeviciene *et al.*, 2017, 2019;).

As my empirical studies, the key performance indicators of universities in Hong Kong can commonly be classified as internal driven and external driven. Internal driven key performance indicators are those solely depend on the effort, competence and resources of the universities or institutions internally. Externally driven indicators depend on external variables, such as economic atmosphere, major civil development, initiatives from the government direction and policies, etc.

Internal driven key performance indicators include the number of patents, the number of commercial licensing, income generated from intellectual property rights. External driven key performance indicators include industrial sponsorship on applied research, number of collaborative research projects.

Technology transfer in The Hong Kong Polytechnic University 2007-2009

The Hong Kong Polytechnic University was with the tradition ambitions industrial collaboration and applied research. Technology transfer was the vital strategic mission of the University, helping to improve the productivity and competitiveness of the industrial and professional sectors for high value-added development in Hong Kong and its nearby region.

The University set up the ISO9001 accredited consultancy arm, PolyU Technology & Consultancy Co. Ltd. (PTeC) and its product development division Rapid Product Development Syndicate (RAPRODS), which provided a platform for the industry to tap into the university's expertise and resources. In 2007-2008, PTeC and RAPRODS achieved a combined record turnover of over HK\$101 million with more than 700 consultancy projects and technologies licensed to industry, serving over 400 clients from government departments, private sectors and NGOs both locally and internationally. In 2008-2009, they kept a consistent performance that the turnover was over HK\$ 97 million with more than 700 projects, serving over 400 clients (Tracy Ng and Aileen Wong, 2010; Alexander Tang and Tracy Ng, 2009; Alexander Tzang and David Poon, 2008).

The Partnership Development Office (PDO) of the University managed patent applications for the whole University and actively promoted the importance of IPR protection. In 2007-2008, PDO processed 105 new applications for patent, trademark and design, and filed 89 patent applications, trademark and design for the academic staff members. The figure increased to 119 in 2008-2009. In Oct 2009, the University and EuAuto Technology Limited (EuAuto) jointly announced the official launch of their home-grown electric vehicle "mycar" in Hong Kong. mycar is the first Hong Kong-developed vehicle that fully complied with European standards and the first home-grown vehicle to hit the international market. With its body designed by internationally renowned Italian car designer Giorgetto Giugiaro, mycar had obtained the World Manufacturer Identification (WMI) Code earlier the year, and it went on sales in many European countries, including the United Kingdom, France, Italy, Austria and Denmark.

“In order to respond to the new trend and policies of low-carbon living, BMW, Fiat, and Volkswagen pressured differently and employed distinctive contrasting styles of innovation. The BMW i3 typified a transformative change-shaping approach to automotive innovation, the Fiat 500e typified a sustaining conservative approach, while the Volkswagen e-Golf assembled bumper-on-bumper alongside conventionally powered sibling model to keep a ceiling on costs” (Benjamin K. *et al.*, 2019; Hetzner, C *et al.*, 2016)

Far before these big names and the phenomenal Tesla stories, mycar has successfully met the roadworthiness requirements stipulated by the HKSAR Government’s Transport Department and had been granted the vehicle type approval as a private car. The consumer version of mycar could travel a distance of 112 kilometres on flat roads and can reach a maximum speed of over 60 kilometres per hour. It required nine to ten hours to be fully charged, which could be done from any regular household socket. The battery life expectancy is slightly more than three years (Rebecca 2009; PolyU Prese Release). Although it is incomparable to Model 3, i3, 500e and e-Golf today, mycar was a stage of art technology. More importantly, it is the one and only one Hong Kong developed vehicle.

Apart from exploring the frontier of electric vehicle technology, the University took part in many other civil engineering projects. In the same year, the Ministry of Railways in Beijing and the Beijing-Shanghai High-Speed Railway Corporation invited the University to utilise optical fibre-based sensing technology into the internationally acclaimed 350 kilometre per hour high-speed railway line. The University was the first research and development institution in Hong Kong involved in technological development projects in the High-Speed Railway system of the Chinese mainland. Cross-functional research teams were involved in application development, on-site installations, and testing of relevant technological systems on the Beijing-Shanghai railway; pre-service in-factory testing of high-speed trains; and rail instrument trains to elevate the safety standard of the high-speed rail system. Wei. *Et al.*, 2012; The Hong Kong Polytechnic University, 2010; 2011).

The University was also involved in the utilisation of smart sensing technologies in megastructure projects. In the Mainland China, their research team took part in China’s iconic megastructures, like the Guangzhou TV Tower, the Sutong Bridge crossing the Yangtze River, and the Shenzhen Stock Exchange towers. In Hong Kong, they were engaged in the structural health monitoring system of the Stonecutters Bridge and the Tsing Ma Bridge (Ni. *Et al.*, 2009).

In the interest of consumers, the University licensed a torque-free single yarn patent to four major global garment manufacturers. This technology enabled the fabrication of milky-soft cotton clothes, with minimal modification on the production lines while use of chemicals and water were massively reduced. Mill trials had been underway with top fashion brands like Ermenegildo Zegna and Loro Piana for introducing new product lines under single-yarns.

3H Framework – heart-, head- and hand-oriented factors on management analysis

Organisational model innovation can be efficient and wonderful as it is neither bounded by internal technical capability nor the new trend or creation of markets. It can upgrade the performance and deliverables of an organisation with the existing services or products generated by the existing resources to existing markets. Because of its “internal” nature, an organisation model change is not transparent to the outside world and is hard to copy. However, it is hard to assess and be systematic without a framework for review and identifying opportunities (Karan, *et al.*, 2014).

The 3H Framework is a tool to develop a holistic solution to manage people, organisational issues and national issues. The expressions of Heart-, Head- and Hand-domains are the core of the framework. It guides to use in the formation and implementation of any strategic plan. The organisational leaders can treat the 3H Framework as a guidebook to establish their holistic minds in initiating and executing their strategies effectively and efficiently, considering all three domains (Yu, 2021). The 3H Framework can be a tool to theorise management approaches and strategies with the nesting feature. It enables the consideration from layers of stakeholders, their relationships, both among the heart-head-hand levels and among stakeholders (Tan *et al.*, 2020), especially in a holistic measurement of an organisational change.

