



**Asia-Pacific
Economic Cooperation**

HKHPC
Hong Kong, China

How the Introduction of Intellectual Capital Management Inspired a Business Model in Hong Kong, China

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The case was developed with the cooperation of The Hong Kong Institute of High Performance Computing solely for educational purposes as a contribution to the project entitled “IPR Strategies for Emerging Enterprises – Capacity Building for Successful Entry to Global Supply Chain,” conducted under the auspices of the Asia-Pacific Economic Cooperation (APEC). The case is neither designed nor intended to illustrate the correct or incorrect management of the situation or issues contained in the case. Reproduction and duplication of this case for personal and educational use is encouraged. No part of this case however can be reproduced, stored, or used for purposes other than the above without the written permission of the author(s) and APEC.

Introduction

Intellectual Capital Management (ICM) is a set of simple management tools which allows enterprises to tap into reservoirs of knowledge and expertise that they already possess but may not be exploiting effectively. ICM also helps enterprises to appreciate competitive pressures from outside and identify their needs to improve knowledge and expertise.

The ICM process involves:

- Analyzing existing enterprise knowledge, recording it to the extent possible, and making it sharable within the enterprise. This would become the enterprise's 'intellectual capital';
- Identifying possible sources of revenue that could be extracted from existing intellectual capital and developing marketing plans for them; and
- Assessing risks involved in protecting the enterprise's intellectual assets and using an effective intellectual property strategy to minimize business risks.

The Intellectual Property Department (IPD) of The Government of Hong Kong Special Administrative Region launched an ICM Consultancy Programme in 2009 which provided free consultancy services to help organizations, especially Small and Medium Enterprises (SMEs), understand ICM and show them how to apply ICM tools to maximize their business potential and compete more effectively in the market.

The ICM Consultancy Programme aimed to encourage the participating enterprises to utilize their intellectual assets more effectively once they had a good grasp of the concept of ICM. Under the Programme, the ICM consultant met with the enterprise in two sessions (up to three hours per session) and went through the ICM process as outlined above. Although an Intellectual Capital (IC) Report was not obligatory, IPD strongly encouraged the enterprises to prepare their own IC Report for internal use or for sharing with their stakeholders.

The Hong Kong Institute of High Performance Computing

The Hong Kong Institute of High Performance Computing (HKHPC) is a knowledge-based enterprise founded in 2002 by Dr LAM Wai-kin. It was established to create a platform for enthusiastic researchers primarily in Hong Kong, to join various projects in the area of high performance computing (HPC), cluster computing and grid computing.

Enterprise Vision¹:

We contribute to the construction, maintenance and development of the knowledge-based infrastructure for the New Economy.

¹ The Hong Kong Institute of High Performance Computing, *Intellectual Capital Report*, May 2009.

Enterprise Mission:

We deliver quality services and promote effective use of HPC/Cluster/Grid resources.
 We assist enterprises to realize their potentials for strategic technology advancement.
 We forge partnerships to promote excellence in the region's ICT infrastructure.

As part of the strategy to support the technological advancement of the academic circle and raise the popularity of supercomputing for the general public, HKHPC carried out promotion, education and training activities.

The Catalytic Reaction of ICM

HKHPC joined the ICM Consultancy Programme in March 2009. Following the guidelines developed by the Director of Intellectual Property, IPD², HKHPC went through the following process.

- **Understanding the Source of Knowledge and the Enterprise's Operation**

HKHPC counted on professionals to create and maintain knowledge. One thing unique about HKHPC was that it functioned as a freely organized community where talented people formed teams according to their interests and capabilities. Team leaders were assigned on the basis of their mutual respect for each other. A committee led by the founder decided whether proposed projects should go ahead or be amended. Another unique culture was the research-oriented perspective of the team members. HKHPC was not operating primarily as a commercially viable enterprise, or running a business in the commercial market but as a research and education institute serving the academic circle in the community.

