THE VALUE OF NETWORKS IN HONG KONG SCIENCE AND TECHNOLOGY PARKS: AN EMPIRICAL STUDY ON NETWORK LINKAGES

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Abstract

Formal and informal networking is part of the intangible infrastructure of science and technology parks, but unlike the physical infrastructure more difficult to assess in terms of quality, dynamic and value-added created. Based on a literature review as well as qualitative interviews among selected partner companies in the Hong Kong Science and Technology Parks, this paper discusses the value of networking as perceived by the companies and the role of the science park management as facilitator in nurturing a networking environment. The interviewees contribute examples of local, regional and international networking activities including suggestions on how networks could be strengthened. Understanding and leveraging the dynamic of networks increases the relational capital, which is part of the value creation through a science park.

1. Introduction

Networking and knowledge exchange are considered a critical success factor for science parks and contribute to the creation of innovation eco-systems, however, due to the social nature of networks, they are more difficult to describe and measure than other success factors such as location, quality of the infrastructure, value-added services, technical facilities. A recent paper by the European Economic and Social Committee (EESC 2010) suggests that science parks play an important role in building a knowledge and innovation driven economy, in particular through their role as network and bridge builders between industry and universities, private and public organisation and society.[1]

Since the 1980's science parks surged in numbers around the world. As governments continue to sponsor the development of science parks to spur technological innovations in their regions, the number of science parks has grown to over 700, housing over 65,000 technology companies according to IASP (International Association of Science Parks). In addition to policy incentives such as rent subsidies, companies who choose to locate in science parks also enjoy "the flow of knowledge and technology amongst universities, R&D institutions, companies and markets", while regions with science parks can benefit from a budding technology sector (Ritter, 2007).[2]

Despite the incredible growth and adoption of science parks by both governments and technology companies, academics have continued to debate exactly what advantages science parks provide companies in their quest to innovate. Specifically, the research has focused on studying the extent to which science parks increase networks and knowledge transfer, one of science parks' primary stated advantages. Proponents of science parks claim that they enable companies to not only engage with like-minded innovative companies within the science park, but also to foster strong relationships with important external actors such as universities and governments. Other research has gone even further by exploring whether increased knowledge transfer and innovation networks in science parks actually lead to more innovation. A strategy tool developed by the IASP (International Association of Science Parks) describes networks as one of the building blocks of science parks, the others being management, knowledge sources, local/regional impact, quality space, value-added services, NTBF creation, marketing existing companies (Sanz 2005).[3]

[1] European Economic and Social Committee (2010). European Technology, Industrial and Science Parks in the crisis management, preparation of the after-crisis and post-Lisbon strategy, CCM1/072-CESE980/2010 fin EN.

[2] Ritter, W. (2007) Knowledge Exchange and Innovation Networks in Science Parks in Asia: Assessing the Value of Networking between Tenant Firms. 11th ASPA Conference "Asian Alliance for Technological Innovation and Regional Development", South Korea.

[3] Sanz, Luis. (2005). Strategigram: A Tool to Understand and Compare the Strategy of STPs,

Additionally, the debate has also centered on whether science parks create economic externalities for their respective regions. This question is critical to governments who are considering using taxpayers' money to build science parks in their areas, to observe how the public prospers from providing these policy incentives that facilitate the building of science parks.

This paper will focus on answering the following research question: Are networks important in science parks and, if yes, how and what types of networks are important? The research question will be answered using two main analytic vehicles. First, a literature review will be conducted from science park research publications in academic journals; this literature studies the success of science parks in stimulating innovation. Second, the discussion will compare the literature review's findings with discoveries drawn from interviews with nine technology companies situated in the Hong Kong Science Park. The details of the companies interviewed are provided in Table 1. After taking a joint look at the literature review and company interviews, the analysis will close by discussing the overarching implications for the Hong Kong Science Park in particular and if possible, science parks in general.

2. Literature Review

The literature review will focus on findings from research publications on science parks from academic as well as other relevant recent literature (some of which are working papers, while others are conference presentations). The literature, mostly published within the past 10 years, examine various features of science parks across the globe.

