

# Innovation Policy and High Growth Startups

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# Summary

Entrepreneurship brings growth, employment and flexibility to economies, yet the mechanisms are not well understood. Governments frequently set policies to stimulate entrepreneurship but those policies vary and their effectiveness is in dispute. In particular, not all entrepreneurship is of equal value: only a small fraction of entrepreneurs make a substantial impact on the economy. While the stories of highly successful entrepreneurs are well known, the conditions that stimulate high growth entrepreneurship in general are not. This study seeks to add to our understanding of the government's policies intended to stimulate high growth entrepreneurship in Hong Kong by comparing them with the situation elsewhere in the world.

We used three sources of data for our study.

- A survey of 505,000 interviews in 44 countries carried out between 1999 and 2004;
- In-depth interviews with 16 key policy-makers and implementers in the Hong Kong government (see Appendix I);
- Secondary published sources from government, the press and academe.

Our key findings are as follows.

Hong Kong's proportion of entrepreneurial activity that expects to achieve high growth is only slightly below the world average. This statistic measures the percentage of the population starting firms that anticipate hiring over 20 persons within five years. The finding contrasts with Hong Kong's *total entrepreneurship activity* rate, which shows Hong Kong as *much* less entrepreneurial than the rest of the world. This means that a larger percentage of Hong Kong startup companies actually anticipate growing rapidly compared with startup companies elsewhere in the world. In Shenzhen, however, a *much* larger proportion of start-up firms expect to achieve high growth. In Hong Kong, 60 percent of the jobs anticipated to be created by entrepreneurs are accounted for by those with high expectations. Worldwide, high growth expectation entrepreneurship is dominated by wealthy, young, well educated males. In Hong Kong, while the sex and wealth biases persist, the education bias does not: in Hong Kong higher education is not a common route to high-growth entrepreneurship. Entrepreneurship with high growth expectations in Hong Kong is concentrated in consumer services, not in manufacturing, transportation, utilities and other transforming industries.

***Hong Kong's government policies towards high expectations entrepreneurship*** have changed substantially in recent years. Hong Kong has been traditionally characterized by the *laissez faire* approach – free trade, low taxes and small government, regular budget surpluses, minimal interference with market forces, no long-term state planning (with the exception of infrastructure, housing and health care) and no development subsidies or investment incentives. Although the degree of government involvement has increased as Hong Kong has evolved from a fishing village to an entrepôt, to an export manufacturing center, and, after the open door policy of China, to a business service center, and although modest support programs for small and middle sized enterprises have existed, the government has refrained from direct subsidies and investment incentives. After the 1997 handover and the Asian Financial Crisis, the business sector and the government became concerned with Hong Kong's eroding competitiveness, attributed by some to low technology. A new philosophy was implemented involving more direct efforts to support technology development, such as more generous funding of research and development (R&D), building incubators, and providing financing for high growth potential enterprises. These efforts, however, have been subject to resistance, cynicism, bureaucratic inefficiency and a volatile economic environment. Although

government policy has changed since the early years of this decade, the philosophies behind the original and amended policies have not been fully articulated. We believe that no government policy in Hong Kong can survive unless it has the support of the Hong Kong people. This report hopes, through debate, to help reach a consensus as to where policy should lie between the legacy of *laissez faire* and the other extreme of state-interventionism, in order to support high growth expectations entrepreneurship as effectively as possible.

We draw the following the tentative conclusions to serve as discussion points for the forum of 25 May 2006:

- There are strong economic arguments for providing public funding for R&D in industries where Hong Kong already has a comparative advantage.
- The sensitivity of the Hong Kong government to public opinion, its lack of a clear political mandate and the need for transparency in policies means that Hong Kong is not well suited to handle complex schemes to stimulate high growth companies.
- Government-sponsored angel investment has been modestly successful and should be expanded.
- The government should not play the role of venture capitalist in Hong Kong
- The GEM Board has not lived up to its expectations but can provide valuable expansion capital availability to high growth entrepreneurial firms if restructured as a junior, institutional-investor-only, greater China board of the Stock Exchange of Hong Kong.
- Educational resources should continue to be channeled towards increasing the flexibility of the Hong Kong education system in order to stimulate creativity and aspiration towards entrepreneurship.
- Policy attention should be turned to strengthening the attractiveness of Hong Kong as a destination for high quality human capital from Hong Kong itself, from other parts of Greater China and from the whole world.

We first present survey statistics of high expectations entrepreneurship in Hong Kong, comparing them with our sister city, Shenzhen, and with other parts of the world, using data from the Global Entrepreneurship Monitor (See Appendixes II and III). We review how Hong Kong's policies on entrepreneurship have evolved from traditional positive non-intervention, through the new philosophy put forward by Professor Tien Chang-lin (田長霖) in the early years of the Tung Chee Hua (董建華) administration, to the current government's approach of promotion of industrial and research clusters, and discuss the premise that promotion of high growth entrepreneurship is achieved by promoting high technology. The study concludes with a discussion of the human resource development, financial programs and infrastructures required to achieve the new policy.



# Acknowledgements

The importance of high-growth entrepreneurial companies for job creation has only recently been realized. As a result, governments of many economies including Hong Kong have focused their policy measures on these companies. In this study, our Team addressed an important yet little understood issue - how have these policy measures impacted high growth startup firms in Hong Kong?

We would like to express our gratitude to the senior policy makers and individuals in the government and business communities who agreed to be interviewed for this study. They were Dr. Chao Shen-Chang, Dr. Sunny Cheng, Mr. S.W. Cheung, Mr. K. O. Chia, Ms. Sabrina Chow, Ms. Subrina S.Y. Chow, Mr. Alan Ho, Mr. Francis Ho, Dr. York Liao, Prof. Otto Lin, Mr. Sin Chung-Kai, Mr. Alan Wong, Mr. Anthony S.K. Wong, Mr. Robert Jih-Chang Yang, Prof. Kenneth Young, and Mr. Fred Yung. Each of them spent *much* of their valuable time to answer our complex questions. We requested an hour of their time, yet they gave us more. They were candid and forthcoming and this brought us to see that they truly cared about their role in charting Hong Kong's path towards innovation and technology development.

In the course of our study, we rediscovered one of the heroes and architects of Hong Kong's strategy for innovation and technology development, Prof. Tien Chang-Lin, who chaired the Chief Executive's Commission on Innovation and Technology (CIT) from March 1998 to July 1999. Prof. Tien passed away in October 2002 and will be admired and remembered for laying the foundation of Hong Kong's innovation policies and programs.

This study is part of an international research inquiry by the Global Entrepreneurship Monitor Consortium. We thank the Consortium members and Prof. Erkkö Autio for the opportunity to take part in this important and timely study. Prof. Autio is Director of Institut Stratège, HEC Université de Lausanne, and leads the global study. We especially thank Prof. Autio for coming to Hong Kong to be the keynote speaker at the "Innovation Policy and High Growth Startups" forum on May 25, 2006.

I am deeply grateful to my colleagues, Professors Kevin Au, Erik Baark, and Hugh Thomas for their dedication and hard work in this study and in writing the report, and to Professor Wong Kam Fai for his contribution to the interviews. These colleagues aided me with their ability to understand and piece together the bigger picture from the numerous pieces of information that were gathered. While strong in their respective academic areas, they showed the capacity to go beyond and into other disciplines, demonstrating a mindset that is truly needed for this study. We thank the Division of Social Science of the Hong Kong University of Science and Technology's (HKUST) for its support and contribution, making possible the participation of Professor Erik Baark in the study.

The research and administration staff at the Center for Entrepreneurship and at The Chinese University of Hong Kong (CUHK) deserves special thanks for providing needed helpful assistance and expertise. Mr. James Ma and Ms. Rosanna Lo worked on the myriad details required for data collection and analysis, bringing the Report to press, and preparing for the Forum. Ms. Jenny Lam has been helpful with her advice and action in bringing the study to the media's attention. Friends, colleagues and students who volunteered their help and participation in the Forum have our utmost appreciation.

The motivation for this study has come from our earlier work in studying entrepreneurship in Hong Kong and Shenzhen, as the Hong Kong Team in the Global Entrepreneurship Monitor research program from 2002 to 2004. The twin city study was made possible by the financial support of the Trade and Industry Department of the Government of Hong Kong SAR and the SME Development Fund, The Asia Pacific Institute of Business of CUHK, and The Chinese Executives Club of The Hong Kong Management Association. We take this chance to thank them once again.

Finally, we want to express our thanks to the community for their interest in this study. We hope that they will continue to pursue this interest and help bring Hong Kong closer to the vision of a city state that is known for entrepreneurship, creativity, and outstanding advancements in innovation and technology.

Chua Bee-Leng  
Director,  
CUHK Center for Entrepreneurship



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# List of Acronyms

ASTRI	The Hong Kong Applied Science and Technology Research Institute Company Limited
ARF	The Applied Research Fund
CEPA	Closer Economic Partnership Agreement
CIT	The Chief Executive's Commission on Innovation and Technology
CUHK	The Chinese University of Hong Kong
GEM	Hong Kong Growth Enterprise Market
EM13	Education and Manpower Bureau
HKE	Hong Kong Exchanges and Clearings Limited
HKIB	The Hong Kong Institute of Biotechnology Ltd
HKITCC	Hong Kong Industrial Technology Centre Corporation
HKPC	Hong Kong Productivity Council
HKSTP	Hong Kong Science and Technology Parks Corporation
HKUST	Hong Kong University of Science and Technology
IC	Integrated Circuit
IP	Intellectual property
IPO	Initial Public Offering
IT	Information Technology
ITF	Innovation and Technology Fund
ITRI	Industrial Technology Research Institute
ITC	Innovation and Technology Commission
ITSP	Innovation and Technology Support Programme
LEGCO	The Literature Council of the Hong Kong SAR
KBS	Knowledge Based Society
OEM	Original Equipment Manufacturer
PRD	Pearl River Delta
QMAS	The Quality Migrant Admission Scheme
R&D	Research and Development
SCM	Supply Chain Management
SERAP	Small Entrepreneur Research Assistance Programme
SME	Small and Medium Sized Enterprises
VC	Venture Capitalist



## I. Survey Statistics of High Expectations Entrepreneurship

Entrepreneurial creative destruction stimulates economic growth and efficiency<sup>1</sup>. The level of entrepreneurship in Hong Kong, defined as the percentage of the population engaged in starting new companies, is a meager 3 percent, compared with a more "normal" level for developed and emerging economies of about 8 percent. In the past, we have argued that this number is a cause for concern<sup>2</sup>. A valid criticism of our conclusion, however, is that it is based on company creation only. While new firms create most jobs in economies around the world, the distribution of job creation is highly uneven, with a very large proportion of the job creation and GDP growth being accounted for by a small proportion of new companies. A critical policy question, therefore, is how to stimulate the creation of these rapidly growing firms.

We identify companies with rapid growth prospects using the expectations of entrepreneurs. We define a high-expectation entrepreneur as an individual who has started a company within 42 months of the survey date, or is in the process of starting a company, and who expects to employ at least 20 employees within five years through his or her new firm. We pool survey data from 1999 to 2004 (i.e., using six separate survey dates), giving us a total of over 500,000 interviews in 46 countries. Appendix III gives more details about our methodology.

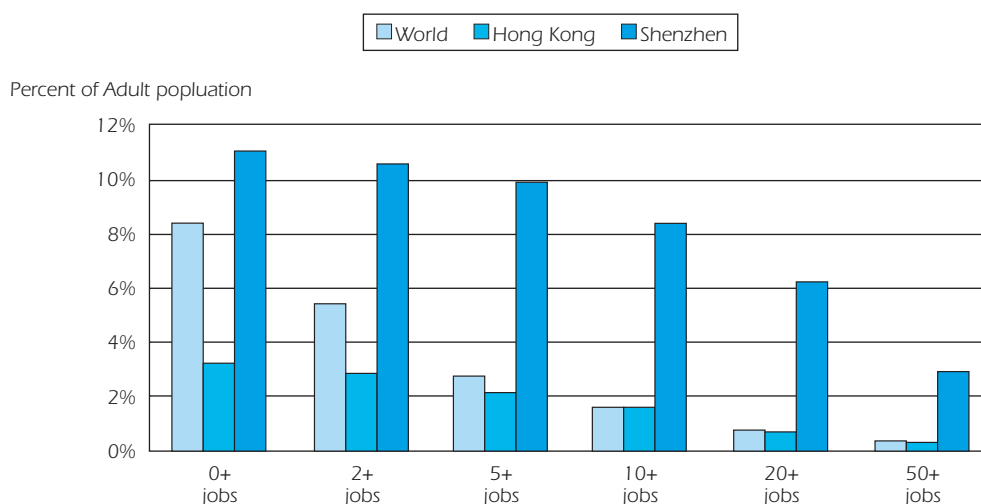
We asked the respondents to the survey: "How many people will be working for this business, not counting the owners but including all exclusive subcontractors, when it is five years old?" Based on their answers to this question, we calculated the proportion of the adult population that is engaged in high growth expectations entrepreneurship. Those entrepreneurs who responded "over 20" we considered to be "high growth expectations entrepreneurs."



<sup>1</sup> Increasingly, economists are accepting the view, propounded by Joseph Schumpeter (1912), that the innovating entrepreneur is the main source of economic progress. Schumpeter's entrepreneur promotes creative destruction by recombining factors of production in new ways to create value, driving out older business models. The entrepreneur may or may not be a capitalist. Many studies focus on creation of new firms and its positive effect on economic growth. Fogel et al. (2005) show that countries with high corporate death rates have the highest economic growth rates.

<sup>2</sup> We expressed these concerns in our collaborative research with the *Global Entrepreneurship Monitor*. See Chua et al. (2003) and Ahlstrom et al. (2004-5) for our own studies, and Reynolds et al. (2000-2004), and Acs et al. (2005) for international studies. For the definition of entrepreneurship used in these studies, see Appendix I.

**Figure 1: Percentage of the Adult Population Starting New Companies by Expectation of Job Creation in Five Years**



Notes: World figures represent those pooled from international data between 1999 and 2004 in the Global Entrepreneurship Monitor studies, including Hong Kong, but excluding Shenzhen. For countries included, see Appendix III  
 Hong Kong figures represent pooled data between 2002 and 2004  
 Shenzhen figures represent pooled data from 2003 to 2004

Figure 1 shows the prevalence of high expectations entrepreneurship. The column entitled 0+ jobs corresponds to the total entrepreneurial activity of the population in the Global Entrepreneurship Monitor. Worldwide, just over 8 percent of the population started or were starting enterprises within 42 months of the survey dates. High growth expectations entrepreneurship, the main subject of this study, corresponds to the second-last column - those respondents who anticipate that the companies they are starting will grow to twenty or more employees within five years. Worldwide, about 0.8 percent of the population is engaged in high expectations entrepreneurship. In other words, only one in ten entrepreneurs expects to grow his or her business rapidly. However, in Hong Kong, where only 3 percent of the population are entrepreneurs, we find that approximately 0.7 percent of the population is engaged in high growth expectations entrepreneurship. Hence, in Hong Kong, about one quarter of entrepreneurs expect to grow their business rapidly. Although Hong Kong's high expectations entrepreneurship is below the world average, it is not nearly as much below the world average as Hong Kong's total entrepreneurial activity is below the world average. When one considers that these data were collected during the years 2002 to 2004, years of economic hardship in Hong Kong, it is likely that the true level of high growth expectations entrepreneurship in Hong Kong is on a par with the world average.

In Figure 1, the results for Shenzhen are particularly striking. There, 10.1 percent of the population are entrepreneurs, and about half of them expect to employ more than 20 people in five years.



Assuming that aspirations are realized, the effect on employment of planned growth is presented in Figure 2.

**Figure 2: Employment Creation by Firm Type: Hong Kong and Shenzhen**

<b>Hong Kong</b>	Number of Firms	Number of Firms (cumulative)	Total Jobs	Total Jobs (cumulative)	Percent of Firms	Percent of Firms (cumulative)	Percent of Jobs Created	Percent of Jobs Created (cumulative)
0 to 1 employee	19	149	6	2,054	13	100	0.3	100.0
2 or more employees	35	130	108	2,048	13	87	5.3	99.7
5 or more employees	23	95	133	1,940	16	64	6.4	94.4
10 or more employees	39	72	452	1,807	26	48	22.0	88.0
20 or more employees	17	33	335	1,355	11	22	16.3	66.0
50 or more employees	16	16	1,020	1,020	11	11	49.7	49.7
<b>Shenzhen</b>								
0 to 1 employee	23	395	14	27,336	6	100	0.1	100.0
2 or more employees	32	372	86	27,322	8	94	0.3	99.9
5 or more employees	51	340	305	27,236	13	86	1.1	99.6
10 or more employees	68	289	838	26,931	17	73	3.0	98.5
20 or more employees	90	221	2,664	26,093	23	56	9.8	95.5
50 or more employees	131	131	23,429	23,429	33	33	85.7	85.7

Our sample of 6,000 Hong Kong residents interviewed between 2002 and 2004, and 4,000 Shenzhen residents in 2003 and 2004, identified 149 and 395 entrepreneurs respectively<sup>3</sup>. Using the expectations of the number of jobs these entrepreneurs intend to provide in five years, we can calculate the impact of high expectations entrepreneurship, assuming expectations are realized. In Hong Kong, 11 percent of the sampled entrepreneurs who will employ 50 or more employees will account for 50 percent of jobs created by new firms, while the 22 percent of firms who will employ 20 or more employees will account for 66 percent of the new jobs. In Shenzhen, one third of those who will employ 50 or more employees will account for 86 percent of newly created jobs, while the 56 percent expecting to employ 20 or more employees will account for 96 percent of new jobs.

Figure 3 presents the summary calculations for different areas of the world from our global study.

**Figure 3: Employment Creation by Firm Type: Global Comparison**

	Number of Employees	Cumulative Percent of Companies	Percent of Jobs Created
Hong Kong	20 or more	22	66
	50 or more	11	50
Shenzhen	20 or more	56	96
	50 or more	33	86
Asia Emerging	20 or more	9	78
	50 or more	5	69
Asia Developed	20 or more	13	68
	50 or more	4	49
North America	20 or more	15	77
	50 or more	6	60
Europe	20 or more	12	69
	50 or more	4	52
Oceania	20 or more	11	71
	50 or more	4	54
Africa	20 or more	6	61
	50 or more	3	50
Latin America	20 or more	8	50
	50 or more	2	31

Figure 3 shows that, throughout the world, rapidly growing firms are disproportionately important to increasing employment and, by implication, economic growth. Their importance ranges from Latin America, where 8 percent of new firms have high expectations and expect to account for 50 percent of new jobs, to developed Asia, where 13 percent have high expectations and expect to account for 68 percent of new jobs. Note that Hong Kong and especially Shenzhen are outliers: here, a far larger percentage of companies expect to be high growth companies, accounting for a higher percent of job creation.