The 3H Framework synthesises the analysis of people and organisational performance for strategy review and prediction. It is essentially shorthand for engaging cognitive, psychomotor and affective knowledge advancement in an academic institution (Bloom *et al.*, 1964). The University Performance (UP), the dependent variable, is a function of the complements among the independent variables - Heart-domain (H1), the Head-domain (H2) and the Hand-domain (H3).

$$UP = f(H1 \cap H2 \cap H3)$$

where

UP = University Performance in Technology Transfer

$\cap$ = Complement to integrate and connect

H1 = Heart-domain (emotional appeal, leading, impact to the wider community, motivation and commitment created among people)

H2 = Head-domain (organisational structure, policies, planning, resource and responsibility allocations, logical and strategic appeal)

H3 = Hand-domain (operational strategies, procedures, competence appeal)

H1 reflects the level of inspirational leadership in an organisation. The crucial feature of H1 is the use of coercing and authorization to influence people's beliefs and feelings from the deep mind of thinking. In an academic institution, H1 is the affective domain about the commitment to advance the academic study to create new value to the world. An outstanding H1 approach is meaningful to the organisation's people and can be build up the shared value among the organisation to energize enthusiastic followers. Inspirational leaders sour people to interpret the meaning of their work in line with the organisational vision and change their way in interacting with each other. (Sipos, *et al*, 2008; Nicholls, *et al*, 1994)

H2 describes the strategies the organisation takes to create an effective organisational structure. It is an cognitive domain of engagement, in where the key elements compose of path-finding (finding the best way), policy and system building. H2 is specific to the nominal head of the organisation, such as the department heads who are responsible for particular subsets of the organisation. They use their H2 approach to ensure the effectiveness of their overseeing units in doing the right things, i.e. the things along the as same as the H1 (Nicholls, *et al*, 1994). In an organisational change, the H2 layer also consider the ways to maintain the inter-sub-unit connection, the time to implement the change, the strategies to tackle people being weary and losing the momentum (Michels, *et al*, 2021).

H3 is about the competence and hands-on supervisory leadership to ensure the daily operation, functional strategies and practices of an organisation. It is also about the capability for an organisation to tackle a particular situation in the operation level (Nicholls, *et al*, 1994; Yu, 2021).

In accordance with the project's scale and nature, the weights of H1, H2 and H3 vary. In this case of analysis, H1 and H2 are the dominating factors. H1 weighs relatively heavier than H2. It is because the main changes of the strategies, in this case, appeared at the organisational direction and system levels. The changes resulted from the restructure in senior management that the new strategies originated at the newly defined organisational direction in technology transfer.

The Case

By 2009/10, the University was showing the momentum of continued growth in technology transfer. The number of patents, number of commercial licensing, income generated from intellectual property rights were demonstrating a trend of increase. Apart from the quantitative measures, there were also amazing university-industry collaboration stories. In a ceremony in October 2009, the then US Secretary of Commerce Mr Gary Locke remarked, "... We are really creating these win-win scenarios with the technologies pioneered here in Hong Kong, and some of the great researchers in PolyU (The Hong Kong Polytechnic University), and... we are creating jobs for the people here in China, and creating jobs for people in the America...". The university staff were committed to transferring their inventions into business by licensing and forming offshoring like joint ventures, spin-offs, and technology-associated companies, etc.

In January 2009, the University welcomed the new President Professor Timothy W. Tong, who later introduced a new senior management structure together with redefined roles and responsibilities for various key posts. The University appointed five new faces at the vice-president level. Before the year, there were only four vice-president posts. The impact created to the technology transfer system was that it converted from a single line of reporting to a divided setting. (The Hong Kong Polytechnic University, Nov 2009). The technology transfer processes were divided into upstream and downstream, among which is the point to invention development. These also resulted in twin technology transfer units and a complicated administration system in the University.

A new direction of technology transfer came along with the new senior management. After assuming duty, the then Executive Vice President Mr Nicholas Yang Wei-hsiung introduced the "do well, do good" concept of technology transfer. It was also from his initiation in his previous post of Chief Executive Officer in the Hong Kong Cyberport Management Company Limited. This new direction was interpreted as a derivation from the conventional ambition of creating a university-industry win-win situation with applied research and research-based innovations.

Applying 3H Framework to analyse The Hong Kong Polytechnic University's strategies in technology transfer in Year 2010 – 2012

Considerations and responses under the 3H Framework

H1. Heart: impact-driven leadership strategies

- Leaders believe a heart-to-heart strategy is for the long term good of the university

- Leaders appreciate technology transfer
- Leaders believe in the win-win situation in a university-industries relationship
- Leaders communicate and render appreciation and belief to staffs and partners

H2. Head: organisation-wide planning and policies

- An efficient organisational structure is essential to support technology transfer in the university
- The establishment of a new structure should well consider the concern and balance the interests of various stakeholders
- An effective translation and communication about new policies across different levels of the university is a necessary management

H3. Hand: operational strategies and procedures

- Individual units' understanding of their duties are important for efficient strategy implementation
- Clear communications are critical for the implementation of new practices and procedures

3H Integration

- Holistic management of people and organisation requires the proper integration of all 3H domains
- Effective communication within and between each domain is critical for the success of an organisational reform

Analysis and Discussions

The 3H Framework is a holistic solution to model and analyses the management and strategies from the views of leadership strategies, organisational structure and operational environment. The Heart-oriented perspective is the reason why the University is committed to technology transfer. The Head-oriented perspective is the organisational structure and policies to facilitate and foster technology transfer activities in the University. The Hand-oriented perspective is about the operational strategies of the technology transfer units and research teams in the University.