- **Introduction of ICM Concept**

The two ICM consultants provided a brief introduction of ICM to HKHPC during the first session of the Programme.³ Prior to their participation in the Programme, the people at HKHPC did not fully understand and appreciate the management of intangible assets which would create value. Dr LAM found the concept very applicable for HKHPC as these intangibles, particularly the human capital, were in fact the most valuable assets of the enterprise.

- **Stakeholders' Interaction**

HKHPC identified its stakeholders which included research institutes, universities, project team members, community/public, partners, and schools. The subsequent discussion of these identified stakeholders' expectations enhanced HKHPC's understanding of their needs.

- **Identification of IC Inventory**

² Intellectual Property Department, Government of Hong Kong Special Administrative Region, *Put Your Enterprise Knowledge To Work – A Guide to Intellectual Capital Management*, March 2009.

³ The consultancy service was provided by two ICM Consultants, Mr C K So and Mr Dominic Choi.

Human capital, structural capital and relational capital were the three common and universal classifications of ICM.

Table 1. Classification of Intellectual Capital

CATEGORY	MEANING	EXAMPLES
Human Capital	Valuable knowledge assets held in the heads of your staff and available for use to create wealth for the enterprise	<ul style="list-style-type: none"> • Professional competencies • Work experience • Motivation and behavior
Structural Capital	Systems and practices of your enterprise that add value and create wealth for the enterprise (“things that are still there when the staff go home for the night”)	<ul style="list-style-type: none"> • Quality control system • Financial control system • Training programs • Registered IP rights • Customer database • Brand
Relational Capital	Value-creating relationships	<ul style="list-style-type: none"> • Relationship with customers • Relationship with suppliers • Convenience of retail outlets • Relationship with regulators

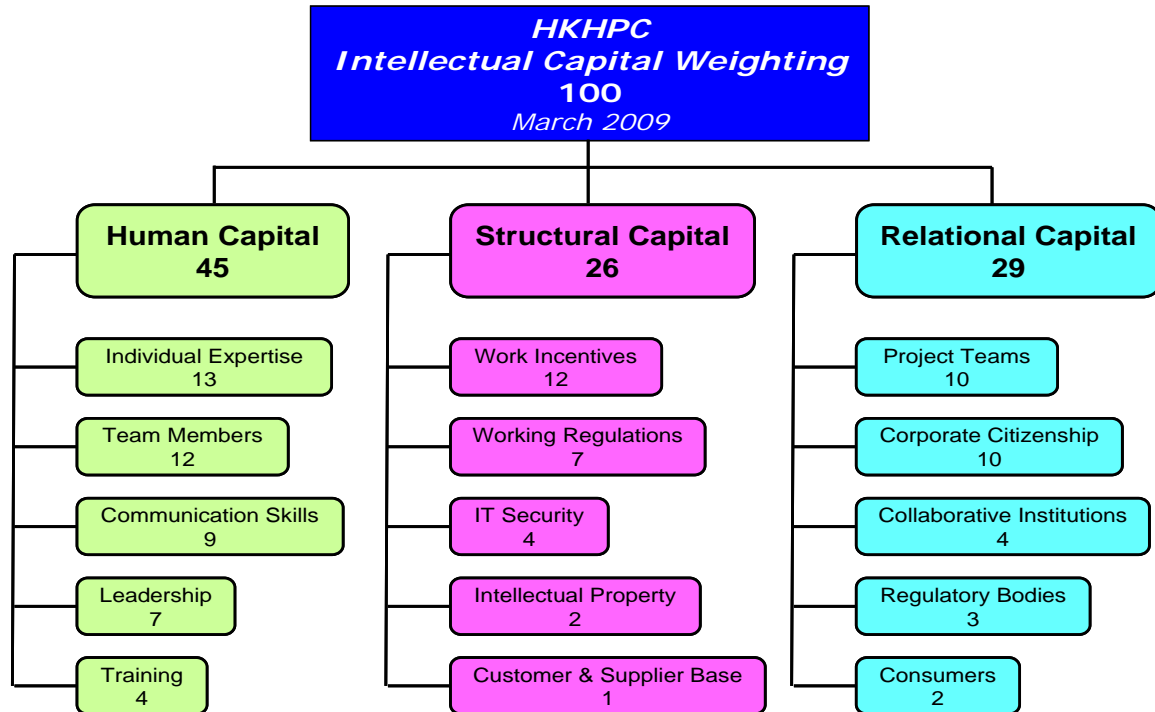
Source: Intellectual Property Department, the Government of Hong Kong Special Administrative Region, *Put Your Enterprise Knowledge To Work – A Guide to Intellectual Capital Management*, March 2009.