Our use of expectations may be criticized. There is no guarantee that expectations will be fulfilled. Entrepreneurs are notoriously optimistic, and a large percentage of new companies fail<sup>4</sup>. However, we believe that the failure rate is no higher among high growth expectations than among low growth expectations businesses.

Moreover, the potential for explosive growth of a small proportion of the high growth expectations firms leads us to believe that high expectations entrepreneurship is more valuable in terms of job creation than the above table indicates.

<sup>3</sup> Note that although the Global Entrepreneurship Monitor studies from which these data were gathered were conducted between 1999 and 2004, Hong Kong participated only in the last three years and Shenzhen in the last two.

**Figure 4: Percent of Entrepreneurs Who Are Male**

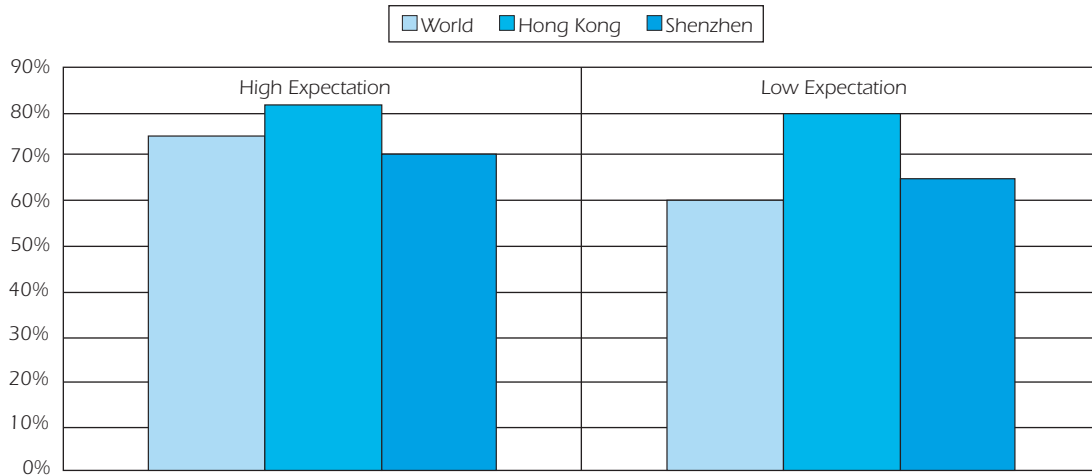
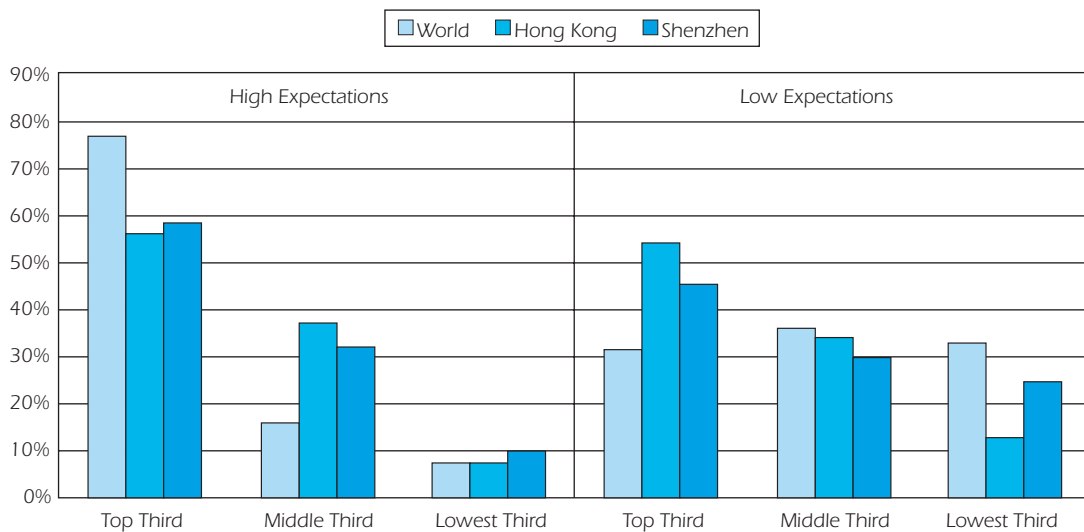


Figure 4 shows the gender distribution of high growth expectation entrepreneurship. Those who start companies are more likely to be men than women and that gender bias is stronger for high growth expectations firms than for low growth expectations firms – in other words, male entrepreneurs are more growth oriented. In Hong Kong, the gender bias is even more pronounced than in the rest of the world, with 81 percent of high growth entrepreneurs being male. Interestingly, the gender bias in Shenzhen high growth expectations firms is slightly smaller than in the rest of the world.

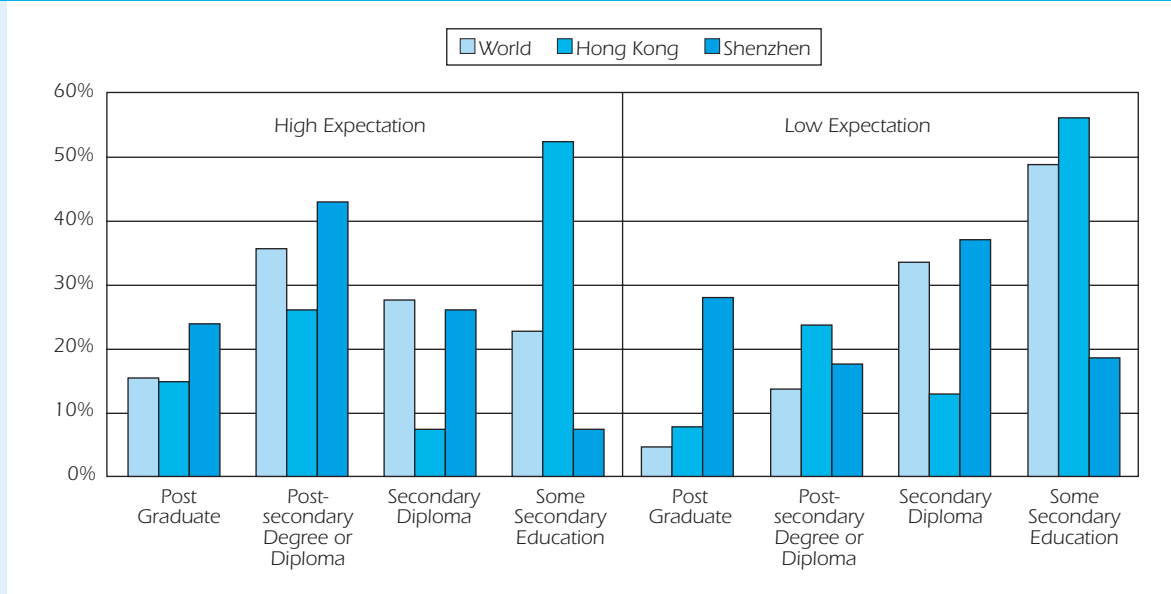
**Figure 5: Distribution of Entrepreneurs by Income**



Worldwide, high-growth expectations entrepreneurs tend to come from the highest third of income earners within each country. When one strips out high growth expectations entrepreneurship from the sample, the distribution worldwide of entrepreneurship tends to be roughly independent of income distribution. In Hong Kong, however, the difference between income distributions of high versus low growth expectations entrepreneurship is not pronounced. Interestingly, Shenzhen appears to be more like Hong Kong than the rest of the world.

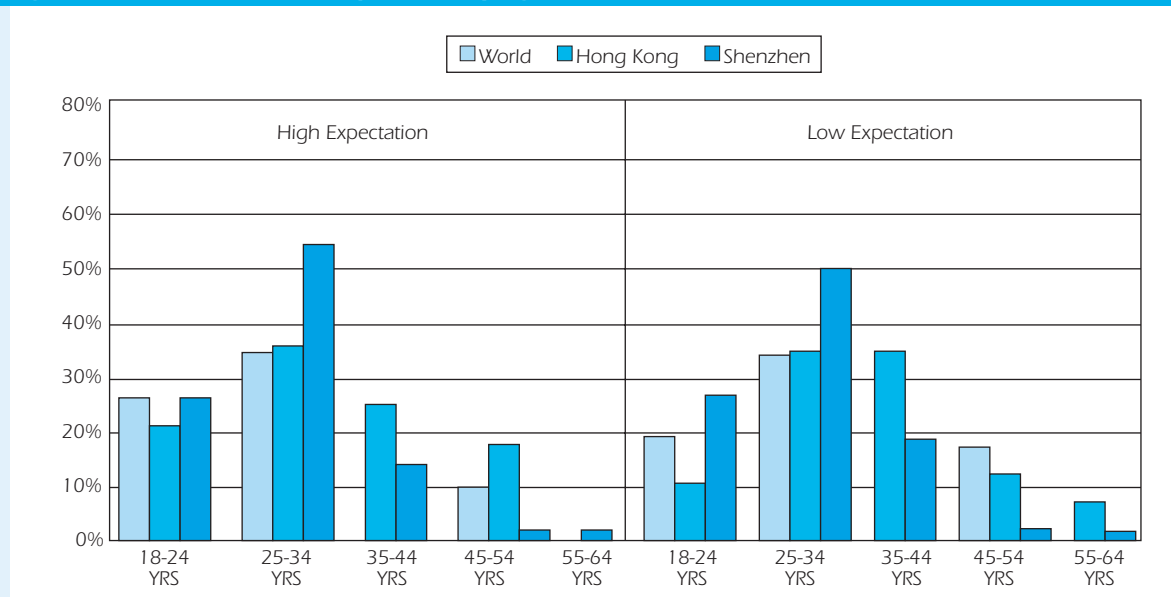
<sup>4</sup> In the US the five year success rate of startups, defined as registered companies, is about one quarter, but that probably overstates failure of full startups, since not all registrations proceed to startup. That percentage certainly exceeds the failure rates of small businesses that actually achieve sales. The death rate across all firms is about 10 percent per annum (US Census Bureau, 2006). The mortality rate for small businesses within five years is 34 percent, while the failure rate for those with the lowest sales is about 50 percent. See Bates and Nucci (1990). These numbers are roughly corroborated by small business surveys that show that about a quarter of small businesses surveyed would likely leave the business in the next few years. See National Federation of Independent Business (2001). We are not aware of corresponding statistics for Hong Kong.

**Figure 6: Distribution of Entrepreneurs by Education**



High expectations entrepreneurs tend to be more highly educated, as is shown in Figure 6. About half the high expectations entrepreneurs in the world at least have a post-secondary degree or diploma (i.e., combining those with post graduate and post secondary diplomas or degrees). Shenzhen and Hong Kong, however, demonstrate departures from the global norm. In Hong Kong, a comparatively low 41 percent of high growth expectation entrepreneurs have at least a post-secondary diploma, while 52 percent have only some secondary schooling. The opposite is true in Shenzhen, where a remarkable 67 percent of high growth expectation entrepreneurs have at least a post-secondary diploma, while only 7 percent have only some secondary education. Note that this bias towards more educated entrepreneurs in Shenzhen and less educated entrepreneurs in Hong Kong is evident even among the lower expectation entrepreneurs. This may be caused in Hong Kong by a relatively equal appreciation among all sectors of society, regardless of education, of the availability of entrepreneurship opportunities. It may also be caused by a stronger risk aversion among more highly educated Hong Kongers coupled with a strong supply of alternative, more stable career paths for those with higher education.

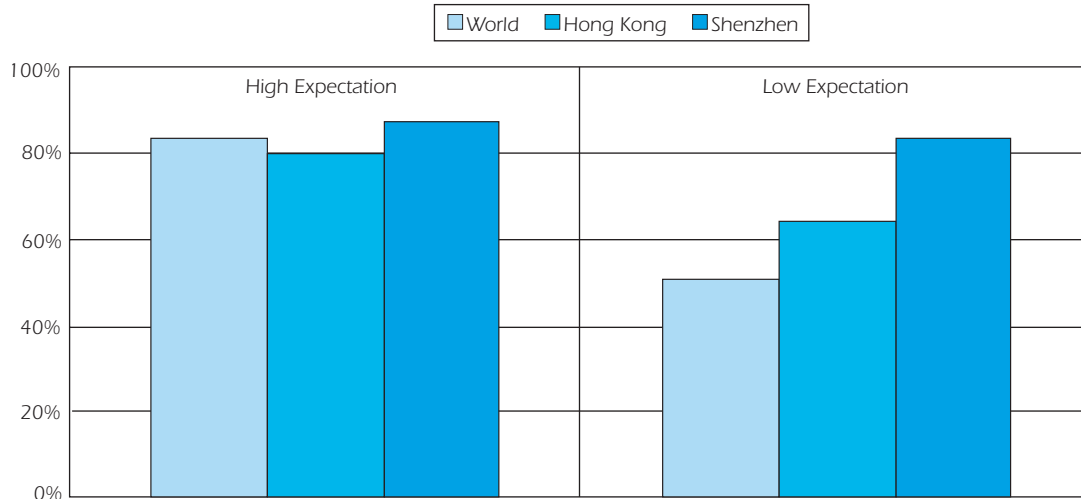
**Figure 7: Distribution of Entrepreneurs by Age**



Note: Data missing for World in various age categories

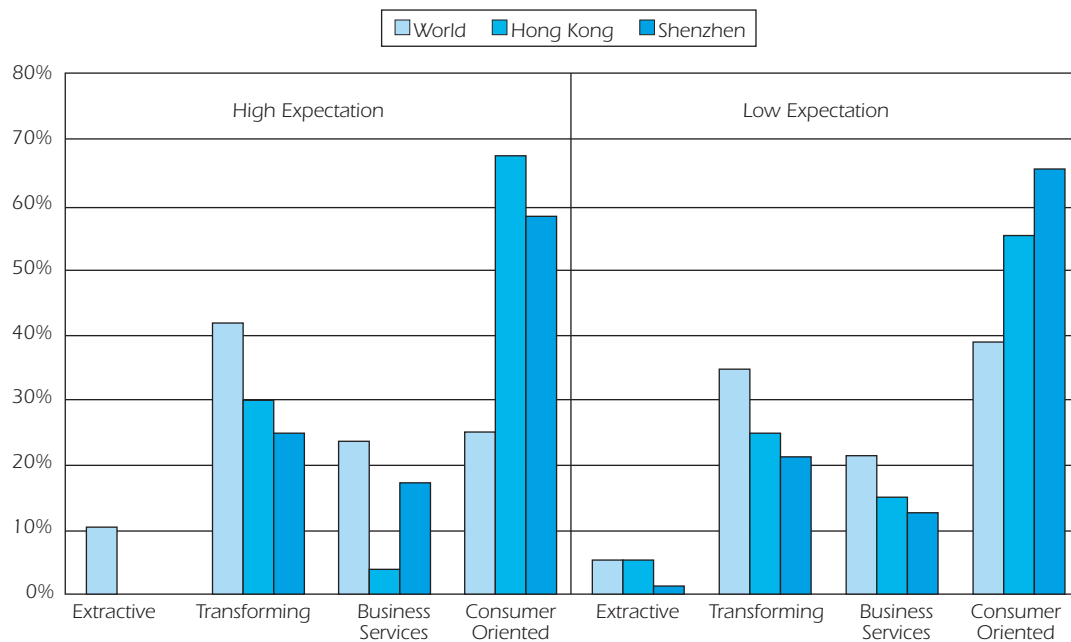
Concerning the age distribution, we are unable to draw firm conclusions except that there seems to be a slight age bias towards the young in high growth expectation entrepreneurship. This appears to be even greater in Shenzhen, a young immigrant city.

**Figure 8: Percentage of Opportunity Entrepreneurs**



We asked each respondent whether he or she was starting a company to take advantage of an opportunity or because they had no better choices for work. We call the former "opportunity entrepreneurs" (as opposed to "necessity entrepreneurs"). Figure 8 shows the percentage of opportunity entrepreneurs among high growth expectations and low growth expectations entrepreneurs. Not surprisingly, worldwide, over 80 percent of entrepreneurs with expectations of high growth start businesses because they are taking advantage of opportunities, not because they have no better choices for work.

**Figure 9: Distribution of Entrepreneurs by Industry**



Note: Extractive includes agriculture, forestry, fishing, mining and construction.  
 Transforming includes manufacturing, transportation, communications, utilities, wholesale, motor vehicle sales and services.  
 Business services includes financial, insurance, real estate and other business services.  
 Consumer oriented includes retail, hotel, restaurant, health, education, social services, and consumer services.  
 Some World categories are estimated by setting the industry proportions of early startups equal to those of nascent companies.

We divide high and low growth expectation entrepreneurship companies by industry in Figure 9 and show the proportion of high expectations and low expectations entrepreneurs in one of four industry groups: extractive, transforming, business services and consumer oriented. Worldwide, high growth expectations entrepreneurship is concentrated in transforming industries, where most high technology is employed. In Hong Kong, however, high growth expectations entrepreneurship is concentrated in consumer services. Here, the association between high growth and high technology is much weaker. We will discuss this association and its implications for government policy in Section 4 below.

## 2. Hong Kong's *Laissez Faire* Legacy and Industrial Development

Throughout some 150 years of colonial administration, the Hong Kong government used a *laissez faire* approach to governance. The essential features of the *laissez faire* approach in Hong Kong included free trade, no import or currency restrictions, low taxes and small government, negligible state borrowing, regular budget surpluses, minimal interference with market forces, no long-term state planning, and no development subsidies or investment incentives.<sup>5</sup>

Under the British, *laissez faire* in economics went hand-in-hand with a deep reluctance among officials to become involved in social development, combined with a marked preference for leaving Chinese society to manage its own affairs. Politics was in the hands of the colonial administration and its co-opted collaborators in the business (compradors) and professional classes. Hong Kong people were satisfied with rapid economic growth, freedom of speech, and high social mobility. Conflicts latent in society were absorbed and resolved through market competition.