Much of the academic literature has studied the performance of on park firms with off park firms. Based on his study of science parks in Sweden, Löfsten and Lindelöf (2001 and 2002) define key metrics to compare and evaluate the effect of science parks on high-tech startup firms (for example, the first metric was 'employment growth' as the author argues that hiring more employees correlates strongly with business success).[4] Their studies showed some differences between the experiences of firms on- and off-park in respect to innovation and marketing issues. Firms located in Science Parks were significantly more likely to have a link with a local university than off-park firms. Furthermore, initiatives to promote new technology-based firms on Science Parks will yield a higher rate of job creation than policies to help new technology-based firms in general. Partially in response to these studies by Löfsten and Lindelöf (2001 and 2002), Hansson, et al. (2005) suggest that the more useful role of science parks may be to cater for the development of the social capital necessary for enabling and facilitating entrepreneurship in networks.[5]

Another Swedish study (Ferguson and Olofsson, 2004), based on two Swedish science parks, found that firms located on science parks have significantly higher survival rates than off-park firms.[6] However, the authors observed insignificant differences in sales and employment. Wider variation in the growth rates of firms located on parks together with the better survival suggests that the science parks may be providing favorable locations for new technology-based firms in a range of development phases. The image benefit associated with a science park location is not helpful in explaining growth, whereas a location benefit associated with cooperation with universities is positively associated with growth.

International Association of Science Parks (IASP).

[4] Löfsten, H, and Lindelöf, P. (2001). Science park in Sweden – Industrial Renewal and Development? *R&D Management*, 31(3), 309-322.
Löfsten, H. and Lindelöf, P. (2002). Science Parks and the Growth of New Technology-based Firms - academic-industry links, innovation and markets. *Research Policy*, 31(6), 859-876.

[5] Hansson, F., Husted, K. and Vestergaard, J. (2005). Second generation science parks: from structural holes jockeys to social capital catalysts of the knowledge society. *Technovation*, 25(9), 1039-1049.

[6] Ferguson, R. and Olofsson, C. (2004). Science Parks and the Development of NTBFs— Location, Survival and Growth. *Journal of Technology Transfer*, 29, 5–17.

Similarly, Colombo and Delmastro (2002) compare empirical differences between firms located in science parks and outside of science parks.[7] Their empirical results confirm the conventional wisdom that input and output measures of innovative activity are only marginally different between on- and off-incubator firms. Nonetheless, they also show that Italian parks managed to attract entrepreneurs with better human capital, as measured by educational attainments and prior working experience. In addition, on-incubator firms show higher growth rates than their off-incubator counterparts. They also perform better in terms of adoption of advanced technologies, aptitude to participating in international R&D programs, and establishment of collaborative arrangements, especially with universities. Lastly, they find it easier to get access to public subsidies. Altogether, such findings support the view that science parks are an important element of a technology policy in favor of new technology-based firms (especially in countries with weak innovation systems). In an earlier study, based on the United Kingdom, Westhead (1997) found no statistically significant differences between independent technology-based science parks firms with a comparable group of firms not located on a science park along a variety of innovativeness measures.[8] Results from both samples suggest science park firms do not directly invest more in R&D than off-park firms nor do they record significantly higher levels of technology diffusion. In the Malaysian case, Malairaja and Zawdie (2008) examine the effectiveness of science parks as a strategy to promote university-industry collaboration.[9] Their findings show a reasonably high level of interactions between the science park (on-park) and off-park firms, and local universities. Overall, science park firms have more links with universities than off-park firms, although the difference is not shown to be statistically significant.

Hu (2007) studies why entrepreneurs choose to locate in science parks in China.[10] Hu argues that if indeed entrepreneurs are attracted to science parks because of the policy incentives, that the spur in innovation is unsustainable and will ultimately converge with off-park firms once the subsidies vanish. On the other hand, the author suggests intrinsic value science park-firms can gain beyond economic incentives includes knowledge spillover, thick labor markets, and backward and forward linkages. Yang, et al. (2009) examine whether new technology-based firms located on science parks more innovative in Taiwan, by comparing on- and off- park firms according to their R&D productivity (rather than focusing on R&D output).[11] Using panel data for new technology based firms located within and outside the Hsinchu Science Industrial Park (in Taiwan), the authors' empirical findings indicate a slight advantage in R&D for firms in the science park, arising from the fact that the science park offers a clustering effect and establishes links among firms and research institutions.

A previously conducted study (Chan and Lau 2005) relevant to this paper provides an assessment framework of technology incubators in the Hong Kong science park.[12] The authors identify nine sets of criteria which are incorporated in the assessment framework: advantages from pooling resources, sharing resources, consulting services, positive effect from higher public image, networking advantages, clustering effect, geographic proximity, cost subsidies and funding support. Using business development data of six technology start-ups in the Hong Kong Science Park, the framework is then applied to examine the effectiveness of incubators from the perspective of venture creation and development process. The authors found that the benefits required by technology founders at different stages of development are varied and therefore, the general merits that are claimed by incubators as useful to technology start-ups are debatable. Chan and Lau's study finds that technology start-ups do not gain any benefits from networking and clustering. The hypothesis that SMEs can gain substantially from the incubator program was proven to be