The founder made an initial inventory of IC that the HKHPC had and discussed in detail with the teams the relative importance (weighting) of these elements. They further fine-tuned the list during the first meeting until they were able to identify 15 IC elements that the HKHPC had.

IC Assessment

The team established the HKHPC Value Tree as follows:

Figure 1. IC Value Tree



Note: Fine-tuned by HKHPC after the ICM Consultancy Programme; figures in percentage or defined as IC Value (ICV).

Human Capital

Human capital referred to a spectrum of individual qualities and capabilities in the enterprise, supplemented by the effectiveness of working as a team and strengthened by communication skills, leadership and training. In this respect, HKHPC relied heavily on experienced professionals to create and maintain knowledge. The enterprise's IC value in human capital rated the highest in comparison to other structural and relational capital.

Table 2. Human Capital Indicators

<i>Indicator</i>	Status 2009	Target 2010
Individual Expertise (13%)		
Years of research experience		
<ul style="list-style-type: none"> No. of researchers with 1-5 years of experience No. of researchers with 6-19 years of experience No. of researchers with 20+ years of experience 	15 0 5	→ ↗ →
Education		
<ul style="list-style-type: none"> 1st degree holder Graduate or post-PhD degree holder 	100% 60%	→ ↗
Team Members (12%)		

No. of teams	6	→
No. of projects	7	→
Communication Skills (9%)		
No. of presentations conducted	20	→
No. of report/paper publications	7	→
No. of formal meetings (local/regional)	15	→
Man-hours of discussion per project basis	100-400	→
Leadership (7%)		
Percentage of project proposals supported by Institute	5%	→
Percentage of project proposals revised by team leaders	5%	→
Percentage of project proposals recommended to further study	90%	→
Training (4%)		
No. of “Garage” meetings*	10	↗
No. of project proposals from “Garage”	20	↗

* “Garage” meeting, as training opportunity, refers to innovations and visions sharing for team leaders and members (may also invite non-members and students nominated by school principals).

Structural Capital

Structural capital referred to an enterprise’s systems and practices that would add to its value and create wealth. In HKHPC, structural capital was relatively immature and the strengthening of structural capital on top of the already mature human and relational capital was one of the challenges posed to the enterprise. Nonetheless, HKHPC was committed to build up its own work incentive scheme, working regulations, IT security, intellectual property, and customer and supplier base.

Table 3. Structural Capital Indicators (estimated percentage)

Indicator	Status 2009	Target 2010
Work Incentive (12%)		
No. of author/co-author on report/paper publications	7	↗
Successful rate* of projects status from “progress report” to “passing out” - project requirements completed	80%	↗
Working Regulations (7%)		
Guidelines for transfer of research result	<input checked="" type="checkbox"/>	→
IT Security (4%)		
Security guidelines	<input checked="" type="checkbox"/>	→
Intellectual Property (2%)		
No. of beta version recorded and available to use	3	↗
No. of transfer of IP to other organizations/researchers	4	↗
Customer and Supplier Base (1%)		
No. of customers - university / school / museum	7	↗

Relational Capital

Relational capital involved value-creating relationship between HKHPC and its stakeholders such as project teams, local community, collaborative institutions, regulatory bodies and consumers. The team members and local community were regarded as the most significant stakeholders.