The main characteristics of *laissez faire* as a governing philosophy are outlined below. But it should be remembered that even traditional Hong Kong *laissez faire* has been tempered by governmental encouragement of industrial development and various modest attempts to raise the technology level of industry.<sup>6</sup> We end this section's review with a reflection on state intervention in the new economic and political environment.

### Positive Non-Interventionism

From the mid 19<sup>th</sup> century through the 1980s, Hong Kong progressed from a fishing village to an entrepôt, to an export manufacturing center, and, after the open door policy of China, a business service center. As society developed, the degree to which the government intervened in socio-economic affairs gradually increased. The following excerpt, capturing the nature of the increasing government interventions, beginning in the 1970s, when Hong Kong went through a period of rapid socio-economic development, is from a speech delivered by Sir Charles Philip Haddon-Cave, the then financial secretary of the Hong Kong government, back in 1973:

...the government's involvement in the community's affairs has steadily become prominent over the years and, while I do not anticipate a greater degree of interference with the economy, I am sure the degree of involvement must continue to increase. There is a need in a more complex society to take care to ensure that private and public sector activities are in basic accord and there is much that the government can, and indeed must, do if it is to help ensure that a high growth rate is maintained. *This does not involve planning, macro-economic management and laying down what private enterprise should do*; rather, it means that the government must *accept such responsibilities as are necessary to ensure that management decisions are not frustrated either by unnecessary constraints or by the absence of facilities and services which only government can provide, or by imperfections in the operation of the market mechanism leading to economic inefficiency or social distress which only the government can remove.*<sup>7</sup>

Haddon-Cave, who had a dominant role in the government, first as Financial Secretary from 1971 to 1981 and then as Chief Secretary from 1981 to 1985, was the architect of modern Hong Kong's philosophy of political economy<sup>8</sup>. Soon after he became Chief Secretary, he detailed the requirements for successful public policies in Hong Kong: they must be *clear, credible, determined and persistent*. He felt that, firstly, the government needs to recognize the effect of the economy on public policy. The Hong Kong economy is externally oriented, so public policies, where appropriate, must maintain the efficiency of the market such that Hong Kong's economy continues to be globally competitive. Second, the government needs to develop and adhere to a coherent philosophy to guide policy-making. Haddon-Cave's philosophy was positive non-interventionism, a term he coined in 1983. He described the concept this way:

<sup>5</sup> Goodstadt (2005)

<sup>6</sup> If housing, land policy, healthcare and education are considered, the claim that Hong Kong is traditionally a *laissez faire* economy is false. Here, we use the term to apply to industrial policy.

<sup>7</sup> Woronoff (1980) p.38.

<sup>8</sup> The impact of Haddon-Cave continues to the present, as references to his philosophy and actions by the current Chief Executive, Donald Tsang, demonstrate.



Positive non-interventionism involves taking the view that it is normally futile and damaging to the growth rate of an economy, particularly of an externally oriented economy, for a government to attempt to plan the allocation of resources available to the private sector and to frustrate the operation of market forces, no matter how uncomfortable may be their short term consequences. *The implication of the adjective 'positive' are important: when faced with an interventionist proposal, the Hong Kong Government does not simply respond that such a proposal must, by definition, be incorrect.* It is true that, more often than not, we come to the conclusion that the balance of advantage lies in not intervening. Yet, in all cases, decisions are made positively, and not by default, and only after the immediate benefits and costs, to the extent that they can be confidently predicted, are weighed against the medium and longer term implications of the interventionist acts proposed [including the inevitable difficulties of unwinding them]. To strike the right balance is not easy for we live in a dynamic world and so philosophy has to be diluted with pragmatism. In any particular case, the trick is to avoid being unnerved by short term difficulties for which market forces would provide the best solution in the course of time....*positive non-interventionism should not be interpreted to mean, necessarily, the absence of interventionism* [author's emphasis] but, of course, great care must be taken to ensure that acts of interventionism which can be justified individually do not have adverse cumulative effects or, worse still, lead to interventionism for its own sake<sup>9</sup>

Third, policies need to show sympathy to individual aspirations. In this sense, public policies have to convey a sense of social responsibility since there are individuals and private firms that cannot benefit from available opportunities. Nevertheless, the basic principle is that social policies are not to interfere with the operation of the free enterprise system. Finally, Haddon-Cave emphasized that the size of the public sector must be kept under careful control. Given the circumstances in Hong Kong, public spending needs to be monitored, especially when debt financing is involved.

## Industrial Development of Hong Kong

At the end of World War II, Hong Kong already had a variety of industries, including ship-building, textiles and plastic products. The civil war in China drove many industrialists from Shanghai and other places in China to flee to Hong Kong and accelerated its industrial development. The Korean War in 1950-1954 led to a United Nations embargo on all trade with the People's Republic of China, forcing Hong Kong to shift focus from China to the markets of North America and Europe and to complement its traditional trading role with manufacturing for export markets. Because of the small local market, firms had to make use of Hong Kong's comparative advantage to produce and export labor-intensive goods, such as textiles and clothing. Exporting grew dramatically in the 1950s as the world's developed countries rebounded from the war and as trade barriers started to drop.

Small and medium-sized enterprises (SMEs) in Hong Kong, as in most other market-based economies, give birth to new manufacturing activity. What is exceptional in Hong Kong, however, is that these SMEs remained small when the export market continued to grow.<sup>10</sup> A combination of factors may explain this phenomenon. The *laissez faire* policy nurtured a business environment that encouraged many of the refugees, who fled from mainland China, to open their own firms. As a result, many small firms continued to emerge to replace less efficient ones. A more important factor is an alternative path of success that SMEs created for themselves irrespective of their size. Most of the small firms in manufacturing were original equipment manufacturers (OEM) that took orders for labor-intensive goods from overseas buyers. Relying on their social networks, small firms were able to obtain information, technology, and capital in an efficient way. They were competitive because they were flexible, capable of reacting quickly to market changes, while keeping costs low.<sup>11</sup>

## Governmental Measures to Support SMEs

Despite their success, owners of SMEs, many of them industrialists, were not completely satisfied with the non-interventionist policy. As early as the 1950's, they lobbied the government to provide industrial land and to set up an industrial bank to provide cheap loans. Despite this, the newly reclaimed land in Kwun Tong was auctioned openly instead of restrictively as suggested by the industrialists. Moreover, the Industrial Bank Committee

<sup>9</sup> Haddon-Cave (1982) p.17.

<sup>10</sup> In the 70's an average manufacturer had 25 employees. Yet, the average went down to lower than 16 by 1989. See Mo Kai (1997)

<sup>11</sup> Strong family ties among Chinese people combined with unique institutional factors can be used to explain the development of Hong Kong. See Redding (1990).



which evaluated the industrial bank suggestion did not find such a need in their 1960 report. Politics also played a role in the decision, as the Committee had no prominent industrialist as a member.<sup>12</sup> Although the colonial administration absorbed business elites into its government, British hong, exodus industrialists from Shanghai, and local compradors were the targets of co-optation at that time. Local industrialists had little influence on governmental policies until much later.

Their weak political connections kept local industrialists from obtaining any direct help from the government. Meanwhile, exports boomed in the 1960's, reducing industrialists' need for assistance. Nevertheless, their plea eventually prompted the government to put forward a highly restrictive scheme in 1972 to assist SMEs for the first time. Accordingly, firms with three years of financial records could borrow loans from a bank to renew equipment. The government would guarantee the loan, so that the company could enjoy a favorable rate of two percent above the interbank borrowing rate. The response was disappointing, however. There were only nine applications and six approvals. The government relaxed the conditions in 1973, but applications remained low because SMEs were able to find other, less troublesome, ways to finance themselves from the market. This scheme was later dropped.

In the 70's, the industries in Hong Kong experienced a shock, which was so serious that adjustment through market mechanism alone was deemed not enough. The 1973 oil crisis and overseas competition threatened the colony to such an extent that the government decided to assist the industries in upgrading themselves. The Report of the Advisory Committee on Diversification in 1979 was the first comprehensive study of Hong Kong's economy and made 47 policy suggestions. As a result, various public agencies and organizations, such as the Hong Kong Industrial Estates Corporation and Hong Kong Productivity Council (HKPC), were set up to supply industrial land, trading support, various kinds of training, new technology and products, quality assurance, etc. In addition, roads and ports were built to connect Hong Kong with China, and new container ports were constructed to expand trade and re-export. The Convention and Exhibition Centre was also built to promote tourism and exhibition businesses.

These measures helped diversify Hong Kong's economy and gave a boost to the SMEs. But a larger factor in transforming Hong Kong's economy came from China's open door policy in the 80's and 90's. Many of Hong Kong's manufacturers enjoyed huge growth, as they took advantage of the cheap labor and abundant land in China. They, in turn, spurred new SMEs to emerge in Hong Kong to provide services for trade, marketing and design, financing, insurance, logistics, and wealth management flowing from China's growth. These services replaced the labor-intensive manufacturing, which was no longer competitive in Hong Kong. In the process, SMEs split the valued added activities in a so-called "front shop, back factory" manner, using services in Hong Kong and producing in the Pearl River Delta (PRD) of southern China. The wealth created in the PRD was plowed back to Hong Kong, and domestic services, real estate, and the stock market enjoyed a boom.<sup>13</sup>

The Asian Financial Crisis put an abrupt stop to the boom. Many SMEs were hard-hit. Inflation of the 1990s had increased labor expenses and rent, reducing profitability of businesses. The "bricks-and-mortar" culture ingrained in bankers and SME owners had allowed mutually beneficial business during the property boom but collapsed property prices reduced the collateral value for bank loans and, consequently, SMEs' borrowing capacity. Liquidity fell and bankruptcies increased. The government, facing crisis, responded to the needs of the business sector. The Special Financial Scheme was set up in 1998 to provide emergency support for SMEs to ride out the worst time. Essentially, the government acted as guarantor for SMEs to secure loans from banks. The scheme was stopped in April, 2000 when the maximum committed amount (HK\$5 billion) was reached. While controlling the immediate damage caused by the downturn, the government commissioned the SME Committee to look into overhauling the policies on SMEs.

The Report on Support Measures for SMEs released in 2001 proposed administrative and policy changes. The Trade and Industry Department was repositioned as the front-line office to support SMEs, together with

<sup>12</sup> The six-man Committee was composed of four bankers, one Indian merchant, and a legislative councilor. The colonial government was observed to have maintained a much better relationship with financial-commercial elites than with local industrialists, and sided with their interests. See Chiu (1994).

<sup>13</sup> Services were competitive because of the unique features of Hong Kong: ability to connect globally, infrastructure, entrepreneurship, concentration of overseas firms, industrial clusters (e.g., electronics), transparent business systems, etc. Many of these features, except location, are a path-dependent result of Hong Kong's development in the past. See Enright et al (1997). Hong Kong was attractive as a business base and residence for business owners because of quality its of life, rule of law, access to information, and networks of services, especially those that support business and wealth management. See Gill (2002).

assistance provided by other departments or government funded agencies, such as the Trade Development Council and the subsequent Closer Economic Partnership Arrangement (CEPA). The government set aside HK\$1.9 billion in 2002 and made a maximum commitment of HK\$7.5 billion to implement four funding schemes (see Figure 10). Some programs were particularly creative. For example, the Pilot Mentorship Programme gave the chance for a less experienced entrepreneur to learn from a more experienced one. Two reviews in 2002 and 2005 endorsed the effectiveness of the four funding schemes. Administrative procedures were rationalized to facilitate application, and more money was injected. However, the SME Training Fund was terminated in 2005.

### Figure 10: Measures Proposed in the Report on Support Measures for SMEs

In June 2001, the Small and Medium Enterprises Committee submitted to the Chief Executive a report on SME support. The report studied long-unsolved, underlying social and economic problems that hampered the competitiveness of SMEs and proposed various measures to achieve several objectives:

- to promote and maintain a business-friendly environment;
- to provide SMEs with more ways of raising finance;
- to raise the level of their human sources; and
- to expand their markets, and to promote technology use.

The report, in particular, established four SME funding schemes to achieve these objectives:

#### (1) SME Business Installations and Equipment Loan Guarantee Scheme

A SME, which has accounts receivable in hand, may obtain up to HK\$4 million guarantee from the Government (HK\$2 million for business installations and equipment loans, HK\$1 million for conditional working capital loans, and another HK\$1 million for loans based on accounts receivable). With the HK\$4 million guarantee, the SME may raise loans of no less than HK\$8 million from lending institutions. Alternatively, SMEs which do not purchase business installations and equipment may obtain up to HK\$1 million Government guarantee for loans based on accounts receivable. This would enable them to raise loans of no less than HK\$2 million from lending institutions to improve cash flow.

#### (2) SME Export Marketing Fund

This encourages SMEs to expand businesses through participating in trade fairs, exhibitions and study missions held outside Hong Kong, as well as local trade fairs. The maximum amount of grant would be 50% of the SME's total expenditure on fundable items of the approved export promotion activity, or HK\$40,000 (whichever is less).

#### (3) SME Training Fund

This encourages SMEs to enhance human resources by providing them with financial assistance when they send employers or employees to training which is relevant to their businesses. The total maximum amount of grant an SME may obtain is HK\$30,000.

#### (4) SME Development Fund

This funding supports non-profit-distributing organizations to implement projects which are conducive to enhancing the competitiveness of SMEs. The maximum amount of funding support for each approved project is HK\$2 million or 90% of the total project expenditure.

## Government Policies on Raising the Technology Level of Industry in the Context of Hong Kong's *Laissez Faire* Legacy

The open-door policy in China allowed Hong Kong companies to expand and prosper, increasing value added through exploiting lower land and labor costs in the PRD and the rest of China, rather than by technological innovation to improve productivity. As we discuss in Section 4 below, R&D is a public good that the private sector provides in an amount less than its social optimum.<sup>14</sup> The government, noting the dearth of innovation and the economic rationale for publicly subsidized R&D, started a series of modest programs in the 1990s to encourage technological innovation in industry and research in universities, but no change of philosophy occurred until after 1997.

The modesty of Hong Kong's approach to innovation was well founded. Hong Kong does not own or control fundamental inventions and key technologies, and most Hong Kong firms are far from being hi-tech. In studies in the early 1990s, it was noted that Hong Kong industry should focus on acquiring modest amounts of commercially available and mature technologies to fill specific missing links and develop niche markets that command high profitability rather than engaging in broad programs of fundamental early stage research.<sup>14</sup> Hong Kong could not afford to invest in all industries. But focused acquisition of technology is problematic. Although it requires less investment than fundamental research, such a strategy requires a sophisticated understanding of various specific industry requirements and in-depth knowledge of those industries' value chains. Yet such understanding and knowledge was not available generally in industry, let alone in the government, in the 1990s.

Moreover, the process of choosing certain industries or research to receive support would have been problematic. Public choices favoring one industry over another are politically controversial. The Hong Kong commitment to *laissez faire* would have made such "picking of winners" even more difficult. From the public's point of view, most people would have regarded proposals to invest in particular industries as futile and wasting public money. The market was believed to be capable of doing the job.

Three factors converged in 1997 to shake this confidence in the market and change the government's philosophy away from positive non-intervention to something new, yet not articulated. These three factors were:

- The return of Hong Kong from the UK to China and the consequent change in the head of government from Governor Chris Patten to Chief Executive Tung Chee Hua;
- The rapid rise of technology-based companies in other parts of the developed world in what became identified in retrospect as the "high tech bubble" or "Internet bubble" and
- The Asian Financial Crisis that plunged Hong Kong into six years of recession and deflation.

As we describe in detail in Section 3 below, Tien Chang-lin, Vice-Chancellor of the University of California, Berkeley, was recruited to spearhead the changes.<sup>16</sup> Perhaps Prof. Tien's sudden death and the lengthy recession were instrumental in obstructing the development of a new philosophy on technology development in Hong Kong, or perhaps such a fundamental change could not have been achieved in part because of the *laissez faire* legacy and the post-handover structure of Hong Kong government.

The formerly colonial government structure, now enshrined in the Basic Law, imposes obligations on the administration to adhere to stricter interpretations of *laissez faire* than the previous colonial administration. At the same time, the role of the business elite in the power structure has dramatically increased. The principles, policies and political arrangements of the past were not crafted to create the ideal environment for capitalist growth. They were designed to allow the colonial administration to rule a British enclave always at risk of being overwhelmed by the Chinese world. But the endorsement of the traditional structures and policies in the Basic Law produced problems when the environment changed and the old philosophy clashed with demand for new policies.<sup>17</sup> At the same time, the lack of a fully democratically elected legislature and Chief Executive robbed the government of the mandate it needed to endorse a new philosophy and implement complementary policies.

Since the handover, politics, economics and several perceived policy missteps, have reinforced popular suspicion that "violations" of *laissez faire* amount to favoring vested interests. The Asian Financial Crisis spurred the government to boost the economy, but some of the proposed policies and projects were not planned or implemented carefully and were withdrawn quickly without even making a real start. The "Chinese Medicine Harbour" is one example. Although many of the proposals were aimed at the long term, their swift withdrawal only gave the impression that they were governmental efforts to support failing industries, a futile policy if markets are efficiently operating. Worse still, some efforts were suspected of using technological development as a disguise for passing favors to particular blocs of interests. A case in point is the construction of the Cyberport by PCCW, a company owned by the son of a local tycoon. Many people became cynical towards the real intentions behind technology projects. Some were also disappointed and angry at what they saw as the fair business environment—a bedrock of Hong Kong's prosperity—being undermined by the government.

<sup>14</sup> As technology diffuses quickly to others players, individual firms cannot recuperate their investment completely. Governments are bound to intervene, lest insufficient R&D investment would result. See Arrow (1962).

<sup>15</sup> See Kao and Young (1991)

<sup>16</sup> See Tien (1998 and 1999)

<sup>17</sup> See Goodstadt (2005), p. 202.

Legislators, in tune with the cynicism, kept a close watch on various programs of technology funding. Reacting to criticisms of cronyism and unfairness, the government put in numerous checks when funding new research and ventures. As we discuss in Section 6, funding amounts were kept small (each up to a few million dollars), so multiple rounds of funding were required for a project. Successful applicants were under heavy scrutiny, as funding agents were accountable to layers of internal inspection and public monitoring. Frequent review meetings and audit reports frustrated many entrepreneurs and investors. Government officials also ended up in internal fights at times. Lacking experience in technology policies and lacking coordination, the government's actions of implementing more programs only fueled conflicts, as we discuss in Section 3. Under these circumstances, early failures in funding technology ventures were regarded as evidence that attempts should not be made to change the *laissez faire* policy,<sup>18</sup> and its underlying philosophy.