[7] Colombo, M. and Delmastro, M. (2002). How Effective are Technology Incubators? Evidence from Italy. *Research Policy*, 31(7), 1103-1122.
[8] Westhead, P. (1997). R&D "Inputs" and "Outputs" of Technology-Based Firms Located on and Off Science park' *R&D Management*, 27(1), 45-62.
[9] Malairaja, C. and Zawdie, G. (2008). Science parks and university–industry collaboration in Malaysia. *Technology Analysis & Strategic Management*, 20(6), 727–739.
[10] Hu, A. (2007). Technology Parks, and regional economic growth in China. *Research Policy*, 36(1), 76-87.
[11] Yang, C.-H, Motohashi, K. and Chen, J.-R. (2009). Are new technology-based firms located on science parks really more innovative? Evidence from Taiwan. *Research Policy*, 38(1), 77-85.
[12] Chan, K. F. and Lau, T. (2005). Assessing technology incubator programs in the science park: the good, the bad and the ugly. *Technovation*, 25(10), 1215-1228.

uncertain. Young tenants from the interview have claimed and state that the argument is more of a political show to justify government's investment in establishing science parks and incubators (Chan and Lau, 2005), and overall, no evidence is found on networking advantage and clustering effect on technology firms in their development process. The paper hypothesizes that the benefit from networking might only apply to the Western science parks in which the terms of conditions in the implementation process are different such that they affect the effectiveness of incubator. Another conclusion that could be drawn from Chan and Lau's study is that university-technology startups relationship is more useful than the science park-technology start-up relationships because university can provide the software support whereas science parks focus on hardware support provision.

Appold (2004) examines the efficacy of science parks in the United States form 1960-1985. The study uniquely takes a county-level approach to analyze whether the introduction of science parks caused more research output over time in the area that it was located. The analysis indicates that research parks were not effective local development tools but instead benefitted from the growth of research activity.[13] In Finland, Höyssä, et al. (2004) uncovers the factors that enabled the 'BioCity' science park to revive the biotechnology sector in the country.[14] Through interviews with several stakeholders including firms, government agencies, and universities to study the effect of boundary objects and naturally evolving innovation systems spanning across various actors versus intended and extensively planned science parks, the authors conclude that the systems approach to regional development needs to be complemented with approaches that focus on the regional mechanisms of adaptation. In Russia, Kihlgren (2003) finds that science parks in St. Petersburg have been rather successful in securing financing for their tenants, but deficient in providing management assistance.[15] The transfer of technology to industry has been weak due to the limited demand for high-tech products. Many firms survive in an embryonic state and this explains why despite the difficulties the number of jobs created has been substantial, although presumably many are low paid.

In exploring the value of external collaborative R&D to internal R&D management in science parks, Oakey (2007) finds that although R&D collaboration with external partners occurs in limited instances among high-technology small firms, much high-technology small firms R&D is highly confidential, competitive and wholly internalized.[16] This tendency, as far as it relates to R&D management, is significant in that it minimizes the likelihood that local management collaboration between co-located firms will improve the performance of R&D projects.

3. Network Linkages at the Hong Kong Science Park

After presenting the findings of the academic articles we can discuss some commonalities. The main, overarching theme resulting from the literature review is that the literature and statistical analyses have inconclusive results. Selection bias is a major problem as it is impossible to control for all biased factors because startups by definition are all unique in their approaches and dynamics. Additionally, many of the parks under scope are far too young to draw conclusions, as the investment in startups is a long-term one and so the studies are using data that may not show a long-term picture. Thus, it may be hard to draw convincing conclusions due to this time constraint of the sample firms. Finally, the divergent metrics to evaluate success reiterate how the academic world has not yet agreed on what constitutes success for a science park. Additionally, even if there were a consensus, quantifying R&D and innovation success can be difficult and thus hard to capture in numerical statistical studies.

[13] Appold, S. J. (2004). Research parks and the location of industrial research laboratories: an analysis of the effectiveness of a policy intervention. *Research Policy*, 33(2), 225-243.
[14] Höyssä, M., Bruun, H. and Hukkinen, J. (2004). The co-evolution of social and physical infrastructure for biotechnology innovation in Turku, Finland. *Research Policy*, 33(5), 769-785.
[15] Kihlgren, A. (2003). Promotion of innovation activity in Russia through the creation of science parks: the case of St. Petersburg (1992–1998).*Technovation*, 23(1), 65-76.
[16] Oakey, R. (2007). Clustering and the R&D Management of High-Technology Small Firms: In Theory and Practice. *R&D Management*, 37(3), 237-248.