H1. Heart-oriented leadership strategies supporting the University's commitment to technology transfer

Before 2010, the University's top management dictated the technology transfer direction to positively impact people's lives and industries. The University transfer their applied research to bring novel

products and services to the market with university inventions, upgrade the industrial standards with research-based knowledge, and build up the University-Industry relationship.

This was a heart-to-heart strategy that the staff in the University could imagine and often see the realisation of their innovation in the form of creative, practical business application; meanwhile, the industries treasured the knowledge inputs from the academic side. This admiration was illustrated in the form of financial investment. In the year 2009, the University received research sponsorship of over HK\$ 2 million from the commercial section, which contributed 62% of the total non-government income generated by the University (Tracy Ng and Aileen Wong, 2010). At the same time, the realisation of innovation was well respect among the society. Solely the mycar stories received coverage of over a hundred media coverages world-wide.

In 2010, the direction of technology transfer changed with the new structure of the University's top management. By the time the University introduced the new senior management position of Executive Vice President. Mr Nicholas Yang Wei-hsiung was appointed to take up this new position. In mid-2011, he introduced the new direction of technology transfer by then, "Do well, do good". Unlike the previous direction of directly benefiting people's daily lives and industries, the new one is more likely an entrepreneurship spirit. By that time, stakeholders had the feeling that the University's leaders narrowed down the technology transfer focus to be on developing their startup community.

Yang: Unlike the general interpretation of "entrepreneurship" which brings merely monetary value out of innovation, we hope to cultivate "Do-well and Do-good" entrepreneurship culture among the younger generation, and nurture them to become socially responsible entrepreneurs and leaders of tomorrow... (Yang's speech on 24 October 2011)

Yang: Since 2011, The Hong Kong Polytechnic University has been committed to fostering the development of innovation industries in Hong Kong. We are delegated to train our young entrepreneurs with the "Do well, do good" entrepreneurship spirit... (Yang's speech on 19 April 2013)

Firms that follow the "do well do good" proposition have the corporate social responsibility to achieve a particular more significant social impact than the financial bottom line and can do so without a

financial sacrifice. They comprehensively understand the proposition that corporate virtue delivers financial reward (Karnani A. *et al.*, 2011).

“Doing well” means a person is content, in good health, or successful. “Doing good” means an individual is performing good acts in the world. To many successful entrepreneurs, the phrases are now interchangeable. (Youth Entrepreneur Council, 2013). In business, there is not a strict dichotomy between doing well and doing good; it is not an either-or proposition. Instead, social good and profitability are among the criteria by which companies make choices. In reality, any company is better off creating both bottom-line and societal benefits – and creating synergies between them. (Rosabeth M. Kanter, 2010).

Nowadays, our general understanding and appreciation of “Do well, do good” is more comprehensive. However, back to the situation in Hong Kong in 2010, not many of the society leaders were talking about entrepreneurship development and social innovation. The majority’s impression about the slogan is on “doing a business well”, but there was not a well-seen link to “doing good to the community”. There were many debates that “do well” and “do good” conflict (Karnani A. *et al.*, 2011). People also interpreted that incubating startups was a vice-verso to building up the University-Industries relationship, which was the mainstream belief of University researchers, government officials and industry leaders.

The University’s senior management also lack effective strategies in explaining and disseminating the concept and prospect of their new direction of technology transfer. Such a failure in engaging internal staff and external stakeholders in the change were significantly reflected in the University’s technology transfer performance. In year 2010, the University generated an income of HK\$6.9 million from the transfer of their intellectual property right (The Hong Kong Polytechnic University 2011). The figure dropped substantially to HK\$5 million in 2011 (The Hong Kong Polytechnic University 2012) and HK\$2.3 million in 2012 (The Hong Kong Polytechnic University 2013).

H2 Head-oriented effects on organisational structure and policies

Until 2010, the Institute for Enterprise was the sole unit that carried out technology transfer functions at The Hong Kong Polytechnic University. The Institute for Enterprise was with three subsidiary units: the Partnership Development office, the Innovation Technology Research Syndicate, and the Management and Executive Development Center. They supported university researchers in all

technology transfer activities, including funding application, contract research, patent registration, consultation projects, promotion and commercialisation. These units were under the leadership of the Vice-President (Partnership Development).

After the restructure of senior management, the main driver of the University's technology transfer was divided into two units overseeing by two management. The new Provost and Deputy President oversaw the upstream technology transfer, covering funding, applied research and patent registration. The Executive Vice President oversaw the downstream technology transfer, which was about consultation projects, promotion and commercialisation, after developing inventions.

This restructuring was such a massive change that the interests of various stakeholders had to be considered. It took nearly two years for the University to settle its new structure of technology transfer. Reporting to the Executive Vice President, the Institute for Enterprise was renamed to Institute for Entrepreneurship to conduct the traditional downstream technology transfer plus the new mission of fostering entrepreneurship development. In the meanwhile, two senior executives at the director grade left the University. On the other hand, the Provost and Deputy President established a new technology transfer unit, called the Innovation and Technology Development Office, from the academic development and applied research perspectives.

The establishment of the new structure was not only time-consuming, but it also faced extensive resistance on resource allocation. There were three major sources of funding supporting technology transfer activities in local universities: (1) the knowledge transfer earmarked grant from the HKSAR University Grants Committee, (2) the annual grant from the HKSAR Innovation and Technology Transfer Fund, and (3) the universities' self-financed income generated from the commercialisation of intellectual property rights. It took a long debate to decide the splitting of the funding into two units instead of the previous on-stop shop.

On the internal policy side, The Hong Kong Polytechnic University accepted the recommendation from a review of the Corruption Prevention Division of the HKSAR Independent Commission Against Corruption to strengthen its management of joint venture projects. (The Hong Kong Polytechnic University 2011) Besides, an independent review panel chaired by the Hong Kong Council for Accreditation of Academic and Vocational Qualifications furnished the University with a report on establishing exiting strategies, strengthening the thorough business plans and budget forecasts on subsidiaries, associates and jointly controlled entities (Jeffie Lam and Stuart Lau, 2016).