Table 4. Relational Capital Indicators

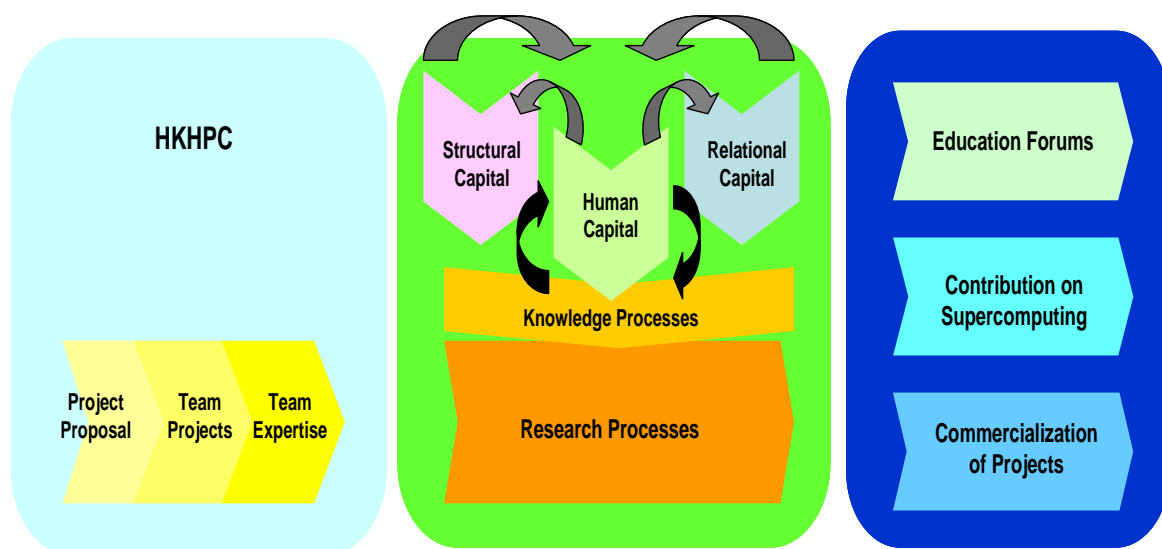
Indicator	Status 2009	Target 2010
Project Teams (10%)		
No. of ongoing project teams	6	↗
Average duration of project teams (months)	18	→
No. of incomplete projects (accumulated)	3	→
Local Community (10%)		
No. of education forum organized	3	→
No. of design competition organized	0	1
Collaborative Institutions (4%)		
No. of local/regional collaborative projects	5	↗
Regulatory Bodies (3%)		
No. of IP right infringement	0	→
Consumers (2%)		
No. of school students attended HKHPC's activities	500	↗
No. of industry associations/schools attended HKHPC's forum	10	↗
No. of contacts built between HKHPC and departments (local/regional governments or public bodies or schools)	50	↗

- Accumulation of IC in HKHPC

HKHPC created IC value by providing a platform for supercomputing researchers to work on projects with bright prospects. Accumulation of IC was at the team member's level instead of at the enterprise level.

The following diagram depicts the intellectual capital flow of HKHPC over the years.

Figure 2. Intellectual Capital Flow
(From project proposals to the utilization of research results)



- Risk Analysis

The team, together with the consultants, discussed the risk associated with the IC inventory. They identified as a priority risk the outcome of losing the key intellectual capital during the process of transferring them among different collaborating parties. The discussion about risks was based on the “Outcome” of considering the “Probability” and the “Effect” of the accompanying risk. Mitigating measures in relation to these identified risks were proposed and subsequently shared among all the Directorates within HKHPC.