Notwithstanding the above, the results of the case studies and literature review did reveal several commonalities of note with implications for science parks from both a policy and entrepreneurial perspective. First, one main distinction was the fact that the types of founders at science park firms versus off-park firms are fundamentally different. The entrepreneurs in science parks have significantly higher levels of education and tend to be more academically focused. Second, the studies revealed that science parks and science park firms have statistically significantly more official and unofficial links with universities. These links include student project and internship links, employment of graduates, research projects, and lab and equipment use. This observation was particularly significant in the Taiwan case study, which revealed connections with both regional and international universities. However, the studies did not make statistically sound arguments for what the actual links provided, but rather just found that more links existed for on-park firms. Third, sales growth was faster for on park firms, but that the firms were slower in achieving profitability.

Another major revelation through the literature review was that policy incentives are a major driving force for entrepreneurs who choose to locate in science parks. While some studies attempted to capture the effects science parks have on their surrounding regions, most of the studies inconclusive on this issue and showed no statistically significant differences between on and off-park firms. Finally, the studies were also inconclusive in their quest to show differences between R&D productivity and efficiency.

Perhaps the most noteworthy study by Chan and Lau (2005) is one that this current paper attempts to refute. Specifically, we show in this paper, through our interviews that technology startups do in fact gain benefits from networking and clustering. It is not just a 'political show' as Chan and Lau argue, for start up technology firms to establish themselves in the science park—there are indeed 'real' benefits, as we demonstrate below.

3.1. Background to the Hong Kong Science and Technology Parks Corporation (HKSTPC)

Managed by Hong Kong Science and Technology Parks Corporation (HKSTPC), the three-phase 22-hectare Hong Kong Science Park provides world-class technological savvy infrastructure and support services. These include market focused clustered laboratory services and support services fostering partnerships and collaboration between industry and universities/applied research institutes through consulting, training and research programs.

Since its inception in 2001, the Park has fostered technological innovation and sustainable development through clustering and attracting high-tech companies and talents to Hong Kong. With a focus on five chosen technologies – Electronics, Information Technology and Telecommunications, Precision Engineering, Biotechnology and Green Technology, the Park is now home to over 300 companies (http://www.hkstp.org) ranging from incubation companies and SMEs to leading innovators and multinational corporations such as Philips Electronics, SAE Magnetics, Johnson Electric, Solomon Systech, DuPont Apollo, Cree Asia-Pacific, etc. which together employ about 8,000 people, among them more than 60% are involved in research and development.

Along this directive, HKSTPC has commenced its Phase Three development in mid 2010 dedicated for green technologies. Embracing green features such as photovoltaic features and wind power turbine in its design, the buildings themselves are demonstrations of green technologies, HKSTPC fosters the R&D development and product commercialization, and green tech is the latest area of focus with great potential whereas other niche technologies including RFID, solid state lighting, IC-mobile devices, energy management and integrator for environmental technologies will be identified as areas with great prospect.

3.2. Network Linkages among Hong Kong Science Park Companies: Methodology

The methodology for this study was based on in-depth face-to-face interviews with nine science park companies. To achieve representativeness, the types of interviewee companies were chosen from a variety of industries (such as pharmaceutical, biotechnology, electronics, and information technology), ranging from companies of large size (400 employees) and companies of small size (4 employees), and those with a long history of involvement in the Hong Kong Science Park (nine years) and those with a much shorter history of involvement in the Hong Kong Science Park (one year). We believe, therefore, that our interview sample embodies a representative cross-section of views

pertaining to network linkages in the Hong Kong Science Park. The individuals interviewed held the title of general manager and above (including CEOs) with a wealth of experience of working in the company, ensuring that the material that we were provided through the interviews was reliable. The interviews were conducted in October and November 2010.

There were two parts to the interview. The first part consisted of a structured questionnaire, which was adapted from a previously conducted questionnaire (Menkhoff, et al. 2005) measuring the existence and nature of networks among firms.[17] The full questionnaire is provided in Appendix A of this paper. The second part of the interview comprised a discussion of open-ended questions that appeared at the end of the questionnaire. The questionnaire was provided to interviewees in advance of the interview, offering them a chance to think through their responses. The open-ended questions that appear at the end of the questionnaire were not necessarily asked in the order they appear in the questionnaire, nor were they asked using the exact same wording. Rather, the open-ended questions that appear at the end of the questionnaire served as a guide and outline for the themes that we wanted to cover during the course of the interview. This technique helped us ensure that we covered all issues of particular interest to us, while also allowing flexibility to tailor the interview according to the responses of the interviewees. To make up for the absence of an audio recording of the interviews, we took copious hand-written notes. All interviews were arranged in advance, conducted without any significant interruptions and lasted between thirty to one hundred and twenty minutes.