The report also recommended the University shutting down offshore companies. Both internal and industry partners interpreted that the University would step back from commercialising intellectual property rights and discourage related activities.

The scope of operation of the technology transfer units changed before and after the reform. To describe it with the Abell's Matrix, we modify Abell's third question from "What technologies are employed to meet the needs of customers by an organisation?" to "What administration systems are established to meet the needs of the customers?" (DF Abell, 2006; M. Luenendonk, 2019).

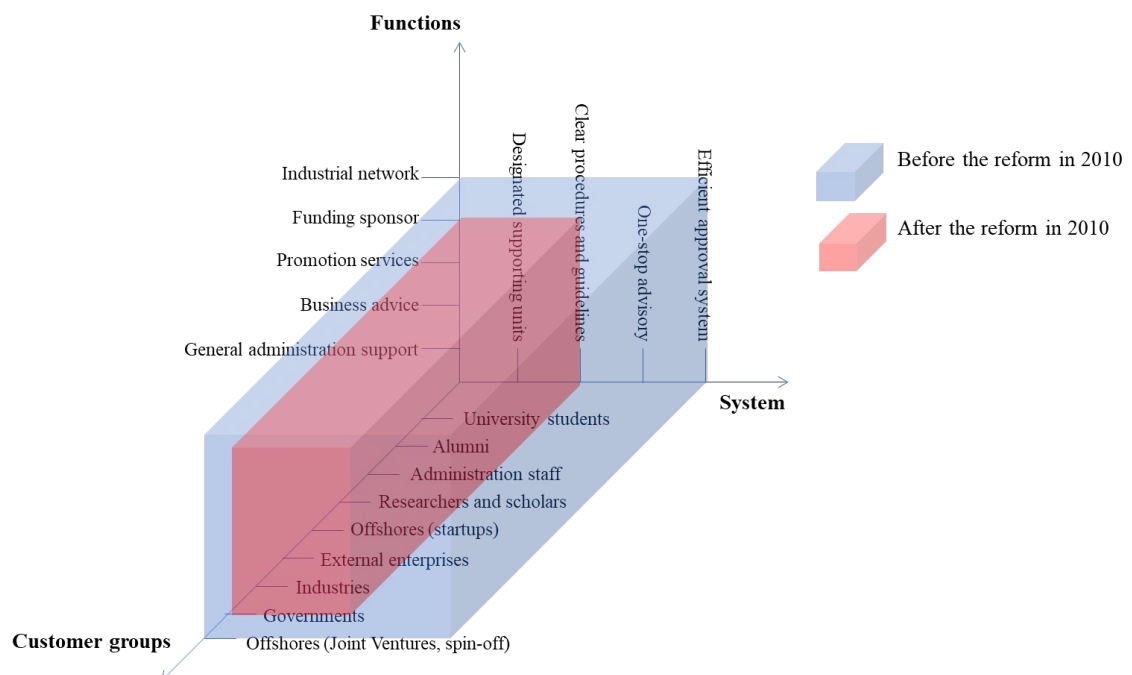


Figure 1. Illustration of the changes in scope of operation of the technology transfer units with the Derek Abell – Business Definition Matrix

In the Function axis, the functions of technology transfer units covered similar support to their customers before and after the reform in 2010. However, the loss of two directors, including the Director of Partnership Development, without replacement had weakened the support in the industrial network. Meanwhile, the customer groups were reduced. At least, joint ventures and spin-off companies were no longer supported from the policy view of the University. If we consider the interpretation of the customers, the axis could be further shortened to offshore (startups). On the administration system side, the University were no longer providing one-stop services to their customer groups while the approval system became complicated.

The above analysis indicates that The Hong Kong Polytechnic University management complicated the organisation structure of technology transfer. External factors were forcing them to change the technology transfer policies. Unfortunately, the time-consuming processes, involvement of massive parties, and failure in explaining the meaning of the changes converted an unfavored message to their stakeholders. This process also damaged the harmony and communications among the units in the University.

H3 Hand-oriented operational strategies and procedures on facilitating technology transfer

The execution of technology transfer activities was the most and the least affected domain. The competence related factors for the University to conduct technology transfer were not affected. The H1 and H2 impacts were not affecting the academic, research and development works, which was the foundation for all technology transfer possibilities. The University did not dissolve the Institute for Enterprise during the structural reform. The supports to aid researchers in taking up technology transfer tasks did not stop. The set-up of the Innovation and Technology Development Office even increased the number of technology transfer supporting staff.

There was no significant change on the practice side. The life-cycle of technology transfer was still unchanged that (1) conducting research and development on new inventions, (2) filing patents to protect the intellectual properties, (3) evaluating the commercial value of inventions, (4) marketing and licensing, and then (5) generating new resources for new research.

However, the technology transfer unit was divided from a one-stop-shop into two stages under two reporting lines. Previously, internal researchers and external partners from industries had to contact one unit to kick-off and finish a technology transfer project. Since the start of the structure reform, they had to identify which of the two technology transfer units they should approach. Even the staff in the units were uncertain about the boundary in between. Such a situation delayed every procedure along the process of technology transfer.

“In pursuit of knowledge transfer and entrepreneurship, the Institute for Entrepreneurship was established to serve as an important platform to forge closer links between academics and business for their mutual benefits...”, stated the web page of the Institute for Entrepreneurship (PolyU IfE, 2021).

“Innovation and Technology Development Office, serves to set up and nurture the platforms to boost high-impact research through both individual efforts as well as in collaboration with other parties including universities, industry, government and the like locally and internationally...”, stated the web page of the Innovation and Technology Development Office (PolyU ITDO, 2021).

Both units defined their key responsibilities were to encourage university-industry collaboration. However, there was no identifications of the differences among the units. Their duties were considered as overlapping by both internal staff and external partners. This results in the exploration of another restructure after a few years, which is out of the focus of this article.