The results of some of the risk assessment exercises were recorded as follows:

Table 5. Risk Assessment

<i>Risk</i>	<i>Probability</i>	<i>Effect</i>	<i>Outcome</i>	<i>Mitigation Measures</i>
Ambiguous ownership of intellectual property rights	Medium	Great	Long-term adverse effect	<ul style="list-style-type: none"> • Awareness of ownership and mechanism to assign/license IP rights • Commercialization model
Loss of IC during the transfer process	Medium	Above average	Significant	<ul style="list-style-type: none"> • Systematic way of IC transfer • To raise the awareness of the importance of IC among members
Loss of experts with key research knowledge	Low	Above average	Competitive disadvantage	<ul style="list-style-type: none"> • Incentive programme such as monetary/recognition scheme • Clear path for gaining academic value as well as ownership of research result • Education forums

Note: The “Outcome” should be the numeric result of multiplying “Probability” by “Effect.” Quantitative result was not available in HKHPC case.

- **Intellectual Capital Report**

The preparation of an IC report and making it available to the public were strongly encouraged by the Programme. HKHPC prepared its own IC report in May 2009. With the goal of meeting the expectations of stakeholders, the report summarized the core value and innovative capacity of the enterprise as well as documented the whole ICM process.

- **Sharing After the Programme**

Dr LAM shared his ICM experience with the IPD in a presentation ceremony held in August 2009. The founder asserted that the mission of the enterprise was to build a platform for researchers to take part in academic and professional projects on supercomputing in Hong Kong. During the sharing session, Dr LAM further reiterated:

Intellectual Property is different from intellectual capital management. To make human capital sustainable, you have to convert it to structural capital (permanent records of knowledge held by an enterprise). At present, not many government departments and academic institutions can offer any form of help. Moreover, the exercise also helps us to identify untapped business potential and strengthen the enterprise’s structural capital on top of the already mature human and relational capital.

Research is creating knowledge; and knowledge needs financial support. There is always a huge gap between holding a pile of knowledge and realizing it as

concrete business. Supercomputer, for example, embraces both direction and potential; however, you need more steps to turn it into money. I regret to say Hong Kong has no supercomputer centres despite its technological advancement. So we are planning to set up a supercomputer centre in Hong Kong. A unique business model is being carefully devised to ensure its sustainable development.⁴



Mr Stephen Selby, Director of Intellectual Property, Hong Kong, China (left) awarded the “2009 Excellence in Intellectual Capital Management” to Dr LAM Wai-kin, the Founder of HKHPC (right) on 4 August 2009.

Conclusions and Recommendations

Ways of Managing Intangible Assets

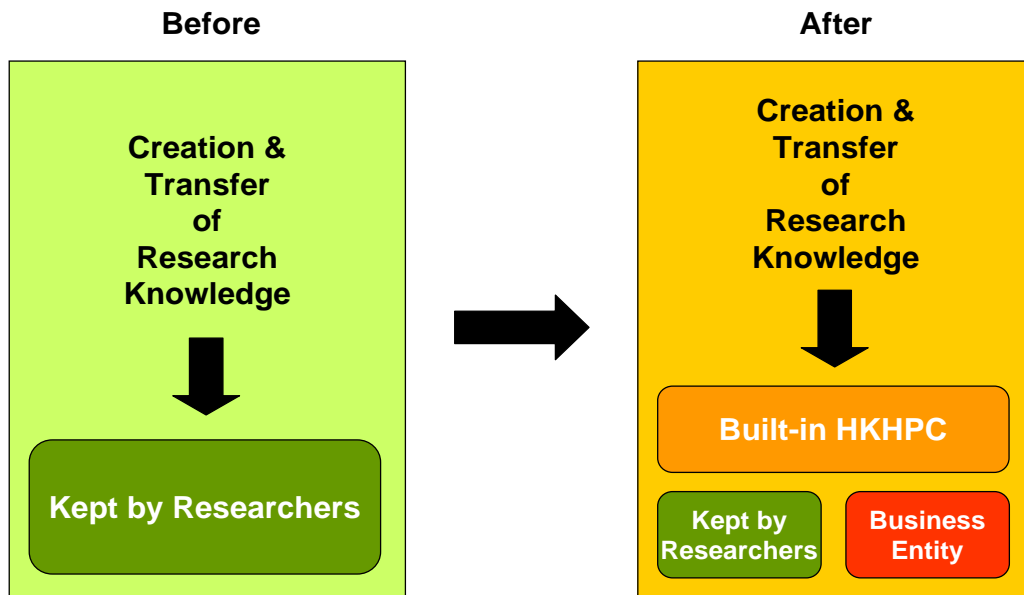
Did the enterprise do things differently when its hidden IC value was uncovered? The answer was definitely a ‘yes’ in this case. The directors of HKHPC gained an understanding of the significance of the IC value accumulated over the years by its team members. Transfer of research results, though was still in an immature stage and could be done in a more systematic and organized manner. The team members were briefed about the ICM concept and sharing sessions were conducted within HKHPC.