3.2. Network Linkages among Hong Kong Science Park Companies: Results and Findings

In terms of the process of knowledge sharing and knowledge transfer within Hong Kong science park organizations, Table 2, below, shows that the interviewee companies mostly agreed or strongly agreed with statements such “employees routinely share ideas and best practices here”; “many colleagues participate in cross-functional teams”; “knowledge sharing is facilitated through special events and meetings”; “lot of collaboration between different departments and units” and so forth. All these statements point to the importance placed upon knowledge sharing by Hong Kong science park companies that we interviewed.

Table 2: Process of knowledge sharing and transfer in the organization

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Employees routinely share ideas and best practices here	0	0	0	3	5
Many of my colleagues participate in cross-functional teams, keep up with external marketplace changes, and solicit outside ideas/views on key projects	0	0	0	3	5
Knowledge sharing is often facilitated here through special events, meetings etc.	0	1	0	5	2
There is a lot of collaboration here between different departments and units	0	0	1	3	4
In this organisation, we communicate mainly face-to-face	0	2	1	2	3
Face to face communication is an effective way of sharing knowledge	0	2	2	0	4

[17] Menkhof.T., Chay, Y.W., Loh.B, Evers, H.-D., Ritter, W. (2005). "What Drives Knowledge Sharing in Kowledge-based Organizations? Challenges and Outcomes". Paper presented at the 5th International Conference on Knowledge, Culture and Change in Organisations held at the University of the Aegean, Island of Rhodes, Greece, 19-22 July 2005 (organised by Common Ground, Australia).

In this organization, we communicate mainly electronically (e.g. emails, intranet, groupware, online discussion forums etc.)	0	1	0	4	3
Electronic communication is an effective way of sharing knowledge	0	0	0	4	4
Knowledge sharing saves a lot of time since we do not have to reinvent the wheel again and again	0	0	1	1	6
The sharing of experience-based knowledge helps avoid costly mistakes	0	0	0	2	6
It will be very difficult to create new knowledge if I do not exchange knowledge with others.	0	0	0	3	5

Additionally, we received open-ended feedback reinforcing the findings of the responses to the questions presented in Table 2, above. For example, one company when they encountered problems "in purifying protein, we had collaboration with other companies to seek ways to develop antibodies for the purification". Another company commented how being in science park aided in cooperation: "through the science park we get to cooperate with other biotech companies, and through this cooperation, both companies came to realize a new business opportunity (micro display for medical inspection".

Clearly knowledge can only be transferred or shared if it is created. Table 3, below, describe the knowledge creation process for the Hong Kong science park companies we interviewed. All the companies agreed or strongly agreed with statements such as "I actively share my experience with others during formal/informal discussions"; "My colleagues and I share work with each other"; "During formal/informal discussions I try to find out others' opinions"; "I express my thoughts during formal/informal discussions".

Table 3: Knowledge Creation in the Organization

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I actively share my experience with others during formal / informal discussions	0	0	0	3	5
My colleagues and I share work or life experiences with each other	0	0	0	5	3
I try to find out others' opinions and thoughts during formal / informal discussions	0	0	0	5	3
I give my thoughts and ideas during formal / informal discussions	0	0	0	3	5

Additionally, we received open-ended feedback reinforcing and augmenting the findings of the responses to the questions in Table 3, above. For example, one company further unraveled the knowledge creation process in their firm by stating, "We even share among ourselves as to how we can hold an even better conference or meeting with experts from other countries so that we can have the best result from the conference or meeting". Another expressed the importance of customers in the knowledge creation process: "As we are client-oriented firm, our knowledge sometimes depends on customers' input". A larger company even went so far as to "define flows and procedures for different departments and units so as to be able to create knowledge more effectively".

The knowledge creation and sharing/transferring process has had positive effects on the Hong Kong science park companies we interviewed. Table 4, below, shows how the majority of our interviewee companies described the knowledge creation and sharing/transferring process benefitted their company by "increasing number of markets"; "improved customer relations"; helped developed new products or services"; "increased adaptation of products or services to client requirements"; "increased flexibility in production and innovation" and so forth. Tellingly, the knowledge creation and sharing process "prevented duplicate research and development" suggesting that not only did this process have a positive, expansionary effect, but it also had a preventative impact.

Table 4: Positive Effects of Knowledge Sharing and Exchange

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Increased our knowledge sharing horizontally (across departments, functions or business units)	0	0	1	3	4
Increased our knowledge sharing vertically (up the organizational hierarchy)	0	0	0	3	4
Increased our number of markets (more geographic locations)	0	0	2	2	3
Improved client or customer relations	0	0	0	2	6
Helped us to develop new products or services	0	0	0	3	5
Increased our adaptation of products or services to client requirements	0	0	0	3	5
Increased flexibility in production and innovation	0	0	0	3	5
Prevented duplicate research and development	0	0	0	1	7
Increased our ability to capture and utilise knowledge from public research institutions including universities and government laboratories	1	0	1	2	4
Increased our ability to capture and utilise knowledge from other business enterprises, industrial associations, technical literature etc.	0	0	1	4	3

Additionally, we received positive open-ended feedback when we asked for specific examples of knowledge sharing and exchange with local partners (i.e. universities) and overseas partners. The Hong Kong Baptist University helped one of the interviewee companies "develop an animal model for the testing of a medicine for the genetic variation of intestinal cancer". Another interviewee company benefited from collaboration with the University of Hong Kong for the joint project of 'modeling of capacity touch panel pixels for simulation purposes'. Finally, student placement was another method through which knowledge was shared with our interviewee companies and Hong Kong's universities.