Many would argue that maintaining the *laissez faire* philosophy does not make Hong Kong the 'last bastion of unfettered capitalism'. Anthony Cheung, a political scientist and currently an Executive Councilor, believes that the Hong Kong philosophy cannot even be described as positive non-intervention.

...By the eve of the transfer of sovereignty, what had emerged was not a Hong Kong model of non-interventionism, but a model of state interventionism driven by bureaucratic reformist sentiments with a clear desire to maintain the city's international competitiveness and political legitimacy and stability.<sup>19</sup>

He cited several others who shared his view. For example, Y.W. Sung, an economist, pointed out that there was clearly active intervention in terms of state expenditure on physical and human capital investment in an effort to promote and facilitate economic growth. Another economist, J. R. Schiffer, argued that Hong Kong's market forces rested on 'an infrastructural support system of non-market regulation of economic activities, administration of key prices, subsidization of "the social wage", interference in (and distortion of) all factor markets, and ownership of one of the two factors of production that are subject to such property arrangements'.<sup>20</sup> Therefore, despite the absence of macroeconomic planning and of subsidies for faltering industries as observed in some Western economies, many non-market forces existed, and non-intervention was only achieved at the micro-level of market operations.

Cheung concluded with the observation that

A more indigenous SAR state, facing economic challenges unseen over the past few decades, and beginning to take bold steps in intervening in the market so as to maintain stability, is charting a course of no return.

The reluctance to intervene applied to government officials in the colonial era, but that has been eroded since the handover. In the realm of technology development, John Tsang, the Head of the Commerce, Industry and Technology Bureau, made the explicit comment in 2005, "The government intervenes into the development of technology out of its usual practice."<sup>21</sup> As we discuss in Section 3, the government has now picked several areas for focused support: intervention may not be a taboo any more, at least among some government officials, but the philosophy for intervention is not well developed and efforts by the government to intervene are likely to be viewed with suspicion.

This suspicion was reflected by a legislator we interviewed who noted that the government basically focuses on training (through Vocational Training Centers), education, marketing through the Trade Development Council, and trade negotiation. He emphasized and that only industries that have lost their edge, such as film-making, would ask for government help. With such views currently held, the government will find it hard to legitimize and implement even its most concerted efforts to intervene in certain specified targeted industries.

As Hong Kong opinion leaders continue to query and criticize the consistency and bias in policy-related decision making, and debates continue over the continued applicability of positive non-intervention, it is useful to remember Haddon-Cave's prescription: effective government policies must be clear, credible, determined and persistent. In the next section, we will review and evaluate several efforts of the government to push ahead technological development during the period when the *laissez faire* legacy was retaining its position as the philosophy for policy formation in Hong Kong.

<sup>18</sup> Early problems and the reasons of failure have been discussed. See Dong (2000) and Zhang and Zhang (2000).

<sup>19</sup> Cheung (2000)

<sup>20</sup> Y.W. Sung (1986), pp. 137-138 and J. R. Schiffer (1983), p. 3.

<sup>21</sup> Tsang made this comment concerning the technology policies of the government during an interview with a journalist. See *Hong Kong Economic Journal Monthly*, (March 2005), 26-32.

### 3. From Embracing of High Technology Entrepreneurship to Development of Clusters

During 1997, the political and economic situation in Hong Kong presented a number of challenges, as we have described in Section 2. These appeared to require a new approach—one of extending government assistance beyond "positive non-intervention". The most conspicuous initiative that came about as a result of these challenges was the setting-up in March 1998 of The Chief Executive's Commission on Innovation and Technology (CIT) under the chairmanship of Professor Tien Chang-lin, the former Vice Chancellor of the University of California, Berkeley.

In its first report, the CIT outlined a vision underscoring that "innovation and technology are vital to the future prosperity of Hong Kong."<sup>22</sup> The commission explored the potential for revitalizing Hong Kong's economy with more innovative and technology-based industries and presented general arguments for more active support by the government in this field. At the same time, Professor Tien undertook a long campaign to muster support for innovation and more appreciative attitudes to science and technology in the community. The CIT held consultative meetings with influential groups in the society and thus initiated a debate on the prospects of high technology development in Hong Kong. This effort was further boosted by the global optimism that surrounded high technology during the end of the 1990s.

In this way, the work of Professor Tien and the CIT became a watershed event in the political support for high technology in Hong Kong. A leading entrepreneur argued that Tien's paper marked the start of innovation and technology development in Hong Kong.

Tien managed to get approval from the government for an earmarked grant of HK\$5 billion. It was a good attempt, but the problem was that Tien probably thought that the HK\$5 billion was for a year or two, but the bureaucrats thought that it was for 10 years.

Indeed, several observers believe that despite all the enthusiasm and interest in embarking on a development strategy based on innovation that Tien Chang-lin managed to generate in society, he still hardly managed to alter the ingrained attitudes and short-termism that was pervasive in the administration. Thus, a leading academic administrator commented:

At the onset, Tien [Chang-lin] was the one who gave Tung [Chee Hwa] the push to get innovation and technology initiatives going. Tung along with other government officials did not really understand innovation and technology development however. When Tien presented Tung with the initial ideas, Tung asked Tien what impact such initiatives would have on employment! Back then Tung faced the issue of increasing unemployment in Hong Kong. Innovation and technology development is a long term endeavor. It is meant to help build competence for Hong Kong in the long run. It is unlikely that such move would result in an immediate decrease in the overall unemployment rate.

The first report from the CIT included recommendations both for an ambitious goal to change the fundamental vision of future development of the city, and for a set of more concrete proposals to support innovation. The two key concrete proposals recommended were the setting up of the Innovation and Technology Fund (ITF) "with an initial injection of HK\$5 billion to meet requirements in the short and medium term" and the creation of an Applied Science and Technology Research Institute (ASTRI). The Chief Executive accepted all recommendations, and The Legislative Council of the Hong Kong SAR (LegCo) approved the financial resources needed for the setting up of the ITF (HK\$5 billion) and ASTRI (HK\$2 billion).

Professor Tien continued his efforts to raise awareness about the importance of innovation in Hong Kong and, further encouraged by the global surge in high technology investments, the CIT prepared its second and final report,<sup>23</sup> which made eight general recommendations:

<sup>22</sup> Tien (1998) p.13

<sup>23</sup> Tien (1999), p. 5-7



- Improving the coordination of the government's policy functions
- Merging of the Hong Kong Science Park, Hong Kong Industrial Estates Corporation and the Hong Kong Industrial Technology Center
- Raising investment in education
- Seeking overseas talent
- Relaxing immigration restriction on talent from the Mainland
- Expanding the government's incubator program
- Developing closer ties between academia and industry
- Exploring the feasibility of a co-investment scheme providing government venture capital on a matching basis with private funds

In summary, the CIT report developed an agenda that was based on a new policy philosophy, and envisaged that this policy philosophy would be *implemented* via a range of practical projects that should enhance support for innovation and for the development of technology-based firms. For us to develop a useful analysis of the performance of the Hong Kong Government's initiatives over the last five to six years, we will need to describe the core concepts of the policy philosophy and evaluate the extent to which these concepts proved realistic in the subsequent process of implementing the policy.

## Policy Philosophy

In this section we analyze the core concepts of the policy philosophy that informed the CIT understanding of innovation and the situation in Hong Kong, and thus provided the framework within which the proposals to support new initiatives were formulated.

## Upstream-Midstream-Downstream

One of the fundamental ideas employed in the CIT reports is that innovation takes place in stages in an R&D spectrum, from *upstream* basic and applied research to *midstream* applied research and development, ending with *downstream* development and commercialization.<sup>24</sup> According to this view, innovation originates in the results of scientific research, where these scientific results are subsequently developed into commercial technologies and finally marketed by firms. Being envisaged as a linear process (like a river flowing to the sea), the knowledge available from "upstream" research by universities will be transferred by "midstream" research institutes to "downstream" R&D in enterprises. The construction of infrastructure for "midstream" R&D in manufacturing and service industries consequently becomes a worthwhile project bridging the commercialization process. If there is a potential demand for the ultimate "innovation", the market will ensure that entrepreneurs will undertake such commercial "downstream" R&D, and capital will be made available.

Although the linear model may represent innovation that has occurred in science-based industries, in large industrialized economies, and over very long stretches of time, it has proven less valuable for analysis of the vast majority of successful innovations emerging during recent decades.<sup>25</sup> Instead, models that underscore the continuous interaction of researchers with markets and advanced sources of knowledge throughout the process of technological development are more relevant, as we shall describe in more detail below. Despite this, the linear model was crucially important in the formulation of concrete initiatives such as the establishment of ASTRI, an organization that was explicitly set up to "do midstream R&D" in order to help the transfer and commercialization of technologies from universities to local industry.

## Both Development and Diffusion of New Technology

Another important idea was that innovation involved both the development of new technology and the diffusion of new technologies in the economy. Moreover, the CIT reports explicitly underscored that new technology would be relevant for the upgrading of *all* sectors of Hong Kong's economy –not merely creating new high technology industries. Unfortunately this sensible position was frequently ignored in the subsequent

<sup>24</sup> See the explanations and diagram presented in Tien (1998), Annex E.

<sup>25</sup> For a brief critique of the linear model, see Chapter 1 of Andrew H. Van de Ven, et al (1999). This book presents an analysis of extensive and substantive case studies of innovation that shows much more complexity and contingency related to innovations.

debate, and there was also a tendency for policy initiatives to target the sectors that were perceived to belong to high technology, such as new firms offering information technology tools or Internet services.

## Cooperation with the Mainland

A third vital element of the CIT's policy philosophy was that the Chinese Mainland had to become an ever more important component of future strategies for innovation in Hong Kong. Although this idea was proposed in very general terms, some of the concrete initiatives were very practical and focused; for instance, the government adopted the proposal to improve the flow of talent from the mainland to Hong Kong and subsequently promulgated an Admission of Mainland Professionals Scheme in 2001, for the purpose of encouraging the immigration of Mainland professionals in finance and information technology to Hong Kong. However, this scheme did not become popular among Hong Kong firms or among Mainland Chinese information technology professionals. The immigration of only 242 Mainland professionals was approved during 2001 and a further 211 were approved in 2002. In the light of this sluggish uptake, the government replaced the original scheme in 2003 with an "Admission Scheme for Mainland Talents and Professionals".<sup>26</sup> This seeks to improve the conditions for this special class of immigrants by granting special concessions such as allowing them bring in their family to Hong Kong; 1501 visa applications under this scheme were processed during July–December 2003.

A member of LegCo pointed out that there was a need for government officials to become committed to a more strategic approach to cooperation with the mainland:

Hong Kong entrepreneurs should also look to how things progress in China. Policy measures such as the CEPA can help Hong Kong to succeed. In this regard, it shouldn't be difficult for the government to find ways to spend money on helping local industries. But the problem is that the Hong Kong government people were trained to take a hands-off approach. That was the usual altitude of the colonial government.

This respondent provided several examples of Hong Kong firms that cooperated intensively with universities or firms in the mainland, successfully leveraging their own competence together with those of their mainland partners.

## Policy Coordination

The fourth idea put forward most strongly in the CIT's second report was that there was an urgent need to *coordinate and consolidate* the various government policies and organizations involved in various aspects of promotion of innovation. This point was underscored several times, particularly in the second report from the CIT. For example, the CIT argued that a new institutional setup should be created:

Innovation and technology policy cuts across many traditional policy areas. It must be dealt with holistically and coherently. This requires good co-ordination and leadership. We recommend the establishment of a policy group headed by the Financial Secretary and comprising relevant bureau secretaries to set and co-ordinate policy. In addition, a standing advisory body reporting to the Chief Executive should be set up to succeed this Commission. The policy group and advisory body should be serviced by a common secretariat with support from full-time science advisers.<sup>27</sup>

The key objective was clearly to establish organizations that would include some of the most powerful government officials and that could directly influence the policy pursued by the Chief Executive. However, the inter-bureau policy group led by the Financial Secretary never materialized, and instead the Council of Advisors on Innovation and Technology, comprising non-official members from business and academic sectors, was created in April 2000. The first chairman of this council was Mr. Payson Cha, a prominent property developer; the second chairman, appointed in April 2001, was an Emeritus Professor of the University of California at Berkeley, Eugene Wong. The council met a few times during the next couple of years, but appears to have had very little influence on policy-making in Hong Kong. The council was replaced by a Steering Committee for Innovation and

<sup>26</sup> See Hong Kong Immigration Department (2003)

<sup>27</sup> Tien (1999), p. 5

Technology established in January 2004. This committee was under the chairmanship of the Secretary for Commerce, Industry and Technology. Thus the promotion of innovation in Hong Kong remains a responsibility of a branch under the HKSAR Commerce, Industry and Technology Bureau, rather than a cross-cutting commitment of all concerned government departments.

## The Implementation of the Innovation and Technology Policy

The implementation of the policy philosophy proposed by the CIT became a major challenge for the government, since its experience in this area of policy making was limited and constrained by the traditional ideology of positive non-intervention described earlier. Therefore, one person interviewed for this study expressed disappointment with the follow-up of the CIT's recommendations:

For instance, on the issue of accountable government, the basics of being accountable is to have [a] clear mandate, appropriate authority, clear goal[s] and criteria of success. However, in the current accountable government, none of the senior officials have been given these clear mandates. The policy goals of innovation and technology are good but the implementations have not been. There is no commitment and therefore no good policies. Simply having policy objectives is not good enough. Policies begin with initiatives and visions. With commitment, strategies are then formulated and subsequently executed. Right now the government officials are part of the government's problem. The leadership is also problematic. There is complacency.

Against this background it is useful to describe briefly the major initiatives undertaken as part of the implementation of the innovation and technology policy, and to assess the problems that emerged in the process. Implementation involved three major tasks: a) developing institutions and organizations that could coordinate policy and undertake implementation; b) providing financial support for R&D, primarily through the Innovation and Technology Fund (ITF); c) the creation of infrastructure for technology transfer, including the establishment of a science park, an applied research institute and incubation units.

In the following, we will describe the initiatives undertaken for each of these tasks and provide an analysis of some of the difficulties encountered.

## The Innovation and Technology Commission

As mentioned above, the original policy coordination framework envisaged by Tien Chang-lin – namely, the establishment of high-level policy group headed by the financial secretary and reporting directly to the Chief Executive – did not materialize. However, there was clearly a need for an administrative body under the Government that would be able to handle the new funding schemes, direct new efforts to improve the culture of innovation in business and in society as a whole, and undertake various policy initiatives such as improved cooperation with the Chinese Mainland. Accordingly, the government decided in 2000 to establish an Innovation and Technology Commission (ITC) within the Commerce and Industry Bureau. The task of the ITC was to take charge of policy on innovation and technology, as well as managing the Government's programs on a day-to-day basis.

It is clear that the establishment of the ITC has had the administrative advantage of monitoring the government's efforts more closely. However, there are still a number of other policymaking bureaus responsible for policy issues connected with innovation. These include the Financial Services Branch (for regulation of financial services and the Stock Exchange), and to a lesser extent regulatory bodies such as the Telecommunications Authority and the Television and Entertainment Licensing Authority.

The ITC has recently developed a more proactive approach, and is increasingly occupying a key role in two areas: policy reform, and promotion of an innovation culture. The strategic review carried out in 2004 resulted in a new approach to the integration of public and private initiatives to support innovation; this involved the setting up of focused R&D centers, which we shall describe in more detail below. In addition, the ITC has emphasized support for initiatives such as various youth science and innovation programs and the Hong Kong Student Science Project Competition. It is also very active in the promotion of new creative industries through the DesignSmart Initiative.



## Financial Support

The most important policy instrument in the Hong Kong Government's effort to promote a new vision of knowledge-based development in the economy was the establishment of the ITF, with an endowment of HK\$5 billion. Figure 11 below shows the various schemes that were created – the most important being the funding of research and/or development projects through the Innovation and Technology Support Programme, which has consumed three-quarters of the HK\$2 billion spent during the first six years of the ITF's operation. Another important scheme is the Small Entrepreneur Research Assistance Programme (SERAP), which will be described in more detail in Section 6 below.

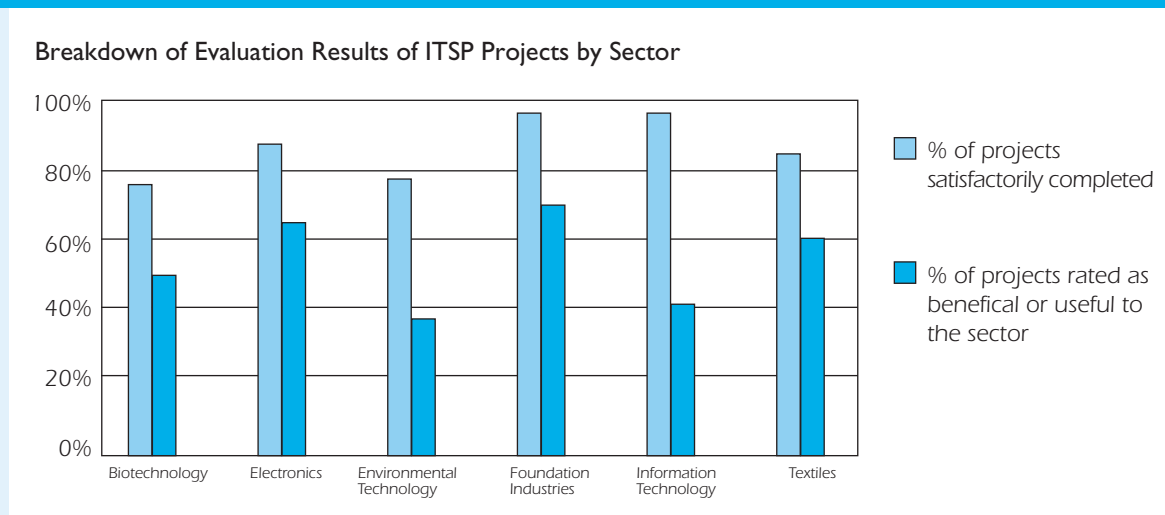
**Figure 11 : Innovation and Technology Fund: Statistics of Approved Projects (as at 31/11/2006)**

Program	Approved Projects	Funds Approved (HK\$ million)
Innovation and Technology Support Programme	292	1,539.7
General Support Programme	76	99.6
University-Industry Collaboration Programme	159	184.4
Small Entrepreneur Research Assistance Programme	237	233.7
Total	764	2,057.4

Source: HKSAR Innovation and Technology Commission <http://www.itf.gov.hk/eng/statistics/StatTable101View.asp?StatTypeId=101&StatId=278&StatCaption=Statistics+of+Approved+Projects>

As shown in Figure 12 below, the majority of funded projects were satisfactorily completed, but only around 40 to 60 percent were rated as beneficial or useful to the sector; In other words, despite very severe "vetting" efforts in the process of selecting projects for funding that strongly emphasized "downstream" research of immediate practical value to the industry, only around half of the projects actually succeeded in providing useful results.