The future economic benefits of IC were assessed. Corresponding strategies especially on technology transfer and commercialization of projects were devised to meet the ultimate goal, i.e., to build a sustainable institute with robust supercomputing research platforms in the region.

The creation and transfer of research knowledge after the ICM Consultancy Programme could be depicted as follows:

⁴ *The Standard*, 19 August 2009:11.

Figure 3. Creation and Transfer of Research Knowledge Before and After ICM Consultancy Programme



Before the ICM Consultancy Programme, the creation and transfer of research knowledge were kept by researchers and the ownership of the resulting intellectual capital was not clearly defined. After the Programme, HKHPC would help maintain a proper record of the research knowledge and decide if a business entity should be set up to hold the corresponding intellectual capital. Participating researchers and/or HKHPC would own the business entity as sole proprietorship, partnership or incorporated enterprise.

Future Outlook and Challenges

The industry of high performance computing, without a doubt, would play a key role in knowledge economies across the region. The founder of HKHPC viewed computation power as the infrastructure of knowledge-based systems in the future.

It is foreseen that the challenges would be coming from outside competition (i.e., other large research institutes in the region) and the insufficient resource (shortage of local brain power) within the economy. Nonetheless, HKHPC had already prepared itself to tackle such challenges and planned some of the education initiatives and forums to address these issues.

Experience Sharing

The paradigm experience in HKHPC served as a good reference for other SMEs across industries and economies. Firstly, value accumulated in an enterprise should be uncovered, identified and recorded. Secondly, intangibles which were not yet commercialized or properly developed should be transferred to suitable person(s) who knew how to make the best out of it.

The Intellectual Property Department had been generating awareness of ICM through its ICM Consultancy Programme. IPD labeled this programme “ICM Lite” since it was clearly not intended as a full-scale ICM support service. IPD hoped to create a market to develop a local ICM support industry.

Within 10 months, over 300 enterprises had enrolled in the programme and the positive feedback for IPD’s initiative had been encouraging. Such experience had provided opportunities for sharing among the economies in the APEC Region. Other APEC economies should consider promoting the ICM concept or launching a programme on a similar scale so as to enhance, in the long run, the economic activities and value in the region.

Supplementary Note

Note 1: HKHPC was able to benefit from the ICM Consultancy Programme as echoed by the Founder:

The findings of last year’s ICM analysis are indeed very useful. As a result of the exercise, HKHPC’s original sponsors support the management’s decision to conduct a major re-structuring of the Institute.

1. Formal organizational structures have been introduced to facilitate the creation and transfer of knowledge.
2. New business operations are being set up to realize the identified business potentials.

The new roadmap reflects that the enterprise is more aware of the importance of securing its intellectual capitals and minimizing potential risks. – Dr Lam

Note 2: HKHPC also gained financial position and industry reputation through the ICM exercise.