In terms of knowledge exchange and transfer within the Hong Kong science park, we found that the networking opportunities offered by the Hong Kong science park (such as seminars, conferences) represented a valuable platform to exchange and transfer knowledge. As one representative of an interviewee firm put it, "I treasure the chance of joining networking activities in the Hong Kong science park. Aside from seminars and conferences, I also join dinner gatherings and ceremonies held at the science park". Another interviewee firm commented, "the science park organizes some semiformal or informal activities such as gatherings or lunches that allow tenants to mingle. Also, between October and December [2010], there are a lot of forums, fairs, and promotional activities at the science park, such as the 'InnoCarnival'. Our chairman attends all such activities regularly."

The interviewee companies further reaffirmed that the networking opportunities offered by/within the Hong Kong science park (such as seminars and conferences) were concretely helpful for their business operations: “Informal dinner parties are useful for me to know what other partner companies are doing in the Hong Kong science park, and if there are opportunities for us to share our knowledge among each other”. Additionally, “functions like exhibitions of various new techniques keep us updated of new knowledge”. Such opportunities led to new business deals and agreements, as recounted by one interview company: “[Through such activities] we collaborated with another company which specializes in pegylation of protein to develop a new product”. An integrated circuit manufacturer stated how it had “entered into contracts with two other companies in the same industry as a result of the Hong Kong science park’s networking opportunities”.

More generally, the sentiment expressed by our interviewee companies was captured in one particular response: “The whole environment for knowledge exchange and transfer is getting better and better as the science park creates more and more opportunities for the burgeoning number of companies to meet and exchange knowledge. So long as there are a lot of companies in the science park, and there are also opportunities for us to all meet informally or formally, we can certainly have more knowledge exchange and transfer among companies.” Another respondent company reaffirmed this, “Hong Kong Science Park has done a very good job in terms of promoting networking”. Yet another company suggested that the presence of companies in the science park, belonging to different sectors represents its strongest suite in terms of promoting knowledge transfer and exchange: “the science park provides infrastructure and facilities including lab facilities to attract high tech companies in different sectors. This makes it easier for all the companies to find collaboration partners within the science park community”.

Means for improving networking opportunities among Hong Kong science park companies, according to our interviewees included initiating a newsletter with dedicated information on the subject of knowledge exchange and transfer as well as of new companies joining the science park, which may provide potential opportunities for further networking. Aside from a newsletter, one interviewee company suggested the possibility of establishing a common room as a means for encouraging informal knowledge exchange.

4. Discussion and Conclusions

Although in the academic literature surveyed in Section 2 there is some ambiguity surrounding the advantages of science parks, one decisive conclusion that can be drawn from this particular study is locating in the Hong Kong science park enables firms to more easily create links to other firms as well as to local (and Mainland Chinese) universities. This finding was concretely reflected in the company interviews conducted: the science park facilitates relationship building and knowledge transfer and exchange. Therefore, not only do firms enjoy financial advantages by being located in the Hong Kong science park (such as differing levels of rent subsidies), but they will also have greater opportunities to create links with other similar firms and universities. This is true for both recently established firms as well as well-established firms, and also true for firms in different industries.

4.1. Networking Events and Activities in Hong Kong Science Park in 2010

For its part, the Hong Kong science park management is committed to offering occasions and environment for partner companies to mix and mingle with each other so as to foster creativity, innovation and collaboration in the cluster environment. In 2010, they arranged some 20 mingling activities in the Science Park community whereas about 50 seminars, conferences and training programs incorporating networking activities were also organized.

In particular the InnoAsia (http://www.innoasia.net/about.html), an annual flagship event of HKSTPC, was organized in November 2010 which did not only help link up companies within the Science Park community but also connected partner companies with local and overseas universities as well as corporations outside the Park.

4.2 Networking and knowledge exchanges create the relational space within the physical space of a science park. The knowledge exchanges with universities, the business community and other organisations in the innovation eco-system are the basis for the intangible value creation through science parks.