**Figure 12: Status of ITF Projects Supported by the Innovation and Technology Support Programme in 2003**



Source: <http://www.legco.gov.hk/yr02-03/english/panels/ci/papers/ci0210cb1-844-3e.pdf>

The approach where ITF was administered along the same lines as other public research funding (like the Research Grants Council), based on open application and "vetting" with criteria that were a combination of academic/technical quality and "usefulness," did not succeed in generating a highly significant economic impact. A leading government official made the following observations on the administration of project funding related to high technology entrepreneurship:

In government schemes of this kind, civil servants are put in a very difficult situation. They do not have the expertise to evaluate these different types of projects. With accountability being such an important issue, civil servants are reluctant to approve these projects.

A related issue is the fact that the ITF has only utilized HK\$2 billion out of its original HK\$5 billion endowment. One respondent described the situation as follows:

The government appropriated HK\$5 billion to the ITC. The money is supposed to help encourage the advancement of innovation and technology and entrepreneurship activities. Till last year, 80 percent of the money is still there. They didn't know what to do with the money. The government has the mentality that stifles Hong Kong. Everyone just talks about real estate.

However, the government had decided at an early date that it would reserve two-thirds of available funding by ITF to support for the research and development activities of ASTRI.<sup>28</sup> This decision became an important constraint on the allocation of funding to projects that had originated in what the ITC has termed the "bottom-up" approach, that is, where applications were invited from all sectors of society. At the same time, the above-mentioned evaluation of the benefits of ITF funding inspired an effort to develop a new strategy.

With the new strategy launched by ITC in 2005, which we shall describe in more detail below, the major part of the remaining funds in ITF were assigned to funding projects at five R&D centers, and focused on a small number of major technological breakthrough projects for specific sectors. The ambition is to focus funding for innovation more precisely on sectors of particular relevance for Hong Kong's economic development.

### Incubator facilities

Hong Kong has witnessed a gradual development of public incubator facilities for more than a decade, including the emergence of independent private incubator activities during the high-tech bubble of 2000-01.

One early example was The Hong Kong Institute of Biotechnology Ltd. (HKIB), which was founded in 1988 with a donation from the Hong Kong Jockey Club Charities Trust as a non-profit but self-financing downstream development centre for biotechnology products. The HKIB was formed to foster a successful biotechnology industry in the Hong Kong SAR by providing downstream R&D support and an incubator facility for local entrepreneurs, but it has so far enjoyed only limited success. There has been a very slow growth of the biotechnology industry in Hong Kong, and the most successful venture in the field, CK Life Sciences, has not been connected to HKIB. Most of the companies that were incubated by HKIB have either disappeared or remain small units lodging in the HKIB building.<sup>29</sup>

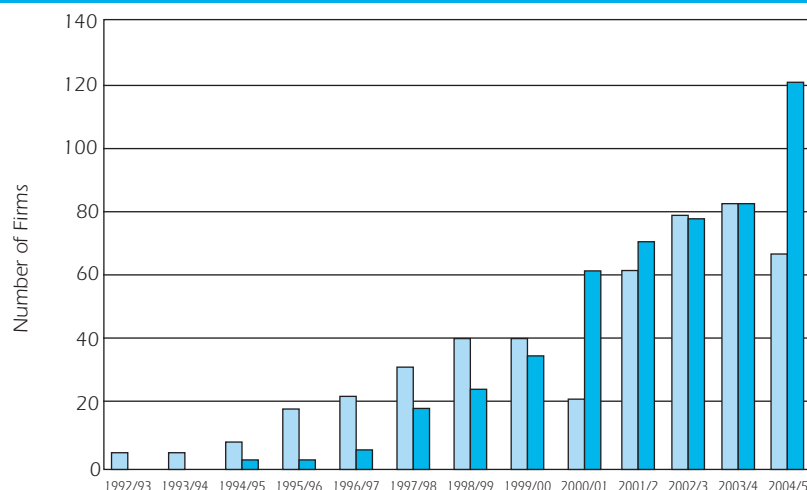
A more important initiative related to incubation of high technology business was the Hong Kong Industrial Technology Centre Corporation (HKITCC) established in 1992. This center, located in Kowloon Tong, constituted a publicly supported business innovation center aimed at promoting technology development through three primary functions: technology-based business incubation and accommodation; the provision of technology transfer services; and the provision of product design, development and support services. The center hosted more than 80 new ventures in high technology areas during several consecutive three-year incubation periods.

In April 2002, the HKITCC was brought together with the new facilities established at the Hong Kong Science and Technology Park to form an enhanced incubation scheme called the Incu-Tech Programme. The history of these incubation facilitation efforts are depicted in Figure 12, which shows the number of firms joining the incubation program since 1992 and the cumulative annual number of graduated firms.

<sup>28</sup> See Hong Kong SAR Government Legislative Council Panel on (2002), Annex page 8

<sup>29</sup> See the assessment in Erik Baark (2005)

**Figure 13: Number of Firms in the Business Incubation Programme and Cumulated Number of Graduates, 1992-2005**



Source: Website of Hong Kong Science and Technology Park Corporation ([http://www.hkstp.org/english/incubation/inc\\_facts/inc\\_facts.html](http://www.hkstp.org/english/incubation/inc_facts/inc_facts.html))

However, these figures notwithstanding, very few high growth firms have emerged from the incubation program. Thus, among 201 companies listed on the Hong Kong Growth Enterprise Market (GEM), only three GEM-listed companies are graduates of the incubation program of the former HKITCC or the Incu-Tech Programme. Most high technology companies launched on the GEM in Hong Kong have originated in Mainland China; a few well-known GEM-listed companies are technology-related spin-off companies of large corporations, such as the CK Life Sciences.

University business incubators also grew during the 1990s. Currently, five out of the eight public tertiary institutions are organizing technology business promotion activity. In many respects, these incubating units make it possible to commercialize research results and technologies developed by faculty and graduate students.

### The Hong Kong Science and Technology Park

During the 1990s, several consultancy studies were conducted regarding the establishment of a science park in Hong Kong. In 2001, a final decision was taken by the Hong Kong Government to create the Provisional Hong Kong Science Park to undertake construction of new park facilities at reclaimed land near CUHK. The Hong Kong Science and Technology Park (HKSTP) was designed to promote the creation of high tech industries and technological innovation by means of support for clusters of knowledge-intensive SME firms.

The management of the HKSTP seeks to provide comprehensive services to help incubatees overcome initial problems in developing their business. Many of these are not business people. Initially, they may not realize the problems associated with operating a business. A manager from the HKSTP explains:

HKSTP has two accountants, each handling the accounts of about 30 to 35 companies. HKSTP has 12-13 management training courses that are not found in business schools. These courses are skill-related. They teach hands-on type of knowledge, not the same as the ones offered in business schools. They are intended to help turn the incubatees into business people. HKSTP is charging HK\$10 per sq. ft. plus HK\$5 per sq. ft. of management fees.

HKSTP use the proceeds from rent to subsidize incubatees. [It is] Currently running a HK\$40 million integrated circuit (IC) design infrastructure. Organizations like HKPC need to ask the government for money but HKSTP does not. Four years ago, HKSTP had three IC companies and, now, HKSTP has 36 IC companies, of which 50 percent come from overseas. As far as return on investment is concerned, the tax money will be the returns the government receives.

As mentioned above, the HKSTP incubation services were merged with HKITCC in 2002, and the new facilities experienced some problems during the first years of operation. The manager argues:

It's difficult to define success. Over the years, three graduates of HKSTP have been listed in GEM but they are not doing so well. There are some merger and acquisition activities. Ten percent to 15 percent of the graduates of HKSTP are doing quite well. Thirty percent eventually closed down. The rest of the companies are still running. During 2003, the period of SARS, there were more companies closing down than any other year.

The ambition has been to create an environment particularly conducive for small high technology companies which would resemble the conditions that have made the Silicon Valley famous. However, the managers of small firms in HKSTP appear to believe more in traditional management of the workers:

We also tried to get the incubatees to mix together. Tried coffee time at 3:30 everyday, but it didn't work. After the restaurant in HKSTP closed down, we tried with a coffee kiosk and it worked but only to small extent. We couldn't set up an environment like the Silicon Valley; since the incubatees are small they are very busy. They want their staff to work, not to chat. Two years ago, when the World Cup was on, we thought about providing a place for the people to mix through watching football but the plan was determined to be too expensive to implement.

## Cyberport

In March 1999, The Hong Kong Government announced its support for the Cyberport project, a joint project with the private sector to quickly create a strategic cluster of leading information technology (IT) service companies in Hong Kong. The project concentrated on communication-oriented industries, providing advanced facilities and office space for 130 firms engaged in telecommunications, network and wireless communications, optical electronics, and Internet applications. The government announced that the Cyberport project would generate more than 12,000 jobs, with approximately 4,000 jobs created in the construction industry to build Cyberport. It was also envisaged that the project would generate additional employment opportunities by ancillary firms operating in retail or hotel business.<sup>30</sup>

At the time of announcing the project in March 1999, Cyberport was seen as a way to attract overseas high tech companies. The government claimed that Microsoft, IBM, Oracle, Hewlett Packard and Cisco Systems were willing to become the five founding industrial partners and would take up major portions of the office space. At the same time, it was announced that Cyberport would become home to 100 smaller companies with the aim of incubating local business and retaining Hong Kong's indigenous technological talent.

In June 2002, the government reported that seven companies had signed up to move into the newly completed Cyberport Phase I building, taking up about 80 percent of the 448,000 square feet office space. As Phases II and III of the Cyberport office buildings were completed in the following year, however, the global economic slowdown and end of the high tech bubble led to reports that Cyberport had problems attracting new IT firms to Hong Kong. Microsoft, for example, did not bring new technology and investment in R&D, but merely relocated its 250-strong workforce from Swire's Taikoo Shing to Cyberport. While Microsoft claims to be committed to developing Hong Kong into an IT hub for the region, the local office appears focused on marketing rather than development of new technologies. IBM has not proceeded with its "founding partner" application, and remains located in Taikoo Place.<sup>31</sup>

## The Applied Science and Technology Research Institute (ASTRI)

ASTRI was set up in January 2000 to perform R&D for transfer to industry for commercialisation with a view to elevating the technological level of industry and stimulating the growth of technology-based industry in Hong Kong. In other words, ASTRI was intended to provide "midstream" and "downstream" research in

<sup>30</sup> Pun and Lee (2002)

<sup>31</sup> Baark and So (2006)

order to facilitate the transfer of "upstream" research results from universities to industry.

The idea to set up ASTRI was inspired by the model of the Industrial Technology Research Institute (ITRI) in Taiwan, which had contributed significantly to the development of Taiwan's high technology industries. In particular, ITRI has become well known for helping to establish the foundation for the semiconductor industry, and it was assumed that ASTRI could achieve something similar. ITRI incorporated several different missions, including conducting advanced research and housing incubator units. However, the most important function of ITRI was, according to the Taiwanese firms that utilized its services, to provide networking between technology suppliers and customers.

The current management of ASTRI reviewed the achievements of the initial years of operation and formulated a new strategy, which has been implemented since 2004. A senior manager has summarized the process as follows:

ASTRI started off like an incubation center but the research groups tended to incubate their own people. When operating in the incubation mode, the research groups competed against one another and once these groups became incubatees and graduated, they would leave ASTRI with their knowledge. In this way, they would leave with much of the knowledge accumulated and there was nothing left in ASTRI.

In contrast, the current strategy seeks to ensure that a major part of the capabilities developed by advanced research groups at ASTRI should remain with the institute even if a couple of researchers might move into industry or create a spin-off company.

The new management was also critical of the initial idea that ASTRI could directly transfer the results of the universities' R&D efforts to industries. Originally the strategy was to exploit advanced research at universities, and create links with ASTRI's applied research that would be focused on the needs of potential industrial customers. The government has realized the problem with the earlier approach and now ASTRI is taking a new direction. The focus now is to use customer-focused R&D to churn out technology licenses rather than tech companies.

The Hong Kong Jockey Club Institute of Chinese Medicine Limited was established as a subsidiary of ASTRI in May 2001 to take forward the vision to position Hong Kong as a world center for the development of health food and pharmaceuticals based on Chinese medicine. Its mission is to spearhead the development of Chinese medicine as a high value-added industry for Hong Kong through promotion and coordination of related activities and support for scientific and evidence-based development programs.

The new management approach of ASTRI leadership emphasizes two principal objectives in particular. On the one hand, ASTRI wants to build customer focus into every aspect of R&D in order to ensure that the results will be genuinely beneficial for the firms. In doing so, the research groups will need to involve companies actively in the identification of technological bottlenecks and opportunities, and work closely together with them in order to adapt technologies for their particular needs. In this process, ASTRI believes that its research groups will benefit from building up domain knowledge that will allow individual researchers to find important challenges in their work while seeing the concrete results of their efforts. It is also important for ASTRI researchers to pursue new company start-up opportunities with customers as partners. A good example of this approach is the case of H.264 video compression technology developed at ASTRI, described in Figure 14.

ASTRI's customers are companies whose technology ASTRI's R&D can improve. A senior ASTRI official noted that when he was hired, he asked the government to state who ASTRI's customers should be. The government officials told him that, with China developing so quickly, companies from anywhere in China were potential customers. The short term priority is Hong Kong and the PRD, but thinking 10 years ahead, ASTRI could be providing excellent R&D for all of China.

#### Figure 14: New Technology Development at ASTRI: The Case of H.264 Video Compression

One of the successful projects utilizing ASTRI's competence in development of multimedia applications and IC design, and building on collaboration with local universities, is the commercialization of a technology to transmit video using the H.264 standard supported by the International Telecommunications Union.

*Focus on the Needs of Existing Industries:* The research group has sought to develop technologies to help Hong Kong's economy. Initially, the group developed advanced wireless technology to promote the tourist industry. However, few firms in the tourist sector in Hong Kong were able to assimilate this technology. Therefore, the group re-focused on developing technologies that would be useful for the consumer electronics industry, which is a relatively strong and dynamic industry in Hong Kong.

The research group consulted with the industry and in 2002 identified new multimedia technologies as most promising. At the time, the H.264 video compression standard was being promulgated by international organizations, and the market opportunities for consumer products that could provide high-quality video based on H.264 standard low broadband signals, appeared promising. With the construction of many new telecommunications systems, efficient low broadband video transmission has great commercial potential. Consequently, the group developed an IC that included communication and decoding on a single, low-power consumption chip. This technology has been tested with broadband TV vendors and is being licensed for production as TV set-top boxes by several firms in Hong Kong and Mainland China.

The key lesson of this experience was that "picking the industry is more important than picking the technology"; that is, it is more essential to find and develop good market opportunities for the consumer industry than it is to research the most advanced technology.

*Working Closely with Universities and Industry:* The research group at ASTRI collaborated closely with researchers at Hong Kong universities, overseas, and in the Mainland. Some of the initial inputs to improve compression algorithms came from researchers at HKUST who had worked with the MPEG-4 compression standards; several students from this group were recruited. In addition, a small group of researchers from the Mainland who had worked in similar areas of research were recruited.

Perhaps even more importantly, the research group at ASTRI sought to use field tests with industrial partners to optimize the technology and ensure commercialization. In particular, they cooperated with Now Broadband TV, a Hong Kong firm marketing TV and movie-on-demand services over existing broadband telecommunications lines. This allowed them to test their technology with a new IPTV set-top box and ensure that it would work with existing systems

The key lesson from this experience was that it is necessary to overcome the initial suspicious attitude of Hong Kong firms (who normally trust overseas researchers/engineers more than the local ones) by direct collaboration and demonstration of a willingness to improve the technology (reduce cost, ensure quality, ensure comparability).

*Packaging the Technology with Appropriate Intellectual Property (IP) Protection:* In their collaboration with industry partners, the group actively seeks challenging partners and emphasize that the partners should contribute a fair share. When the industrial partners realize that ASTRI is making its IP available at a price, they respect the researchers even more.

The ASTRI group would exchange engineers with industry partners, but the manager of the group does not want to lose his best researchers, and therefore tries to motivate his research engineers to remain with ASTRI. In order to do so, he emphasizes that they are presented with new technological and commercial challenges in their job at ASTRI. They are encouraged to work with several different companies and this enhances their career path.



## Emergence of a New Policy: Towards Support for Clusters

For a small, open economy dominated by traditional industries and services, the linear model of innovation described above may be of little use – or even misleading. Here conceptual models such as the chain-linked model of innovation become more realistic. These models emphasize the central role of markets in defining technological needs, the importance of feedback flows of knowledge at various stages of development, and the interaction with existing pools of knowledge and linkages to research. In other words, they emphasize the need for interaction between developers and markets on the one hand, and developers with various sources of knowledge (including researchers) on the other.

Therefore, more advanced and realistic models of innovation emphasize the need for interaction between many partners during an innovation process. In other words, successful innovation does not normally take place as a linear process of successive implementation of steps, but rather through multiple linkages and interactions between various actors. This concept of innovation has been supported by the emerging realization that business networks or clusters frequently provide the key competitive asset of rapidly growing high technology organizations.