Competence of the faculty members – in terms of university ranking, number of staff

An integrated view of the 3H domains

Although The Hong Kong Polytechnic University was the second university in Hong Kong to establish the technology transfer units, their corresponding modes and models had to undergo continuous reviews. From the 3H domain analysis, the University’s reform driven by the new management in 2010 was unsuccessful, at least in the short term.

Firstly, the new management pushed a new heart approach but failed to illustrate the actual value behind it. Stakeholders misinterpreted that the management’s direction changed from impacting the industries and society to single small companies. The University had to pay extra effort to manipulate the new direction and re-build the connection with industries.

“We changed the marketing team to industrial network team in 2014, with the new strategic focus of industrial relationship building”, said the head of the team in the Institute for Entrepreneurship.

Secondly, the new organisation architecture was more complicated. The division of labour was not significantly more effective and efficient than before. There was a lack of strategic planning to render the meaning of the change to the parties involved. Stakeholders wondered about the changes’ necessities, especially when there were no significant corresponding changes in the Hand-domain to improve their user experience.

Thirdly, the University was forced to change the policies on offshoring companies. This mediating effect can be critical for a structural changing organisation, focusing on the crucial internal factors to support the smooth transition towards the new system (Kumar *et al.* 2021).

Effective communication is critically important when the heart approach is forward-looking. The “do well, do good” concept is now widely accepted and even adopted in the technology transfer ecosystem. All the eight University Grant Committee-funded universities in Hong Kong gradually started their own entrepreneurship centres or entrepreneurship development units to foster technology transfer by nurturing its start-up business ventures. The Hong Kong government also launched various seed fund and incubation schemes, for instance, the Technology Start-up Support Scheme for Universities under the Innovation and Technology Commission in 2014 (Innovation and Technology Fund, 2020) and the Social Innovation and Entrepreneurship Fund in 2013 (HKSAR, 2020). The new Heart domain initiatives of The Hong Kong Polytechnic University in 2010 was in a more extended term good for the University and its technology transfer. The startups originated from this approach also advanced the development of new economies that benefit both the University and industries. Unfortunately, the University paid time and effort.

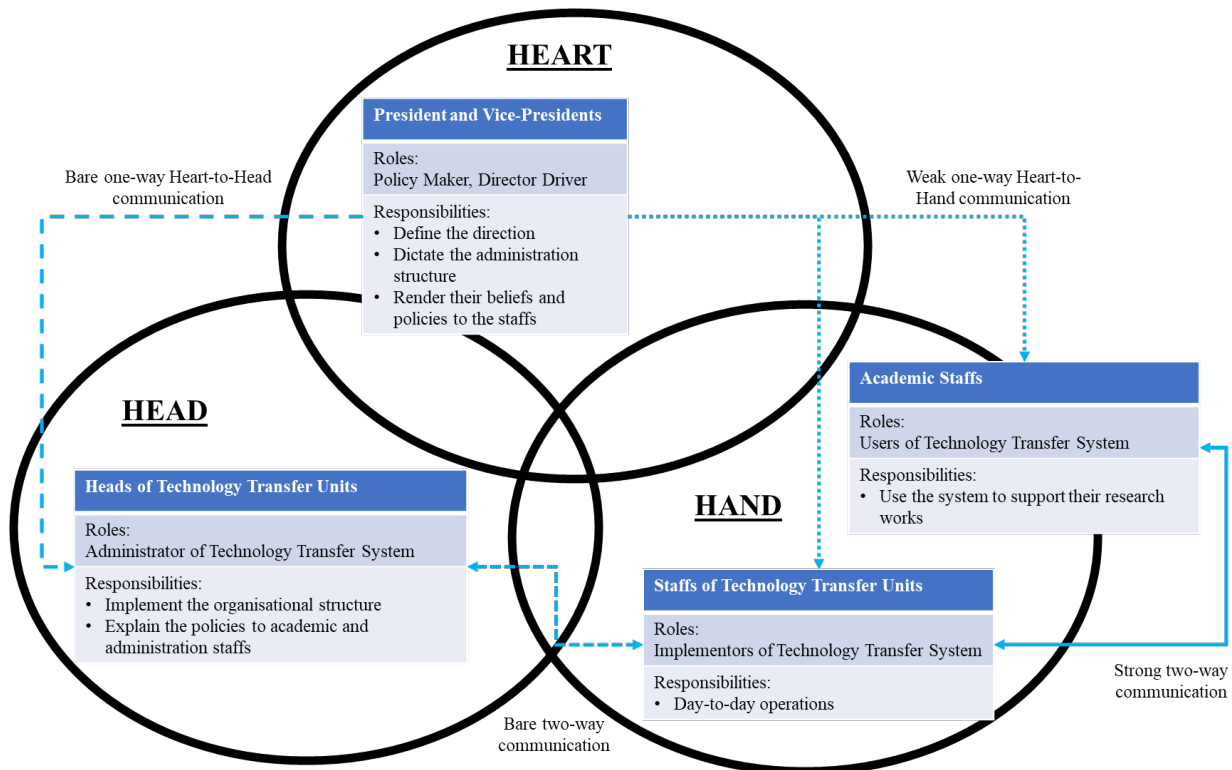


Figure 2. Illustration of the units of analysis with the 3H Framework

Technology transfer is an organisation-wide performance in the University. The organisational leaders launched a new direction of technology transfer, which was not clearly understood by its staff and partners. Even the heads of technology transfer units, as the administrators, did not fully receive the concept behind it. They could hardly implement and explain the new direction to colleagues. The failure in both heart- and head-domains was vital to the breakdown of the technology transfer performance.

The technology transfer staff and academic staff continued to carry out the routine practice parallel to the gradual adoption of the new system and direction. The hand layer was still delivering the basic performance of technology transfer in the University. However, there was no synergy created among the university management, department heads, researchers and administrative staff. The levels of communication illustrated in the diagram explained the reasons for the weak inter-domains correlations.