While it is difficult to quantify the importance of networks, our research shows that both social and professional networks are contributing to the attractiveness of science parks as facilitator of interactions. At the centre of these networks in most science parks are a small number of key individuals (often, but not necessarily from the science park management side) who to have an important influence on the success of the cluster through providing advice to new entrepreneurs, identifying promising opportunities, and generally creating opportunities for formal and informal exchanges.

4.3 According to Vyakarnam and Myint (2005) who analyzed networks in Cambridge, the very nature of science parks can be described as a network environment, as it is build on collaboration, sharing of resources (both physical and mental).[18] The "ingredients" of a networked environment include physical infrastructure, financial infrastructures, know-how infrastructure, value-added services (e.g. legal , venture fund management, design, consulting etc), and non-physical (intangible) such a access to know how, opportunities for relationship building for at various levels, e.g. providing access to the industry and university collaboration. The function of these networking activities is gaining access to local university resources, potential joint R&D project, as well as bridging academic and business research.

Some of the network activities are managed and controlled, others are not; sometimes it is a combination of both, meaning that a science park can actively influence the setting of a network, without being able to control the outcome.

This reflects perhaps the difficulty in determining the value of networking; while most agree that networking is a vital for the economic value creation through science parks, managers of science parks can only indirectly contribute to the innovation eco-system through facilitating knowledge flows.

[18] Vyakarnam, S., Myint, Y.M. and Marino, L. (2005) "Research parks and incubators: re-defining the role of the incubator." In: Advancing innovation and entrepreneurship: Technology Transfer Society Annual Conference, 28-30 September 2005, Kauffman Foundation, Kansas, MO.

Table 1: Details of the Interviewed Companies

Name of Company	Major Business	No. of years in HKSTP	No. of employees in HK	No. of employees outside HK and where	Title of Interviewee	No. of years in the company
Lee's Pharmaceutical Holdings Limited	R&D, Manufacturing, Distribution of pharmaceuticals and medical services	5 yrs	25+	400+ (Mainland China)	CEO	16yrs
Interactive Systems & Technology Ltd.	Biotech (Air purification system)	3 yrs	6	0	CEO	8yrs
Dragonchip Limited	Semiconductor company - design (R&D), manufacturing, marketing and sales of IC	9 yrs	Approx. 20	Few (China, Japan, South Korea, Singapore - to assisit sales representatives / distributors)	Chairman & Executive Director	9 yrs 3months
Kopin (HK) Limited	Micro-display module	4 yrs	4	0	General Manager	4 yrs
GeneHabor	Contractual research, Licensing R&D, Manufacturing their own products	N/A	40-50	>100 (Mainland China)	Assistant of the CEO	6 yrs
PSP Security	IT security, Facial recognition system	1 yr	5	3-4 (Taiwan and USA)	President	1 yr
Northeast Electric (Hong Kong) Limited	Energy Tech	3 yrs	100	6000 (China)	General manager	N/A
Solomon Systech Limited	IC	7 yrs	260	100 (Shenzhen, Singapore, Beijing, Japan, Shanghai, USA, Europe)	Corporate Communication Director	11 yrs 4 months
Intuitive Automata Hong Kong Limited	IT / Telecom	2.5 yrs	6	0	CEO	2.5 yrs

Appendix 1: Interview Questionnaire

(For official use only)

ID No: | | | | |

Questionnaire

Knowledge Exchange and Networking

The Hong Kong University of Science and Technology is conducting a survey of knowledge transfer and networking practices of partner companies in the HK Science Parks.

The International Association of Science Parks (IASP) considers networking as one of the core activities of a Science Park. According to their definition, “a SP stimulates and manages the flow of knowledge and technology amongst universities, R&D institutions, companies and markets; it facilitates the creation and growth of innovation-based companies through incubation and spin-off processes; and provides other value-added services together with high quality space and facilities.

We would like to better understand how partner companies in the HKSTP use knowledge sharing, exchanges and networks to create value for their organisation but also for the whole innovation ecosystem within the science park, the community in Hong Kong and worldwide.

The findings of this study may suggest some practical measures for the HKSTP that could increase the value of networking.

You are not asked to write your name in the survey form. All individual information obtained in the course of this project will be kept strictly confidential and will be used for research purposes only.
Your participation would add greatly to the value of the research. If you have any questions about this study, please contact us directly and we would be happy to answer them.

- Thank you for your help! -

香港科技大學
THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY

SECTION A
General Information

Please check (✓) the appropriate box and fill in the necessary information where required. All information will be kept strictly confidential.

Job Title: _____

Company Name: _____

Company Address: _____

Telephone (Office): _____ _____

Email: _____

When did you join this company? years months

How many years of work experience do you have?
years months
(including work in this company, other organizations etc.)

What is your company's major business?

How long has your company been in the HKSTP?