*Clusters* can be characterized as being networks of production of strongly interdependent firms (including specialized suppliers), knowledge producing agents (universities, research institutes, engineering companies), bridging institutions (brokers, consultants) and customers, linked to each other in a value-adding production system. The cluster approach focuses on the linkages and interdependence between actors in the network of production when producing products and services and creating innovations. Major proponents of using the concept of clusters to analyze industrial competitiveness includes Michael Porter, who popularized some of the basic ideas in *The Competitive Advantage of Nations*,<sup>32</sup> and the OECD Secretariat, which has undertaken several studies of innovative clusters in advanced industrialized countries.<sup>33</sup> In studies of Hong Kong and the PRD, the concept has been mostly employed by Michael J. Enright and his colleagues.<sup>34</sup>

The policies relating to innovation and technology in Hong Kong, we would argue, have been gradually moving towards an emphasis on market-driven and interactive knowledge flows in the innovation process that is reflected in the concept of innovative clusters. The concept of clustering was explicitly employed to describe activities at Cyberport, which presents itself as a an initiative devoted "to creating a strategic cluster of IT companies". The new strategy of the ITC, which we shall describe in more detail below, uses the term "clusters" sparingly, and there appears to be a preference for using the more limited concept of "technology focus areas". Nevertheless, one respondent argued that it was necessary to take the first steps towards promoting clusters in Hong Kong, even if this was something new for the government:

For Hong Kong, we have to use a cluster concept. The designated area must be significant in a global scale, like the chocolate of Switzerland, tiles of Italy, etc. The concept of specific cluster is new to Hong Kong because this means picking winners. Hong Kong has never done it before and it is not compatible with the positive non-intervention approach the government adopts. No matter what, this has to be done.

Creating a new strategy for the promotion of innovation and technology with a stronger focus was thus motivated partly by the experience of the practical administration of schemes such as the ITF and the Applied Research Fund (ARF), but also partly by the recognition that the economic benefits of public support of innovation would be more apparent if R&D were much more closely integrated with a select network of business enterprises – in other words, with existing or emerging clusters.

### *The New Strategy of Innovation and Technology Development*

In 2004 the ITC prepared a consultation paper outlining a strategy that could better serve industry needs and raise the effectiveness of the government's support for innovation and technology. This paper reiterated the importance of extending the perspective to the demand for technology upgrading in Hong Kong-related

<sup>32</sup> Porter (1990) and Porter (1998) pp. 77-90

<sup>33</sup> See for instance OECD (1999)

<sup>34</sup> See Enright et al (2005) and OECD (2001)

enterprises in the PRD region, and stressed the need to identify and coordinate R&D efforts and commercialization in selected focus areas:

To further promote the development of innovation and technology, Hong Kong should capitalize on its existing strengths, bridge the gap between research capabilities and industry needs, and utilize the production base in the Greater PRD as the platform for developing its applied R&D and commercialization of applied R&D deliverables.<sup>35</sup>

The concrete criteria for the new approach included the following elements:

- **Focus** – Identify key technology focus areas where Hong Kong is deemed to have an advantage, in order to make optimal use of resources to create greater impact;
- **Market Relevance** – Adopt a demand-led, market-driven approach in driving the innovation and technology program, to ensure investments are relevant to industry and market needs;
- **Industry Participation** – Closely involve the industry in defining the focus areas and in other stages of innovation and technology development;
- **Leverage on the Mainland** – Utilize the production base in the Greater PRD region as the platform for developing applied R&D and commercialization of applied R&D deliverables;
- **Better Coordination** – Strengthen coordination among various technology related institutions and the industry for enhanced synergy and impact

After consultation with universities, industry associations and other stakeholders, the ITC selected technology focus R&D centres based on the following criteria:

- **Existing research capability** – The R&D centres are expected to work closely with local universities and R&D institutions. It is imperative that universities and R&D institutions possess considerable research strengths in the technology focus area such that the R&D Centre can leverage on their resources and competitive edge.
- **Competitive advantage** – It would be advantageous if a strong industry base in Hong Kong or the PRD backs up the technology focus area such that a platform for commercializing the deliverables of the future R&D centre could be provided.
- **Industry needs and market potential** – There should be clear industry needs and market potential for the R&D deliverables under the technology focus area so as to ensure relevance of the government's investments in the R&D centre to industry and support for the continued operation of the centre.
- **Industry commitment and support** – Priority should be accorded to technology areas where industry players are committed to R&D activities and indicate substantive support for the operation of the R&D centres.
- **Clearly defined objectives for R&D centres** – To ensure effective use of resources, the R&D centres should have clearly defined objectives and a roadmap for the technology development of the focus area.<sup>36</sup>

Based on these criteria, the ITC is setting up R&D centres hosted by universities and/or public organizations in the following areas:

- Automotive Parts and Accessory Systems
- Logistics and Supply Chain Management Enabling Technologies

<sup>35</sup> See Hong Kong SAR Government ITC (2004)

<sup>36</sup> See Hong Kong SAR Government Legislative Council Panel on Commerce and Industry(2005). Legislative Council Panel on Commerce and Industry Bureau (2005) p. 3-4



- Textiles and Clothing
- Nanotechnology and Advanced Materials

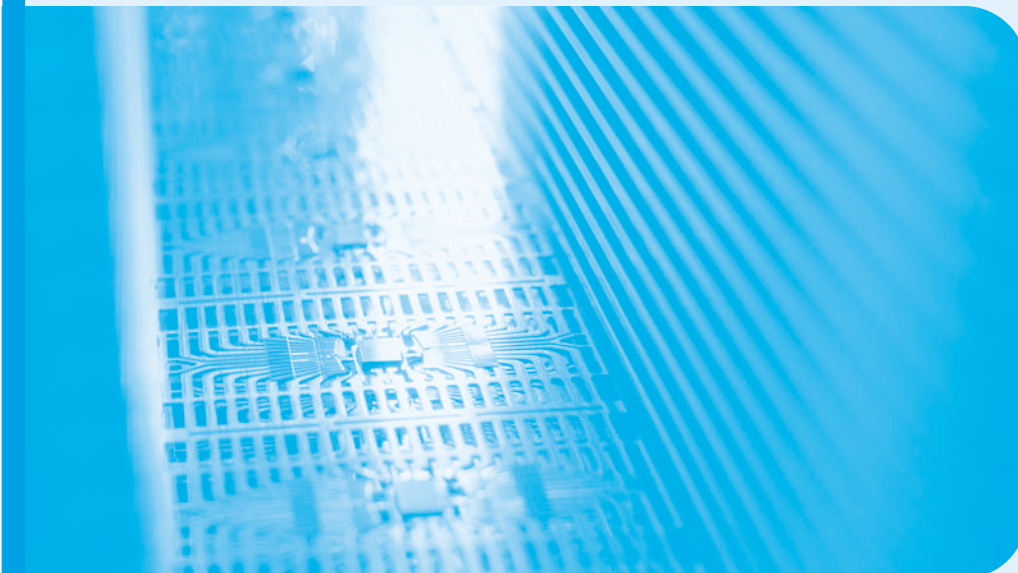
R&D centre-type activities will also be hosted by ASTRI in the following focus areas: communications technologies, consumer electronics, IC design and opto-electronics. In this case, it is not envisaged that there will be separate R&D centres, but instead highly integrated efforts led by ASTRI management. Moreover, a technology focus area for Chinese medicine will be managed by ASTRI through its subsidiary Hong Kong Jockey Club Institute of Chinese Medicine.

The Tier-1 funding of R&D centres will come through ITF. In addition, several focus themes will receive R&D support via a Tier-2 funding scheme. The Tier-2 projects will involve individual projects that are designed to develop specific technologies through collaboration between universities and industry partners; one such theme is the development of mechanical watch movements for the large watch industry based in Hong Kong and the PRD. Finally, the ITC plans to invite proposals for Tier-3 ITF funding, with the objective to continue to support innovative projects proposed by various organizations but falling outside the scope of activities for the R&D centres outlined above.

Space does not allow a very detailed description of these initiatives, but a common thread is that the new funding schemes aim to strengthen innovation in clusters of existing or emerging industries by means of further integration between R&D activities in public and private organizations. The organizational framework for the R&D centres will emphasize the establishment of management committees to direct the R&D activities, and technical committees to review and advise on individual projects. This means that much of the decision-making process related to R&D activities and funding will be decentralized to cooperation between the centres/ASTRI and their industry clients, thus creating stronger incentives for close interaction and networking in the clusters.

While the new strategy of the ITC represents a stronger commitment by the Hong Kong government to steering technological innovation efforts – and thus reflecting a policy of "picking winners" rather than "non-intervention" – it is by no means certain that this approach will improve conditions for high growth entrepreneurship. The selection of focus areas has been explicitly and clearly influenced by established industries or public organizations with vested interests that may not be representative of current or future high growth firms, or of highly innovative technology-based industries. For example, the choice of the focus area "automotive parts and accessories systems" would appear to reflect the ambitions of a limited group of the HKPC client base rather than any emerging high technology entrepreneurship.

Nevertheless, the new strategy shows important signs of an approach that could solve some of the most difficult issues created by the previous adherence to the "linear model of innovation", such as the ineffectiveness of technology transfer and commercialization.



## 4. High Growth Entrepreneurship, High Technology and Government Programs

As we have outlined above, Hong Kong industrial policy has moved from positive non-interventionism to a limited promotion of specific high technology industrial clusters. As one interviewee commented, "*The paradox is that the government takes a hands-off approach but the whole process is bringing the government in.*" In other words, the government is moving from "invisible hand" to "helping hand"<sup>37</sup>. In this section, we discuss two interrelated questions:

- to what extent should government extend a helping hand in the stimulation of high growth entrepreneurship? and,
- If extending a helping hand, to what extent should government do so by stimulating high technology entrepreneurship?

If markets for products and services determine the prices that allocate factors of production into their most efficient uses, industrial policy can only be justified if it addresses market incompleteness or failure. Without such justification, increasing government intervention is likely to crowd out private investment and to reduce non-subsidized new firm entry while increasing political risk, private sector lobbying for government favors and regulatory deadweight burden. Recent international research at the country level shows that the intended benefits of the helping hand of government can easily hinder entrepreneurship<sup>38</sup>.

Even a competent government can miss its target. From the 1950s through the 1980s Japan's industrial policy - which included preferential tariffs, tax relief and subsidies - was justified in terms of subsidizing high technology and stimulating economic growth. In fact most of the subsidies went to sunset industries. Either Japanese bureaucrats were trying to "pick the winners" and doing a pathetic job or, more likely, they were hijacking the policy to win political support from established but low growth industries. While the stimulated industries grew because of the subsidies, they enjoyed no gains in productivity.<sup>39</sup> In short, research findings place the onus on specific programs to demonstrate that their benefits in correcting market failure are sufficiently strong to offset the costs of government intervention.

Mindful of these empirical facts, interviewees in our study voiced unanimous opposition to pouring money into individual companies. Yet there was widespread support for the evolving policy of providing government support to R&D in specific industry clusters as described in Section 3. Interestingly, the government has made little attempt to justify or publicize its policy.<sup>40</sup> Here we provide some justification. Even though high technology is not coincident with high growth entrepreneurship, the private sector's failure to provide R&D freely in the market (a global as well as a Hong Kong failure) argues strongly for public support of R&D activities.

### High Technology and High Growth

The answer to the question, "is high growth entrepreneurship the same as high technology entrepreneurship?" is an unqualified "no". As one senior official in the Trade and Industry Department commented,

In Hong Kong, most high-growth firms are not related to hi-tech, unlike the originally intended subjects of [your] study. Most of the high-growth firms in Hong Kong are related to services.

<sup>37</sup> Frye and Schleifer (1997) sort governments into three types, (1) "invisible hand", i.e., "... uncorrupted, and relatively benevolent ... providing basic public goods, such as contract enforcement, law and order, and some regulations, and it leaves most allocate decisions to the private sector, (2) "helping hand" where bureaucrats are "... intimately involved in promoting private economic activities..." and (3) "grabbing hand" where "...government is just as interventionist, but much less organized, than in the helping-hand model. The government consists of a large number of substantially independent bureaucrats pursuing their own agendas..." The difference between type (2) and (3) is largely one of coordination, not basic nature.

<sup>38</sup> Desai et al (2003) show that regulatory burden in Europe correlates with average firm size and government corruption. Fogel et al (2006) show that an effective, uncorrupt, and transparent government that avoids direct interference with market mechanisms encourages entrepreneurship, but burdensome regulations on business and rigid employment laws discourage entrepreneurs. Better educated adults, market diversity, and unrestricted capital are associated with more entrepreneurial formation..

<sup>39</sup> See Beason and Weinstein (1996).

<sup>40</sup> For example, in the Budget speech of February, 2006, there was no mention of this major policy even though its overall budget amount exceeded that of other programs.

Figure 8 in Section 1 above bears out his observation: in Hong Kong, only 29 percent of high expectation entrepreneurship is transformation-related, while consumer services account for a full 67 percent of high expectations entrepreneurship. Even those in manufacturing, logistics and transportation – which we group together as "the transformation sector" – are not generally high technology. As the same senior official noted,

About 80 percent to 90 percent of the manufacturers in the PRD are owned by Hong Kongers. All of them are OEMs. They do not require much new technology. They only focus on the manufacturing process – management of the unskilled work force. Technologies are mostly imported. They do not know enough about technologies to invest in them.

Although the statistics mentioned by the official are somewhat overstated<sup>41</sup>, his general point is true. Hong Kong entrepreneurs are less likely to use high technologies than those in the rest of the developed world. Moreover, even in rest of the world, high growth does not equal high tech. We are living in the "age of the gazelle", an age during which most new jobs created are in a small percentage of firms that experience extended periods of rapid growth – i.e., "gazelles". But only two percent of US gazelles are in high technology industries. Gazelles are widely disbursed around industries, with many in industries with negative average growth overall. The top five industries containing gazelles are chemicals, electronics and electrical equipment, instruments, paper products and rubber and plastics products. The conclusion: rapid corporate growth is certainly not confined only to those sectors commonly thought of as "high tech."<sup>42</sup>

Entrepreneurship in general, and high growth entrepreneurship in particular, pursues practical innovation – the introduction of new products and services or the reconfiguration of resources in new ways to improve delivery of existing products and services. The entrepreneur, unlike the research scientist, pursues technology only for its usefulness, not for its novelty. The vast majority of patents are never used. And yesterday's high technology is today's industry standard. The internet is a good example of a mature technology whose application today yields tremendous profits. In general, entrepreneurs use mature technology.

The Trade and Industry Department, in their stimulus of technology, clearly has in mind this type of mature, applied high technology, rather than cutting edge, basic research. According to a senior official interviewed in the study:

The intention is to reduce "hi-tech" to "not-so-hi-tech" with an aim to help enhance the current manufacturing processes...The issue becomes what technology can help upgrade what we have for what we need. The OEM manufacturers have made great progress in developing businesses. ...The key is to use highly labor intensive processes to adjust to the production needs. China is the only place that can do it this way, use low technologies to produce products for the highly competitive market.

## The Need to Subsidize R&D

But why does the Hong Kong government need to subsidize any type of research? The answer lies in market failure. Simply put, the creating of knowledge by R&D is expensive but, once it is created, it easily flows to those who did not make the effort to create it. Hence, there is an incentive in the market not to create knowledge, but to simply wait for someone else to create it and then to enjoy the spill-over effects of others' R&D.

A LegCo member commented

The problem is that Hong Kong manufacturers are not willing to spend money on R&D. They prefer to use money to treat customers with expensive meals and entertainment. They do not have the culture to do R&D.

<sup>41</sup> In fact, 70 percent of Guangdong foreign direct investment is from Hong Kong. If foreign direct investment corresponds to approximately 7 percent of total Chinese investment, then about 5 percent of total PRD investment would be from Hong Kong. The contention that all of Hong Kong investment is OEM should be modified by the observation that increasingly Hong Kong manufacturers provide design expertise.

<sup>42</sup> The term "gazelle" comes from Case (1996), quoting consultant David Birch of Cognetics Inc., who analyzes these high growth rate small companies. Gazelles are defined to be companies with initial sales of at least \$100,000 in the 1990 base year and with growth rates in sales of at least 20 percent per year in the five years thereafter.

But Hong Kong entrepreneurs would probably reply that they are realistic. Why should a firm engage in R&D? If research results lead to a breakthrough, the researcher might simply quit the company and join another, taking the fruits of his research with him. That company would have been better off to wait until the research results are available from a competitor and then hire away the researcher or otherwise copy his results, without putting in the time, effort and investment in what might be a fruitless search<sup>43</sup>. Yet if every company operated in this way, there would be no applied research and no resulting innovation.

International studies have demonstrated that the effects of R&D on productivity are greater at the country level than at the firm level because of these spillover effects. Knowledge, once produced, diffuses away from the producer. The same effect occurs at the firm level: R&D investment by one firm creates spillover effects at other firms as ideas (and people) move between firms, raising the productivity of all. Knowledge, in short, is a privately produced but publicly enjoyed good<sup>44</sup>.

This market breakdown involves property rights over information production. Of course, improvement of IP protection can somewhat address the problem, but a vast amount of knowledge produced by R&D is simply not efficiently patentable even in the most scrupulously legalistic IP protection regimes.

At the firm level, spillover occurs in geographically defined areas, especially from highly innovative, entrepreneurial firms. Thirty years ago, when Fairchild Semiconductor matured in the US, it "spawned" dozens of new firms as former employees left to become entrepreneurs themselves. They took with them not only technical knowledge, but relevant market and financial knowledge critical to starting more successful corporations. When these firms are grouped geographically, a cluster is born.<sup>45</sup> Small, new firms can compete successfully with larger, older firms not only because they are flexible and their personnel are less encumbered by commitment to existing business models; they are also helped by ability to draw on resources – human, sourcing, distribution, financial, etc. outside of their corporations. The cluster allows them to do so.

What is the optimal level of public R&D spending to offset market failures from the public good nature of information? We do not know. What is the rate of success or failure of government policies to build clusters? Again, we don't know. However, aggregate data does exist on the amount of R&D carried out.