The 3H Framework viewed this case as the University were neither committed to nor well-planned their technology transfer during the period. Fortunately, the Hand-domain still performed to maintain some essential deliverables. The negative impact was reflected on the researchers' output in technology transfer activities. In 2010, the University ran over twenty spin-off companies. The figures reduced to five in 2011 and 2012. During the period, the number of patents filed reduced from 76 to 42. During the period, the GDP grew from USD214 billion to USD 262 billion in Hong Kong when USD5.1 trillion to USD 8.5 trillion in China.

Other local universities also changed their technology transfer structure over the years. In 2014, the Chinese University of Hong Kong dissolved its Knowledge Transfer Office and reformed the Research Administration Office to the Office of Research and Knowledge Transfer Services. The restructuring process, which streamlined the technology transfer activities under one unit, was the opposite to The Hong Kong Polytechnic University. The Chinese University of Hong Kong kept a similar mission of technology transfer in the reform to strengthen their commitment to the community and economic development with excellent research results. The University's number of patents filed had a drop from 166 patents in 2013/14 to 125 patents in 2014/15, but the income generated from intellectual property rights increase from HK\$42 million to HK\$84 million. The figures in 2015/16 maintained in the similar level of 2013/14 (The Chinese University of Hong Kong, 2014, 2015, 2016). Therefore a holistic plan of organisational management, which avoid creating internal conflict, can eliminate the negative impact of an organisational structure reform.

We also observed that communication plays a critical role in management strategies. We saw the university leaders appreciated technology transfer and tried to launch a new architecture and a direction for advancement. They intended to do something good but failed to achieve it. This indicates the importance of the assumption that effective communication is the key to make the management strategies successful. Effective communication is a factor to link up the 3H domains and create the intersection. That is the nesting feature.

In the case of The Hong Kong Polytechnic University, the reform significantly weakened the H1 factors. The intended improvements on H2 factors failed. The H3 competences retained, even improved in the view of the size of the labour. The University staff were uncommitted to the new technology transfer directions and modes but were capable of managing the routine system to continue technology transfer activities.

As Michels and David (2021, p. 67) describes:

Every company will have its own balance of factors that affect change power. But we've found that most fit a pattern corresponding to one of four common archetypes: In search of focus, stuck and skeptical, aligned but constrained, and struggling to keep up. Each archetype has its own symptoms and remedies.

The University was stuck and skeptical in the organisational change that staff were stuck where the new management direction originate; they felt disconnected with our units; and worried about the extra time taken to achieve the same level of recognition as in the previous system.

Limitations

Other factors affected the technology transfer performance besides the internal management direction, organisation structure and operation strategies. For instance, the “3+3+4” New Academic Structure reform in September 2012 consumed many resources and time of the University. Other internal factors, such as changes in performance review policies, might also reduce faculty members' commitment to technology transfer.

External economic factors are not comprehensively considered here in the analysis. To eliminate the external factors, the discussion and analysis of this article are mostly based on the internally driven performance indicators of the University.

Besides, the timeline is a factor affecting the analysis. In recent years, the “do well, do good” concept was more widely adopted. There was a hot wave of discussions and investments on startups adopting technology and innovations to create a positive social impact. The judgement on H1 and H2 can be different if we extend this study’s timeline, say to ten years.

Moreover, we discussed the performance of the three domains in the 3H Framework and evaluated any intersection in between. There is room for further study on the areas of intersection. That is the strength of the connection among the 3H layers.

As a course assignment, the timeline for the preparation of this article does not allow an ethical review of the research methodology. The data sources of this article are public and internal annual reports of the University, news reports, press releases, and third-party reports. The analysis is an empirical analysis of case research.

Conclusion

More than even before, organisations in both commercial and public sectors are facing the challenge in boosting their capacity in tackling internal and external changes. The first step is to measure, understand and review how an organisation performed in previous changes (Michels *et al*, 2021). With the 3H Framework, this report analyses the performance of The Hong Kong Polytechnic University in technology transfer because of a senior management restructure in 2010. The University established its technology transfer unit in the year 2000. It was committed to applied research and had already delivered many impactful and remarkable technology transfer projects by 2010. However, the reform in 2010 could not be classified as a good one. Our 3H Framework analysis shows that the University demonstrated unpleasant performance in both the heart- and the head-domains. Firstly, the new management over-estimate the wide acceptance of the new direction. They lacked a strategic communication plan to motivate staffs’ and partners’ commitment. Secondly, the change in organisation architecture took time, but the effects were not significant. The good performance in the Hand-domain lacked synthesis with the upper layers. The 3H Framework analyses and explains the situation that a forward-looking vision and competence cannot be the sole factors to make an organisation successful. There has to be a holistic plan to get people motivated and committed within and outside the organisation’s structure. Effective communication strategies and a streamlined operation structure with a balance of interests of various parties are critical for organisational reform to be successful.

References:

- Albats, Ekaterina, Fiegenbaum, Irina & Cunningham, James A, 2018. *A micro level study of university industry collaborative lifecycle key performance indicators*. The Journal of technology transfer, 43(2), pp.389–431.
- Alexander Tsang, David Poon, 2008, "*The Hong Kong Polytechnic University Annual Report 2007-08 Celerbrating 70 Years of Professional Education*", <https://www.polyu.edu.hk/cpa/AnnReport/ar0708/>
- Alexander Tzang, Tracy Ng, Aileen Wong, 2009, "*The Hong Kong Polytechnic University Annual Report 2008-09 Prime for the Future*", <https://www.polyu.edu.hk/cpa/AnnReport/ar0809/full.html>
- Beltran-Morales, L., Almendarez-Hernández, M.A., Flores-Delgado, V., Trejo-Berumen, K., Lagunas-Vázquez, M. And Ortega-Rubio, A., 2020. *Technology Transfer Offices As Promoters Of Technology, Innovation And Regional Development In Mexico*. International Journal Of Innovation, 8(1), Pp. 121-136.
- Benjamin K. Sovacool, Jan-Christoph Rogge, Claudio Saleta, Edward Masterson-Cox, *Transformative versus conservative automotive innovation styles: Contrasting the electric vehicle manufacturing strategies for the BMW i3 and Fiat 500e*, Environmental Innovation and Societal Transitions, Volume 33, 2019, Pages 45-60
- Bercovitz, J., & Feldmann, M. (2006). *Entrepreneurial universities and technology transfer: A conceptual framework for understanding knowledge-based economic development*. The Journal of Technology Transfer, 31(2), 175–188.
- Bigliardi, B., Galati, F., Marolla, G., & Verbano, C. (2015). *Factors affecting technology transfer offices' performance in the Italian food context*. *Technology Analysis & Strategic Management*, 27(4), 361-384.
- Bloom, B.S., Masia, B.B. and Krathwohl, D.R. (1964), *Taxonomy of Educational Objectives (Two Volumes: The Affective Domain & The Cognitive Domain)*, David McKay & Co., New York, NY.

Brennenraedts, R., Bekkers, R. and Verspagen, B. (2006), *The Different Channels of University-Industry Knowledge Transfer: Empirical Evidence from Biomedical Engineering*, Eindhoven Centre for Innovation Studies, Eindhoven.

Cheng, E.C.K. (2021), *Knowledge transfer strategies and practices for higher education institutions*, VINE Journal of Information and Knowledge Management Systems, Vol. 51 No. 2, pp. 288-301.
<https://doi.org/10.1108/VJIKMS-11-2019-0184>

Coupé, T. *Science Is Golden: Academic R&D and University Patents*. *The Journal of Technology Transfer* 28, 31–46 (2003). <https://doi-org.ezproxy.uwtsd.ac.uk/10.1023/A:1021626702728>

Derek F. Abell, 2006, “*The future of strategy is leadership*”, *Journal of Business Research*, Volume 59, Issue 3, Pages 310-314,

Etzkowitz, H. (2003). *Research groups as ‘quasi-firms’: The invention of the entrepreneurial university*. *Research Policy*, 32(1), 109–121.

Grosse, Robert. “*International Technology Transfer in Services*.” *Journal of International Business Studies*, vol. 27, no. 4, 1996, pp. 781–800. JSTOR, www.jstor.org/stable/155512. Accessed 30 June 2021.

Hetzner, C., 2016. *VW: Next e-Golf will match BMW i3's range: U.S. is biggest market for face-lifted hatchback*. *Automotive News*, 90(6727), pp. 4.

HKSAR The Hong Kong Special Administrative Region of the People’s Republic of China, “*The Chief Executive’s 2020 Policy Address - Striving Ahead with Renewed Perseverance*”, Chapter V of the Supplement, Unlimited Business Opportunities, pp. 56,
https://www.policyaddress.gov.hk/2020/eng/pdf/supplement_5.pdf

Huyghe, Annelore. (n.d.). *Technology transfer offices as boundary spanners in the pre-spin-off process: the case of a hybrid model*. *Small Business Economics*, 43(2), 289–308.
<https://doi.org/10.1007/s11187-013-9537-1>

Innovation and Technology Fund, 2020, “*Technology Start-up Support Scheme for Universities*”, HKSAR Innovation and Technology Commission, view on 18 Jul 2021, <https://www.itf.gov.hk/l-eng/TSSSU.asp>

Jeffie Lam and Stuart Lau, 2016, “*Hong Kong Polytechnic University move to set up two offshore firms ‘contravened guidelines of institution and funding body’*”, South China Morning Post, <https://www.scmp.com/news/hong-kong/politics/article/1938265/hong-kong-polytechnic-university-move-set-two-offshore-firms>

Karan Girotra & Serguei Netessine, 2014. *Four Paths to Business Model Innovation*. Harvard business review, 92(7,8), p.97.

Karnani A. “*Doing Well by Doing Good*”: *The Grand Illusion*. California Management Review. 2011;53(2):69-86. doi:10.1525/cmr.2011.53.2.69

Kumar, Saurabh & Bhatia, Manjot Singh, 2021. *Environmental dynamism, industry 4.0 and performance: Mediating role of organisational and technological factors*. Industrial marketing management, 95, pp.54–64.

Lap-chee Tsui, Rita Lun, Edwin Cheung, “*The Eco-system of Innovation and Technology in Hong Kong*”, Our Hong Kong Foundation, 2020

Martin Luenendonk, 2019. “*Strategic Framework: Abell’s Framework for Strategic Planning*”, Cleverism, <https://www.cleverism.com/abells-framework-for-strategic-planning/>

Michels, David, 2021. *How Good Is Your Company at Change?* Harvard Business Review, 99(4), pp.62–72.

Mowery, D. C., & Nelson, R. R. (2004). *Ivory tower and industrial innovation*. Palo Alto: Stanford University Press.

Ni, Y.Q., Xia, Y., Liao, W.Y. and Ko, J.M. (2009), *Technology innovation in developing the structural health monitoring system for Guangzhou New TV Tower*. *Struct. Control Health Monit.*, 16: 73-98. <https://doi.org/10.1002/stc.303>

Nicholls, John. “*The 'heart, head and hands' of transforming leadership*”, Leadership & Organization Development Journal; Bradford Vol. 15, Iss. 6, (1994)

O'Reilly, N., Robbins, P. and Scanlan, J. (2019), “*Dynamic capabilities and the entrepreneurial university: a perspective on the knowledge transfer capabilities of universities*”, Journal of Small Business and Entrepreneurship, Vol. 31 No. 3, pp. 243-263.

PolyU IfE, 2021, *University-Industry Collaboration*. Available at: https://www.polyu.edu.hk/ife/corp/en/about_us/overview.php (Accessed: 30 June 2021)

PolyU ITDO, 2021, *PolyU Innovation and Technology*. Available at <https://www.polyu.edu.hk/itdo/en/rolesofitdo.php> (Accessed: 30 June 2021)

Rasmussen, E., Moen, O., & Gulbrandsen, M. (2006). *Initiatives to promote commercialisation of university knowledge*. Technovation, 26(4), 518–533.