How many employees are there in your company? _____

In HK_____

Outside Hong Kong_____

Where? _____

SECTION A **The statements below describe the process of knowledge sharing and transfer in your organization. For each statement, please indicate the extent of your agreement or disagreement.**

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
A.1	Employees routinely share ideas and best practices here	❑	❑	❑	❑	❑
A.2	Many of my colleagues participate in cross-functional teams, keep up with external marketplace changes, and solicit outside ideas/views on key projects	❑	❑	❑	❑	❑
A.3	Knowledge sharing is often facilitated here through special events, meetings etc.	❑	❑	❑	❑	❑
A.4	There is a lot of collaboration here between different departments and units	❑	❑	❑	❑	❑
A.5	In this organisation, we communicate mainly face-to-face	❑	❑	❑	❑	❑
A.6	Face to face communication is an effective way of sharing knowledge	❑	❑	❑	❑	❑
A.7	In this organization, we communicate mainly electronically (e.g. emails, intranet, groupware, online discussion forums etc.)	❑	❑	❑	❑	❑
A.8	Electronic communication is an effective way of sharing knowledge	❑	❑	❑	❑	❑
A.9	Knowledge sharing saves a lot of time since we do not have to reinvent the wheel again and again	❑	❑	❑	❑	❑
A.10	The sharing of experience-based knowledge helps avoid costly mistakes	❑	❑	❑	❑	❑
A.11	It will be very difficult to create new knowledge if I do not exchange knowledge with others.	❑	❑	❑	❑	❑

A.12 Could you tell us some examples of successful knowledge sharing and transfer in your organization?

_____

_____

_____

_____

A.13 Would you like to comment on any of the above statements?

_____

_____

_____

_____

SECTION B **The statements below describe how knowledge is created in your organization. For each statement, please indicate the extent of your agreement or disagreement.**

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
B.1	I actively share my experience with others during informal discussions	❑	❑	❑	❑	❑
B.2	My colleagues and I share work or life experiences with each other	❑	❑	❑	❑	❑
B.3	I try to find out others' opinions and thoughts during informal discussions	❑	❑	❑	❑	❑
B.4	I give my thoughts and ideas during informal discussions	❑	❑	❑	❑	❑

B.5 Would you like to comment on the above statement?

_____

_____

_____

_____

B.6 Do you have some other examples of how knowledge is created in your organization?

_____

_____

_____

_____

SECTION C **The statements below describe positive effects of knowledge sharing and exchange. For each statement, please indicate the extent of your agreement or disagreement.**

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
C.1	Increased our knowledge sharing horizontally (across departments, functions or business units)	❑	❑	❑	❑	❑
C.2	Increased our knowledge sharing vertically (up the organizational hierarchy)	❑	❑	❑	❑	❑
C.3	Increased our number of markets (more geographic locations)	❑	❑	❑	❑	❑
C.4	Improved client or customer relations	❑	❑	❑	❑	❑
C.5	Helped us to develop new products or services	❑ (N.A.)	❑	❑	❑	❑

C.6	Increased our adaptation of products or services to client requirements	❑ (N.A.)	❑	❑	❑	❑
C.7	Increased flexibility in production and innovation	❑ (N.A.)	❑	❑	❑	❑
C.8	Prevented duplicate research and development	❑	❑	❑	❑	❑
C.9	Increased our ability to capture and utilise knowledge from public research institutions including universities and government laboratories	❑	❑	❑	❑	❑
C.10	Increased our ability to capture and utilise knowledge from other business enterprises, industrial associations, technical literature etc.	❑	❑	❑	❑	❑

C.11 Could you tell us examples of successful knowledge sharing and transfer with local universities?

C.12 Could you tell us examples of successful knowledge sharing and transfer with other local business/association?

C.13 Would you like to share some stories of failed or difficult knowledge sharing and transfer?

SECTION D **Knowledge exchange and transfer within the HKSTP**
The following questions shall explore your views on the networking opportunities within the HKSTP

D.1 Do you take part in the networking opportunities in the HKSTP, such as public seminars, conferences and others?

D.2 Could you give us some examples on what you found useful or less useful?

D.3 Can you give us some suggestions on how the HKSTP can provide more networking opportunities among partner companies?

D.4 Did informal networking within the HKSTP lead to concreate new business deals/agreements?

D.5 My thoughts on this

SECTION E **Knowledge exchange and transfer outside the HKSTP – locally and internationally**
The following questions are about the importance of networking with the global business and science community.

E.1 In your field of business, what are the key conferences/fairs/any other events that are crucial to attend to keep up-to-date, to develop business and foster relationships?

E.2 Do you have other comments on the importance of networking and knowedge exchange in your field of business?

E.3 Do you have some examples of useful gain from the mentioned conferences/fairs/events?

- End of Questionnaire-