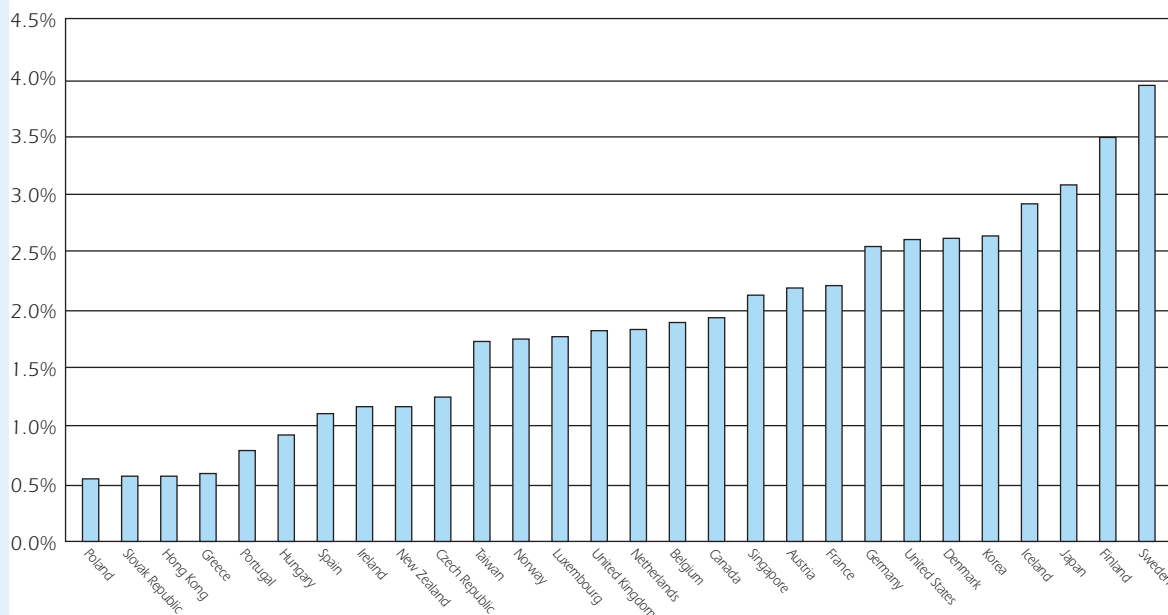


<sup>43</sup> This argument somewhat overstates the case. Researchers have shown that companies need to invest in R&D simply to absorb the fruits of other companies' R&D. See for example Cohen and Levinthal (1990)

<sup>44</sup> See Frantzen (2000) The spillover phenomenon is economically similar to the "tragedy of the commons", which Hardin (1968) described concerning the degradation of the environment in the absence of property rights. Chichilnisky (1994) has modeled this problem concerning pollution (a negative good) and suggest how it is identical to knowledge (a positive good) with a different sign. Chichilnisky (1998)

<sup>45</sup> The cluster idea gets a great deal of support from spawning, spinning off new ventures from highly entrepreneurial companies whose growth has leveled off. See Gompers et al (2003)

**Figure 15: Non-Defense Related Public and Private R&D Spending as a Percent of GDP**



Source: OECD 2003 data except for Hong Kong (Hong Kong as a Knowledge-based Economy - A Statistical Perspective 2005, Singapore (NATIONAL SURVEY OF R&D IN SINGAPORE 2003 Agency for Science, Technology and Research Singapore December 2004) and Taiwan (Hong Kong Institute of Science)

Figure 15 shows clearly that Hong Kong is near the bottom of the table when it comes to public R&D<sup>46</sup>. Were defense R&D to be included, Hong Kong's trailing of R&D would be even more dramatic. This is not a problem if we can "free ride" on others' efforts. But how much we can "free ride" is unknown.

In the words of a member of the Steering Committee on Innovation and Technology:

Hi-tech entrepreneurs require assistance to get started. The old system was clearly not working for this type of endeavors. Small entrepreneurs simply didn't have the resources to get started on hi-tech projects. Second, in our competitor countries, their governments are taking active roles in helping their entrepreneurs out. Though no one knows whether government intervention would really work, governments in our competitor countries are working to help their entrepreneurs. The issue is that it is not sure whether government interventions will pay off but, without it, firms trying to find a spot in the market place for hi-tech endeavors are doomed to fail.

We agree with the underlying conclusion that greater availability of high technology than is currently used is a necessity for competitiveness, and that the market is unlikely to provide this higher technology without some subsidy to R&D. We agree that, unlike supplying other subsidies to firms, it makes economic sense to subsidize R&D in areas where knowledge spillovers within the Hong Kong economy are likely to occur.

<sup>46</sup> The R&D is 56.1 percent university research, 41.5 percent business and 2.4 percent government. We are not confident that the definitions of R&D are constant across countries. Concerning business R&D in Hong Kong in 2001, 52 percent was in wholesale, retail and import/export trades, restaurants and hotel, 20 percent was in manufacturing and 18 percent was in financing, insurance, real estate and business services. The low ranking of Hong Kong is also evident in the UNCTAD Innovation Capability Index, which ranks Hong Kong 45<sup>th</sup>, between Uzbekistan and Lebanon. There may be a substantial underreporting of Hong Kong's R&D activities because Hong Kong has no R&D tax credits, and its low corporate tax rate gives less incentive to overstate R&D expenses by "re-labeling". The argument that Hong Kong, as a service economy, is structurally less oriented toward R&D is somewhat invalidated by the example of Singapore, which is mid-ranking in the figures above and ranks 26<sup>th</sup> in the UNCTAD index. See United Nations Conference on Trade and Development (2005)

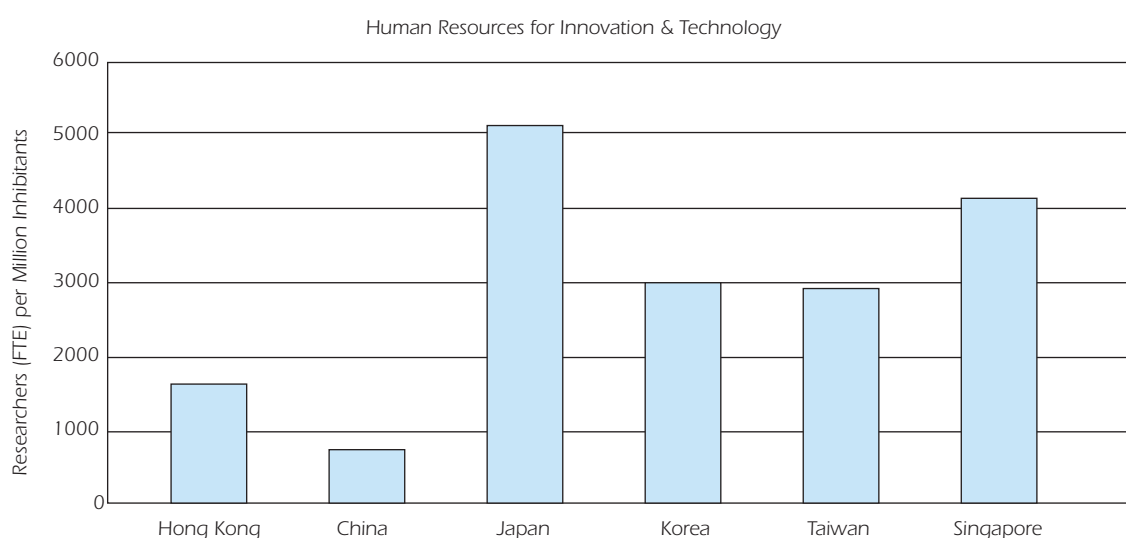
## 5. Human Resources

The ability to attract and retain key talent with technological skills and knowledge is critical for high growth entrepreneurial firms in Hong Kong. For R&D efforts to bear fruit, a country must have a sufficient number of technically trained personnel who can engage in R&D<sup>47</sup>. Non-fiscal policies on education and immigration can ensure this pool of scientific and technical support talent. Research carried out at universities and research institutes provide the potential crop of technologies that can be developed and commercialized for the marketplace. Equally important are personnel who provide much needed technical support and are motivated to work in the volatile conditions facing an enterprise in the start-up phase.

Respondents whom we interviewed in our study believe that Hong Kong currently does not have adequate professionals to fuel the latest innovation and technology initiatives. A number of the respondents in the study have offered explanations for this phenomenon. The reasons offered are: the cultural expectations towards innovation and technology are largely determined by historical factors; Hong Kong's education system does not inculcate the mindset and behaviors for pursuing entrepreneurialism; and a perceived lack of opportunities to pursue science and technology-related careers.

This observation is supported by statistics relating to human resources in science and technology in a number of Asian countries, as shown in the following table. Among the more developed economies in Asia, Hong Kong has the lowest number of researchers per population. Japan, as an advanced economy, has the highest number of researchers, at least comparable to, if not higher than, many advanced industrial nations in Europe and America. As one of the newly industrialized economies in South East Asia, Hong Kong's level of human capital for innovation and technology, as indicated by the number of researchers in the population, lags behind that of Korea, Taiwan, and Singapore.<sup>48</sup>

Figure 16



Adopted from the UNESCO Institute for Statistics

([http://www.uis.unesco.org/ev.php?URL\\_ID=5218&URL\\_DO=DO\\_TOPIC&URL\\_SECTION=201](http://www.uis.unesco.org/ev.php?URL_ID=5218&URL_DO=DO_TOPIC&URL_SECTION=201))

<sup>47</sup> See Mani (2004).

<sup>48</sup> Singapore, in particular, was cited to have been the most successful at this, where 75 percent of enrolments in polytechnics and about 62 percent of university enrolments are in Science and Technology related subjects. The result has been sharp increases in overall research intensity. This finding is from a survey of 11 countries by Mani (2004) on the role of government in promoting innovation and technology.



For some countries, education policies have been established and implemented to increase the enrolment for science and engineering courses at the tertiary level, thus ensuring a pool of personnel for the industrial sector to do R&D projects. Israel exemplifies a country where research grants as a financial policy instrument has been successful in creating new technologies. In fact, Israel has the world's highest per capita number of engineers and scientists. More than 30 percent of the university students specialize in engineering, mathematics, physical sciences and medicine, all being fields with potentially high industrial R&D activity<sup>49</sup>.

## Building Knowledge and Mindset for Innovation and Technology

As discussed in Section 2 above, Hong Kong has grown to its present status of economic development largely out of the industrial activities that have occurred since the 1960s. Trading and trading-related services and low-technology manufacturing have been the key areas in which Hong Kong has excelled. After China opened up, starting in 1978, many Hong Kong industrialists moved their manufacturing facilities to mainland China mainly in the PRD to take advantage of low cost factors of production. Consequently, the demand for technical personnel in Hong Kong gradually decreased.

The vast majority of the manufacturers in the PRD are OEM. A low skilled workforce is sufficient for this level of manufacturing. Innovation and more advanced technologies were not considered necessary to build a competitive edge. As a result, these manufacturers have not developed the know-how and incentive to invest in high technology. They think that it is more expedient to import technology when needed, rather than to build from within that required employing talent for developing new technologies. For Hong Kong to be able to build up a knowle based society(KBS), this situation may need to change.

Hong Kong needs to build a pool of future science and technology professionals and entrepreneurs. An inadequate pool of science and engineering graduates at both undergraduate and post-graduate levels would be detrimental to Hong Kong's goal to build its research and development capacity. However, the current job market does not favour this trend. At present, there are more career opportunities for young graduates in Hong Kong's dynamic services, trading and business environments. Engineering and computer science graduates who have the potential for R&D careers are finding themselves restricted to engineering sales and services positions at large and medium size companies. Few opportunities are found in jobs that would tap into what they have learned at university and enable them to develop further interest and skills in technology R&D. A number of the interviewees lamented that the youth in the schools have not developed an interest in or "fascination" with the science subjects. It could be said that the lack of career prospects in the sciences and technology influence the youth's choice of study at the universities. As one interviewee commented:

A number of other elements including financing and human resources are needed for hi-tech firms to flourish. Hong Kong does not have enough talent for innovation and technology development. Technology subjects are not the preferred subjects for kids. Students prefer to study business, medicine... Part of the reason is that manufacturing firms in Hong Kong have moved to China. Putting these together, Hong Kong lacks human resources to support innovation and technology development.

One senior executive at HKSTP has estimated a need for 15,000 engineers from various disciplines over the next ten years. While there are about 6,000 engineering graduates each year from the Hong Kong universities, the HKSTP has only been able to attract 800 of the local graduates to fill 2,500 positions sine the firs phase of HKSTP's operation. Graduates are tending to select offers from the business sectors because they perceive that these sectors, in particular financial services, pay better salaries. Hence, engineering graduates do not choose engineering professions. HKSTP employs mainland graduates to fill the vacancies, although they would prefer to employ local graduates because they are more adaptable, have the market knowledge that is essential for design work, and also respect intellectual property rights<sup>50</sup>.

<sup>49</sup> Cited by Mani (2004) from a paper by Teubal, M (1999)

<sup>50</sup> Ming Pao (2006 and LiaoCo

For innovation and technology development to thrive in Hong Kong, the quantity and quality of engineering and sciences graduates must be assured. To gauge whether these disciplines are attracting higher caliber potential students, we looked at Band A secondary school students applying to CUHK. Here, the Integrated Bachelors of Business Administration attracted the highest number of applications from these Band A students<sup>51</sup>. The preference for business studies over engineering and the sciences reflect students perceptions that better paying jobs are found there.

## Educational Foundations for Creativity and Innovation

On a number of occasions, our interviewees mentioned education as one of the areas that Hong Kong has to address if the current goal of stimulating rapid growth entrepreneurship is to be realized. At the secondary education level, the observations are that the Hong Kong education system centers on examinations as a measure of academic achievement. Students prepare themselves to perform well in exams via rote learning, and keeping to specific subjects that will be tested. As a result, the limited learning experiences of the students do not develop a capacity for spontaneity, knowledge application, critical thinking and action. The students fail to develop creative skills or broad knowledge of events in the environment, and are not exposed to learning topics outside the narrow exam-based curriculum. These skills and types of motivation are not conducive for innovation and entrepreneurialism. An interviewed experienced in directing rapidly growing technology startups commented.

The Hong Kong education [system] focuses on grades ... The education system is another problem for Hong Kong. The education system trains kids to be robots not thinkers. They do not like to talk ....worse of all, they don't read ... and they often ask for examples of how to do things.

In 2000, the Education Commission of the government published proposals for education reform that aim to "enable every person to attain all-round education and life-long learning." Key terms to impart to the students include: "critical and exploratory thinking, innovating and adapting to change, self-confidence, team spirit, social skills, moral and civic values and behaviors". The proposals were adopted in the policy of 2001 the implementation of which was reviewed in the three following years.<sup>52</sup> The 2004 review showed improvements in the students' communication, independent thinking, learning motivation, innovation and commitment. The reforms encourage students to take part in more extra-curricular activities, and schools to adopt project based learning in the internal school assessment. Education is a long-term process and it will take time to see the positive effects of the reform on nurturing future generations of scientists and engineers for Hong Kong.

Government policies on education are implemented by the Education and Manpower Bureau (EMB). The policy initiators are the Education Commission, the Curriculum Development Council, the Advisory Committee on Teacher Education and Qualifications and the Standing Committee on Language Education and Research<sup>53</sup>. In 2004, the EMB launched a proposal for "Reforming the Academic Structure for Senior Secondary Education and Higher Education" towards a goal of creating a KBS for Hong Kong. EMB proposed that the curriculum reform includes introducing liberal studies as a "core course" for the New Senior Secondary Curriculum. The EMB proposal also specifically endorses the idea of "whole-person development" within the required Liberal Studies course.

If a liberal studies curriculum could encourage students to draw knowledge from different disciplines in the analysis of issues, and to develop their own views, construct personal knowledge, and become critical thinkers, this could it be the vehicle to prepare the future generation for careers that require innovation and entrepreneurial thinking?

The purpose of the EMB proposal is to create for Hong Kong the required "social capital" for becoming

<sup>51</sup> This is from the 2005 JUPAS Sub-system for Self-recommendation Scheme at CUHK. Band A choices were: 185 for Integrated BBA program; the highest number of applications to the Engineering faculty was for Information Engineering at 37 and Systems Engineering and Engineering Management at 33. The SRS was first implemented by CUHK in 1999 to attract more high caliber students. It is a channel for JUPAS applications who have attained outstanding non-academic achievements. It also complements the School Principals' Nomination.

<sup>52</sup> Hong Kong SAR Government Education commission (2000, 2001, 2002-4)

<sup>53</sup> Kennedy, (2005)



a KBS. In a KBS, human resources are developed to support a knowledge-based economy. Stephen K.C. Leung, Senior Statistician, Hong Kong Government SAR identified these indicators as essential for developing the KBS: innovation in creating knowledge and information; information and communication technology to efficiently and effectively distribute information and knowledge in the economy; sufficient numbers of individuals who have the caliber to create and produce knowledge and information; and a business environment that supports creation, production and distribution of information and knowledge for the economy.

In recent years, schools and universities have taken new initiatives to stimulate students' interest by organizing science fairs and science related competitions (Figure 17A)<sup>54</sup>. But more community initiatives are needed to supplement the government. We have emphasized above the dearth of talent in science and technology. But in the pursuit of stimulatory high growth startups, multi-disciplinary creativity is at least as important. Responding to this need, a new private school, the Lee Shau Kee School of Creativity, which will admit its first batch of 210 students in September 2006, focuses its curriculum on creativity as Figure 17B shows. Its graduates will find career opportunities in the applied technology fields that include multimedia performing arts, film and digital entertainment and environmental and spatial design.

#### **Figure 17A: Hong Kong Student Science Project Competition\***

The Hong Kong Student Science Project Competition (HKSSPC) is jointly organized by the Innovation and Technology Commission, The Hong Kong Federation of Youth Groups, the Education and Manpower Bureau and the Hong Kong Science Museum. Launched in 2001, the HKSSPC encourages secondary school students to develop academic and career interests in applied science and technology through invention and investigation. Schools can nominate up to 8 teams of 2-5 students from across different forms and academic streams. The HKSSPC is an initiative to foster an innovation and technology culture in Hong Kong beginning with the youth. It aims to stimulate curiosity among these young people, about things that are present in the environment. By using the scientific approach to discover and explore the phenomenon, the students will gain an appreciation for the sciences and gain the basic knowledge and skills of doing research and development. Faculty members from the universities and tertiary institutions serve as mentors and advisors to the teams, sharing their experiences of their own scientific investigations. Winning teams gain prizes and are sponsored to take part in international youth science programmes.

The ASTRI Junior Fellowship is a new prize offered to students of winning teams of HKSSPC. The aim is to inspire young students an intellectual interest in science and technology and to encourage them to pursue a future career in the field. The Fellowship is sponsored by the Hong Kong Applied Science and Technology Research Institute Company Limited (ASTRI). Six ASTRI Junior Fellows will be given the opportunity to work with world class engineers in a real research and development environment. The first group of Fellows will begin a 15-work-day programme in July 2006. The programme comprise orientation, a site-visit to ASTRI, a 10-day assignment at ASTRI and a meeting with Fellow's mentor. Two Fellows will be assigned to a Mentor who is either an industrial leader or an entrepreneur in Hong Kong.