Rebecca Tsui, 2009, “*Hong Kong-developed electric car is poised to hit city roads*”, South China Morning Post, viewed on 1 July 2021, <https://www.scmp.com/article/695857/hong-kong-developed-electric-car-poised-hit-city-roads>

Rosabeth Moss Kanter, 2010, “*How to Do Well and Do Good*”, MIT Sloan Management Review, Magazine Fall 2020, Big Idea: Leading Sustainable Organisations, <https://sloanreview.mit.edu/article/how-to-do-well-and-do-good/>

Sharifi, H., Liu, W. and Ismail, H.S. (2014), “*Higher education system and the ‘open’ knowledge transfer: a view from perception of senior managers at university knowledge transfer offices*”, Studies in Higher Education, Vol. 39 No. 10, pp. 1860-1884.

Sipos, Y., Battisti, B. And Grimm, K., 2008. *Achieving transformative sustainability learning: engaging head, hands and heart*. International Journal of Sustainability in Higher Education, 9(1), pp. 68-86.

Stankevičienė, J., Maditinos, D.I. And Kraujalienė, L., 2019. *Multimoora As The Instrument To Evaluate The Technology Transfer Process In Higher Education Institutions*. Economics & Sociology, 12(2), pp. 345-360.

Stankevičienė, Jelena, Kraujalienė, Lidija & Vaiciukevičiūtė, Agnė 2017. *Assessment of technology transfer office performance for value creation in higher education institutions*. Journal of business economics and management, 18(6), pp.1063–1081.

Stankevičienė, Jelena, Maditinos, Dimitrios I & Kraujalienė, Lidija, 2019. *MULTIMOORA as the instrument to evaluate the technology transfer process in higher education institutions*. Economics & sociology, 12(2), pp.345–360.

Stankevičienė, Jelena. (n.d.). *Assessment of technology transfer office performance for value creation in higher education institutions*. Journal of Business Economics & Management, 18(6), 1063–1082.
<https://doi.org/10.3846/16111699.2017.1405841>

Tan, D.Y., Tay, E.G., Teo, K.M. et al. *Hands, Head and Heart (3H) framework for curriculum review: emergence and nesting phenomena*. Educ Stud Math 106, 189–210 (2021).
<https://doi.org/10.1007/s10649-020-10003-2>

The Chinese University of Hong Kong, 2014, “*Transforming and Connecting – Annual Report on Recurrent Funding for Knowledge Transfer 1 July 2013 – 30 June 2014*”,
<https://www.ugc.edu.hk/doc/eng/ugc/activity/kt/CUHK13.pdf>

The Chinese University of Hong Kong, 2015, “*Annual Report on Recurrent Funding for Knowledge Transfer 1 July 2014 – 30 June 2015*”, <https://www.ugc.edu.hk/doc/eng/ugc/activity/kt/CUHK14.pdf>

The Chinese University of Hong Kong, 2016, “*Annual Report on Recurrent Funding for Knowledge Transfer 2015-2016*”, <https://www.ugc.edu.hk/doc/eng/ugc/activity/kt/CUHK15.pdf>

The Hong Kong Polytechnic University, 2009, “*Home-grown electric vehicle mycar makes its first journey in Hong Kong*”, Press Release

The Hong Kong Polytechnic University, Nov 2009, "*New management personnel appointed*",
Excel@PolyU, Issue 05,
https://www.polyu.edu.hk/cpa/Excel@PolyU/past_issues/01/2009/200911/highlight.html

The Hong Kong Polytechnic University, 2010, "*Annual Report for FY 2009/10 on UGC Funding for Knowledge Transfer*", <https://www.ugc.edu.hk/doc/eng/ugc/activity/kt/PolyU09.pdf>

The Hong Kong Polytechnic University, 2011, "*Annual Report on Activities and Advancement of Knowledge Transfer Support by earmarked UGC Funding FY 2010/2011*",
<https://www.ugc.edu.hk/doc/eng/ugc/activity/kt/PolyU10.pdf>

The Hong Kong Polytechnic University, 2012, "*Annual Report on Activities and Advancement of Knowledge Transfer Support by earmarked UGC Funding FY 2011/2012*",
<https://www.ugc.edu.hk/doc/eng/ugc/activity/kt/PolyU11.pdf>

The Hong Kong Polytechnic University, 2013, "*Annual Report on Activities and Advancement of Knowledge Transfer Support by earmarked UGC Funding FY 2012/2013*",
<https://www.ugc.edu.hk/doc/eng/ugc/activity/kt/PolyU12.pdf>

Tracy Ng, Aileen Wong, 2010, "*The Hong Kong Polytechnic University Annual Report 2009/10 Building Our Future*", <https://www.polyu.edu.hk/cpa/AnnReport/ar0910/full.html>

Wei, Chuliang, Xin, Qin, Chung, W.H., Liu, S.Y., Tam, H.Y. And Ho, S.L., "*Real-Time Train Wheel Condition Monitoring By Fiber Bragg Grating Sensors*". International Journal Of Distributed Sensor Networks, Vol. 2012, pp.1-7 (2011 Aug) (Article ID 409048)

Youth Entrepreneur Council, 2013, "*Do Good and Do Well: 3 Life Lessons for Entrepreneurs*", Forbes, <https://www.forbes.com/sites/theyec/2013/05/02/do-good-and-do-well-3-life-lessons-for-entrepreneurs/?sh=35e4ddd87d5d>

Yu, E. (2021), "*An analysis of China's strategy in combating the coronavirus pandemic with the 3H framework*", Public Administration and Policy: An Asia-Pacific Journal, Vol. 24 No. 1, pp. 76-91.
<https://doi.org/10.1108/PAP-12-2020-0055>