The IC report is well received. We have received a number of enquiries on synergy and collaborations after the distribution of our first IC report in May 2009. That is very encouraging. The IC report also serves as an effective tool for venture capital (VC) and new sponsors to better understand the Institute’s status and potentials. The investors generally endorse our new business model.

In our recent communications with potential investors, it was generally agreed that the market potentials of the Petacomputing infrastructure and personalized high performance computing (HPC) are great and should not be ignored. We are prepared to share profits with our synergy partners.

At specially designed workshops/seminars, government officials of medium-sized cities (in mainland China) indicate their intent to investigate and adopt our proposed model of implementing an information and communication technologies (ICT) infrastructure to prepare for the challenges of knowledge-based economy. They perceive this as an important step in upgrading the quality of local manpower.

– Dr Lam

Note 3: Garage meetings – one of the major activities of HKHPC

The garage meetings were organized regularly. The main aim of the meeting was to facilitate and cultivate new project proposals.

Members from different project teams joined the meeting to provide comments on the project. While project team members were encouraged to express their views freely, project leaders were also invited to observe and listen during the meeting. No real decisions were made in the garage meetings. Project leaders might choose to respond by revising their respective projects to incorporate the new ideas gathered from the meeting.

When the new idea received general support during the meeting, the initiator/s were encouraged to submit a new project proposal to the directorate for endorsement.

Note 4: How the weights for the IC items were assigned

Step 1. IC Item Selection

From the original list of structural capital, human capital and relational capital items suggested by the ICM consultants, HKHPC compiled a list of IC items that were relevant to its operation. The list was circulated to senior members for comments and suggestions.

Supplementary Table. List of IC Items*

List of IC Items	
Human Capital	
Personal Ability	Education/Professional qualifications/Licence Work experience Language proficiency Personal network Attitude and personality Commitment
Teamwork	Converge to corporate culture Stick to corporate goal/vision/mission Degree of trust Creativity Execution Division of Labour Synergy
Communication	Communication between supervisor and subordinate Communication between colleagues Communication between departments Knowledge sharing across entire enterprise Communication with management Communicate externally

List of IC Items	
Leadership	Leadership skills Capacity to move forward Goal setting Build corporate culture Encourage innovation Value creation
Training	Voluntary learning Passion on learning Mentors Resources allocated for training Expectation and indicators on training programme
Structural Capital	
Training and Knowledge Sharing System	Job requirement and selection criteria Personnel ability test and database Established workflow/regulation/guideline Continuous training programme and indicator Encouragement of knowledge sharing Work goal and achievement level monitor
Work Incentive	Company culture Ideology/Goal/Vision/Mission Appraisal system (Material/Non-material) Work satisfaction Relation and recognition Ownership of company stock/option
Information Technology System	Security Portable memory device management Information back-up Access control External relation management system Quality control management system
Strategic IP Management	Software asset management Possession of trademark/patent/copyright/trade secret <ul style="list-style-type: none"> - IP as core development strategy - Value of IP to the company - Income and benefit derived from IP - Exploration/Registration/Maintenance
Creativity and Innovation Management System	Collection/Encouragement/Development/Statistics Resources devoted to innovation development Innovation portfolio management <ul style="list-style-type: none"> - Categories (Product/Service/Work process) - Risk and Return (High/Medium/Low) - Return Duration (Long/Medium/Short)
Relational Capital	
Supplier	Supplier diversity Supplier stability Communication with suppliers
Customer	Client diversity Client distribution/networking Brand perception from clients Value-added for clients Client loyalty

List of IC Items	
	Client communication and sharing Stability of service level Client feedback and complaint handling
Staff	Communication with staff Staff loyalty Sense of belonging Staff satisfaction Staff commitment
Same Line of Business/Federation	Level of cooperation Strategic alliance/Mutual development Upgrading industry code of conduct Knowledge sharing Resources sharing
Regulatory/ Government	Internal control Compliance with regulation Support government programme Job creation Convey the right message Product safety Occupational safety Environmentally friendly Community service Anti-discrimination

* Suggested by ICM Consultants for general discussion

Step 2. Weight Assignment

Mutually blind inputs from senior members on weighting of relevant IC items were collected and summed up.

Relevant IC items:

- Individual expertise
- Team members
- Communication skills
- Leadership
- Training
- Work incentives
- Working regulations
- IT security
- Intellectual Property
- Customer and supplier base
- Relationship with project teams
- Corporate citizenship
- Relationship with collaborative institutions
- Relationship with regulatory bodies
- Relationship with consumers

The final weighting was expressed in points of 100, or interpreted as percentage. No

monetary assessment was involved in the exercise.

The calculation can be illustrated as follows:

$$W_i = Q_i / \sum_{i=1}^n Q_i$$

Where

$i = 1$ to n

$n =$ total number of relevant IC items identified

$Q_i =$ quantitative measure to show value contributing to stakeholder for IC item i

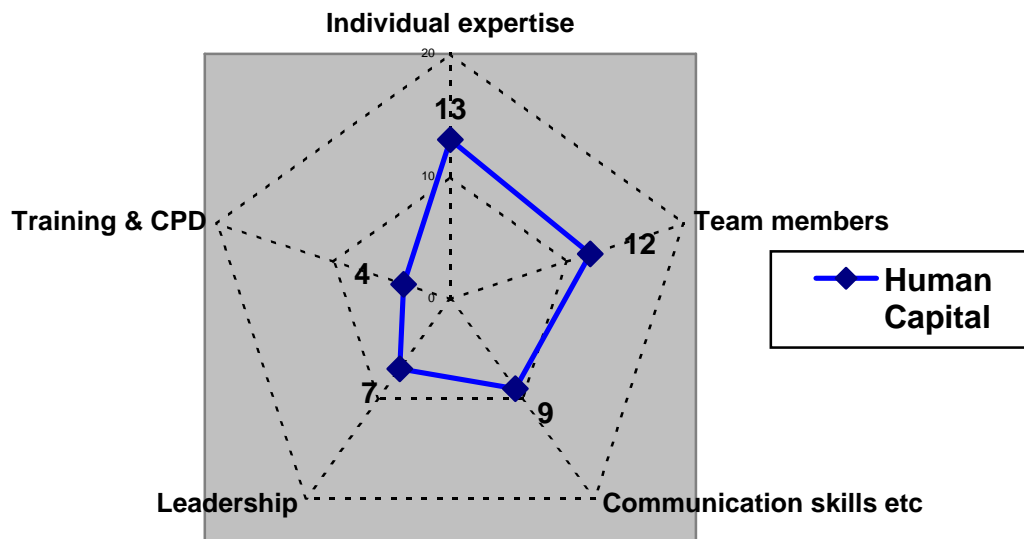
$W_i =$ point value or percentage of IC item i

The key was for the senior members of HKHPC to put up a quantitative measure for each relevant IC item - Q_i . Integers were recommended to show how much an intellectual capital item could contribute to the creation of wealth for HKHPC in the eyes of stakeholders. The same scale had to apply for all IC items. Sum of all W_i had to equal to 100 IC value (ICV) points or percentage.

Step 3. Visualization

To facilitate easier communication, radar charts were used for visualization.

Supplementary Figure. Radar Chart for Human Capital



Note 5: Comments from the Founder of HKHPC

As a beneficiary of the ICM exercise, HKHPC is willing to share its experience with other institutions/enterprises at appropriate occasions. In addition to the clear roadmap for restructuring, the adoption of a new business model, and internal training sessions at HKHPC, we have also offered seminars and consultancy workshops on ICM to

outside parties – including university-based incubators, science & technology parks in mainland China.

– Dr Lam