The HKSSPC and the ASTRI Junior Fellowships are innovative ways to nurture the future generation of scientists for Hong Kong. Both programmes are targeted at secondary school students. Curiosity and discovery are essential for creativity and should be cultivated among even younger children in primary schools. They will be more open and prepared for the HKSSPC when they progress to secondary school. The attitudes and skills for scientific discovery, investigation and development should continue to be fostered and developed at the tertiary institutions and universities. There are many ways for achieving this including local and international competitions for university students to develop business plans for creating new ventures, and for transforming ideas to become products; a comprehensive curriculum for entrepreneurship; and internships with R&D units and entrepreneurial firms.

<sup>54</sup> McCann (2006).

\* [www.hkssp.gov.hk](http://www.hkssp.gov.hk)

### Figure 17B: HKICC Lee Shau Kee School of Creativity

The Hong Kong Institute of Contemporary Culture (HKICC) Lee Shau Kee School of Creativity is scheduled to open in September 2006, and will be the first Direct Subsidy Scheme senior secondary school in Hong Kong that is devoted to "creative education". It will depart from the exam-oriented traditional education style in Hong Kong, as only five to seven subjects will be examined, while there will be a wide selection of school-based subjects. This will ensure an "all rounded education" that emphasizes personal development, creativity, and multi-disciplinary knowledge. The learning process will be project based, developing an ability to do research and solve problems through creative and critical thinking. This will be achieved through tutorial and mentoring, internships, self-learning, and experiential learning. "Art-in Education" is an innovative method to integrate art in all the subjects, further honing students' creative and artistic potential. Language skills in English and Chinese, together with information technology and media skills, are also emphasized, ensuring that graduates have the foundational skills and mindset for thriving in a knowledge-based economy. It is envisaged that they will move on to enroll in community colleges and media arts programs at selected universities in Hong Kong.

The challenge for this new school is to gain acceptance from parents, who need to be confident that their children will be able to find gainful and secure employment as graduates, and be able to be admitted to tertiary institutions. Universities will also need to accept non-examination based pre-requisites.

## Management of Engineering and Technology Talent

High growth entrepreneurial firms must manage and motivate their engineering and technology talent, not just with competitive and attractive compensation and benefits, but also with opportunities for challenging and meaningful work. One of the respondents, who is leading a company spun off from a research institute, strives to enable his professionals to see their research become reality and used in the "real world". This gives them a sense of accomplishment and satisfaction that they greatly value. His challenge is to find customers who will adopt and use the technology and research that his team has developed.

Developing a business strategy involving a timeline for achieving marketing and sales targets requires business knowledge and skills. At the early stage of the firm, this is generally the domain of the founder or innovator. Later on, as the firm grows, there will be a need for the firm to engage professionals to do this work. However Firms engaged in R&D may fare better in "growing their own talent" with assignments, training and development in skills and knowledge for the future.

## Managers of Innovation and Technology Programs

Key decision makers in the government are a critical group to ensure that policies are effectively implemented. They too are part of a talent pool for innovation and technology development in Hong Kong. The respondents observed that government officials comprise this managerial resource. Any lack of knowledge of innovation and technology would hinder the implementation of government initiatives. One interviewee commended that, during the early years of the ARF, there was a government requirement for a 5 percent return on investment. This reflected a lack of understanding that high-technology investments are high risk activities and an expectation of 5 percent of steady return on investment is unrealistic, especially at the startup stage of the venture. Another expert in the high-technology investment believes that the government should be satisfied with a 10 percent success rate amongst high-technology projects. It is necessary to term perspective on investments of this kind; unfortunately, government officials did not seem aware of this. If the situation is to improve, government officers assigned to managing innovation and technology programs will need to have the required expertise and interest in science and technology, and be able to take a specialist role, while still retaining the opportunity to advance through the civil service career structure. A member of the CIT noted

The Government needs a champion to lead these innovation and technology initiatives. But a career civil servant has no incentive to be a champion. If you are in transport for three years and education for three years, there is no reason to be a science and technology champion. Now, with the R&D center concept,

I am not sure how things will turn out without [this] long term goal.

## Attracting and Retaining Global Talent

The respondents in general agreed that human resources are a critical attribute for Hong Kong to develop its agenda to stimulate high growth entrepreneurship. They were also optimistic that Hong Kong is able to attract talent from around the world to come to Hong Kong to meet its human resource need. Professionals referred to both the knowledge workers and the technology entrepreneurs.

In fact, Hong Kong already has distinct advantages in this area. Respondents said that Hong Kong's status as the "first free economy" in China gives it an important edge. Hong Kong also has a good macro environment that is conducive for business development. In addition, salaries in Hong Kong are at least as competitive as those in other popular places around the world. For example, more than half of the IC companies in HKSTP come from overseas. High-caliber technology professionals from overseas many of whom are ethnic Chinese, have come to Hong Kong one interviewed commented. This attraction is even greater for Mainland Chinese.

The people problem can't be solved right away; but at least Hong Kong enjoys [an] unlimited supply of manpower coming from the Mainland. In Universities, most of the research students are from the Mainland.

Professionals and talents from around the world, as long as they possess knowledge and skills that are valuable to the SAR, should be allowed to seek employment in Hong Kong. Over the past few years, the Immigration Department has implemented a number of schemes to specifically target importing professionals and talents from Mainland China. Under the latest initiative, the Admission Scheme for Mainland Talents and Professionals has resulted in a steady flow of competent people from Mainland China to Hong Kong. For the years 2004 and 2005, 4,370 and 4,665 professionals and talented people came to Hong Kong for employment respectively. ]In addition, the number of mainland students studying at universities in Hong Kong has increased. For 2003-2004, 1,528 mainland students were granted student visas for degree courses in Hong Kong.

Since 2001, a number of outstanding mainland students graduating from UGC-funded universities have been allowed to re-enter Hong Kong for employment. As of March 2004, 239 mainland students have received employment visas to work in Hong Kong upon their graduation. This immigration policy may help companies and organizations obtain talents that will in time contribute to the economic development of Hong Kong. Still, most of the mainland students we train do not stay, causing Hong Kong to lose expertise we have trained.

Other measures already exist to allow Mainland residents to resettle in Hong Kong. For example, One-way Permits are for the entry of Mainland residents into Hong Kong for residence and are provided for under Article 22 of the Basic Law.

One-way Permits are issued by the relevant authorities of the Public Security Bureau in the Mainland. The daily quota of One-way Permits is 150, including 60 reserved for persons who were born in the Mainland and have the right of abode in Hong Kong by descent from either parent in accordance with Article 24(2)(3) of the Basic Law, and 30 reserved for long separated spouses. From April 2004 to March 2005, 36,424 Mainland residents entered Hong Kong for settlement through the One-way Permit Scheme<sup>55</sup>.

On July 9, 1997, the Immigration Ordinance introduced the Certificate of Entitlement Scheme, whereby persons claiming the right of abode in Hong Kong under Article 24(2)(3) of the Basic Law would need to have their claims verified by the relevant authorities and be issued with a Certificate of Entitlement. This would be affixed to their One-way Permits before they could exercise their right of abode in Hong Kong. On August 15, 1997, the first group of persons came to Hong Kong under the Certificate of Entitlement Scheme. As at March 31, 2005, 158,009 persons had entered Hong Kong under the scheme. The question is whether this immigration policy can help bring the Mainland talent that Hong Kong particularly needs. In the short and

<sup>55</sup> See Hong Kong SAR Government Immigration Department (2006).

### Figure 18: The Quality Migrant Admission Scheme

The Government has recently taken action to remove another barrier to talent coming to Hong Kong. In past years, professional talent had to obtain an offer of employment for a working visa before coming to Hong Kong. The Quality Migrant Admission Scheme (QMAS), announced on February 23, 2006, has eliminated this requirement and is expected to attract quality migrants from Mainland China and overseas to settle and work in Hong Kong. The QMAS could hasten the provision of scientists and technical support personnel that are greatly needed for R&D efforts in the universities, research centres in the public and private sectors. An initial annual quota of 1,000 has been set; applicants will have to meet a set of criteria.

QMAS immigrants may be permitted to bring in their dependants (i.e. spouse and unmarried dependent children under 18 years of age) provided that they are capable of supporting and accommodating their dependants on their own without relying on public assistance in Hong Kong. Dependants of QMAS immigrants would be allowed to work without prior permission from the Director of Immigration.

QMAS immigrants will be allowed an initial stay of one year. At the end of the first 12-month period, the QMAS immigrants should be able to demonstrate that they had taken steps to settle in Hong Kong, e.g. by securing gainful employment or establishing a business.

medium term, this seems unlikely, as the bulk of the One-Way Permit Holders comprise children, elderly relatives, and women with few skills.

The Quality Migrant Admission Scheme that will be implemented in June 2006 may be the better way to bring in overseas and Mainland Chinese talent to Hong Kong. The quota of 1000 per year may not be sufficient to make a significant difference to fulfill the urgent need for skilled people. However, it is a promising initiative if efficiently implemented.

In summary, human resources are critical in a KBS where the creation, production and development of knowledge and information fuel high growth entrepreneurship. We have identified the following factors that have an impact on Hong Kong's source of talent, and are essential for creating and developing entrepreneurship and innovation: education, the mindset for engaging in innovation, and immigration policies. Our conclusion is that Hong Kong's education system has not created a sufficient quantity and quality of people who choose to study the disciplines that are geared for R&D work innovation and creativity. Also, the immigration policy, as an immediate measure to import talent, has not attracted sufficient technology and entrepreneurial talent to Hong Kong. Some recent initiatives to address these issues are a good start. However, it will take a long while before the benefits emerge.

## 6. Finance

Without money, even the best ideas cannot become market reality. Across the world, entrepreneurs cite finance unavailability as the most serious weakness impeding entrepreneurship<sup>56</sup>. Banks will never lend without tangible assets as collateral or at least a stable expected future cash flow which can be verified – usually by referring to historical performance.

As a result, equity is typically the major source of startup and early growth capital. The lack of finance is a problem because those who spot the entrepreneurial opportunities often lack sufficient capital themselves, and it is difficult for outsiders to appreciate the value of the opportunity and monitor the investment. Moreover, the entrepreneur himself may be incorrect in the assessment of the value of the venture, so it is extremely difficult to distinguish between a lack of finance and the rational decision of holders of capital to invest only in profitable enterprises<sup>57</sup>.

To help overcome these barriers, the Hong Kong government has, over the last decade, implemented three programs to stimulate high growth expectation entrepreneurship. In this section, we discuss the ITF, together SERAP, the ARF, and GEM.

### The Innovation and Technology Fund (ITF)

As we discussed in Section 3 above, the CIT report, published in 1998, led to the establishment the ITF under the ITC, to be funded by an initial injection of \$5 billion "... to meet requirements in the short to medium term". The CIT also recommended that there be a mechanism put in place to evaluate the effectiveness of the fund. The objective in the words of an ITC member was to

... not promote high-tech for the sake of high-tech...[but to place]...the emphasis ... on stimulating dynamism in all economic sectors for innovation and upgrading by introducing improved technology and methods, by penetrating new market segments and by entering activities of higher value.

Although the ITF has four programs, we focus here on SERAP, whose activities are directed to new high growth potential enterprises, as summarized in Figure 19.

**Figure 19: The Small Entrepreneur Research Assistance Program**

<b>Years in Operation</b>	1999 to present
<b>Participating institutions:</b>	Local private industries, universities
<b>Total budget, time allocation</b>	SERAP is a part of ITF, which was set up with an initial injection of \$5 billion, aiming at supporting projects that contribute to innovation and technology upgrading in industry.
<b>Number of people directly working for the initiative:</b>	SERAP is managed by the ITC, which has a head count of about 200 staffs (2005). Within the commission, 7 staff are allocated to work on the SERAP programme to promote technological entrepreneurship; applications for SERAP are reviewed by an assessment panel of 4 to 5 assessors (selected from a pool of 36 assessors) who come from the business and academic communities.
<b>Resource type:</b>	For projects approved for funding, up to HK\$2 million will be provided on a dollar-for-dollar matching basis. The first allocation of up to HK\$400,000 will be for validating of technology and/or building the prototype for the first phase. If completed, additional funds could be approved (subject to vetting) for use in the second phase.
<b>Growth mechanism addressed:</b>	Projects are evaluated based on the innovative and technological contents of the project; commercial viability; and commitment and capability of the team. The government's contribution will be recouped if the project is able to attract follow-on investment or generate revenue. Projects under SERAP would be carried out in two phases. In general, Phase I will not last more than 6 months. Contingent upon the success of Phase I, Phase II will take the project forward for no more than the remaining months of the 24 months project period.
<b>Firm life cycle stage:</b>	SERAP focuses on the start-up and early growth firm life cycle stage.
<b>Sector addressed:</b>	Technology entrepreneurs of a locally incorporated company with less than 20 employees.
<b>Number of firms or projects processed in total:</b>	As of August 2005, SERAP has approved 226 projects with an investment amount of HK\$223.4 million in total.
<b>Number of firms or projects per annum :</b>	For the previous 3 years (2002 - 04), the fund has approved 28, 64 and 44 projects, respectively.
<b>Notable success cases:</b>	AppoTech Limited, a fab-less IC design house incorporated in Hong Kong in January 2003. AppoTech received SERAP funding for the designing of a 100 MIPS 8-bit MCU, which is 20 times faster than similar products existing in the market today. The company's web site is <a href="http://www.appotech.com">http://www.appotech.com</a> .
<b>VC funding received:</b>	Dragonchip Limited ( <a href="http://www.dragonchip.com">http://www.dragonchip.com</a> ) for HK\$ 17.94 million, Emsoft Limited ( <a href="http://www.emsoftltd.com">http://www.emsoftltd.com</a> ) for HK\$ 7.8 million. Also, Kanhan.com Limited ( <a href="http://www.kanhan.com">http://www.kanhan.com</a> ) went IPO on the GEM in Feb 2003.

<sup>56</sup> See, for example, Ahlstrom, et al (2005) page 17

<sup>57</sup> Economists describe these market failures in terms of "informational asymmetries" and agency costs, which costs can be subdivided into moral hazard and adverse selection. A very large body of financial theory discusses these problems. In the context of entrepreneurial finance, Gompers and Lerner (1999) present a detailed description of the venture capital industry, while citing those theoretical and empirical academic financial works that help an understanding of venture capital in general, and the provision of external financing to rapidly growing enterprise in particular.

SERAP was based loosely on the US Small Business Administration model to provide funding to small companies for high tech projects. As a senior government official commented:

When it was started, the SERAP Secretariat spent two months talking to the SERAP assessors ...asking for directions and insights of how to execute the program. Through this exercise, the assessors became aware of the program. This interactive open dialogue with the assessors laid a good foundation for the program.

Under SERAP, the government provides an unsecured, non-interest bearing loan of up to HK\$2 million, where the company itself must match either in kind or in cash. An official who was acquainted with the program commented:

When the initial batches of applications came in, it was clear that quality of the applications was poor. SERAP then started monthly marketing activities to promote public awareness. In about six months, SERAP saw a steady flow of applications and the quality of projects improved tremendously.

As the program progressed, new issues came up. Typically, successful applicants came to the SERAP Secretariat for directions when they faced problems in their projects. The Secretariat would typically say, "Ask your customers what they want, and never come to the government for directions. You have to be market focused. The government cannot help you on this." It was never the intention for the Secretariat to interfere, and as a matter of fact, the Secretariat wanted to stay out of the way so that the market could lead innovation.

The interviewees in our study shared the consensus that SERAP is a good model. A small, new company with the ability but not the funding to implement a technical upgrade, can realize its plan through SERAP. SERAP plays the role of an angel investor, providing a defaultable loan: in unsuccessful projects, the applicants do not have to pay back the loan. In successful projects, however, the loans do have to be repaid, interest free. The government intends to continue the program.

## Applied Research Fund (ARF) 1998-2004

Venture capital<sup>58</sup> is insignificant in terms of the percentage of startups that it finances: only about one in ten thousand new companies are venture capital financed.<sup>59</sup> Yet in terms of the amount of external equity capital raised by high technology startups, venture capital is extremely important. Formal venture capital in the US accounts for two thirds of the privately-sourced, external equity raised by high technology companies<sup>60</sup>. Hong Kong hosts the most active community of venture capitalists (VCs) in Asia, but typically Hong Kong VCs invest the vast majority of their funds outside Hong Kong.

The importance of VCs to high technology financing, coupled with the limited enjoyment of those funds by Hong Kong entrepreneurs, motivated the Hong Kong government to implement a publicly financed, privately run venture capital fund, the ARF, in 1998. In the words of a member of the CIT, the ARF was "...an *abysmal failure*." This failure, however, provides valuable lessons about feasible roles for government in stimulating high growth expectations companies.

Regardless of the theoretical arguments for or against government funding of domestic venture capital, the Hong Kong government is culturally incapable of successfully administering a venture capital program because

- Conventional VCs place funds at the disposal of companies typically owned by already well-off members of society
- VCs expect to book frequent and large losses in supporting these private companies.
- The political environment of Hong Kong is highly transparent.
- In government, blame for failure is high while reward for success is low.
- The horizon of VC investments exceeds the tenure of most government postings.

<sup>58</sup> We use the term "Venture Capital" here in its classic sense – investment by a formal VC fund into a start-up or early stage company with high growth prospects. However VC funding in general and in Hong Kong in particular often includes other private equity activities such as late stage growth financing, management buyouts, pre-IPO financing, natural resource rights and other non-publicly traded equity security investment.

<sup>59</sup> In Hong Kong, early stage venture capital financing is less common among VCs than other aspects of private equity financing.

<sup>60</sup> See Bygrave (2005).

<sup>60</sup> See Freear and Wetzel (1990)



**Figure 20: The Applied Research Fund**

<b>Years in Operation</b>	1993 – present although it started in its venture capital format in 1998 and it stopped making new investments in April 2005. The program is being discontinued																					
<b>Participating institutions:</b>	Applied Research Council and eligible non-government Hong Kong VCs Walden Technology Management Company, Hong Kong & Shanghai Banking Corporation, Asia-Tech Ventures																					
<b>Main financiers, their funding shares:</b>	Hong Kong Government																					
<b>Total budget, time allocation<sup>61</sup>:</b>	The ARF is a government-owned venture capital fund which started as the Applied Research and Development Scheme, set up in 1993 with a capital injection of HK\$175 million to provide support for technology venture. In June 1995, the Finance Committee of LegCo approved another HK\$50 million for the setting up of the Cooperative Applied Research and Development Scheme to provide finance to local companies which collaborated with Mainland researchers in technology venture. In 1998, a government review concluded that these two schemes were successful filling a gap in providing finance for technology start-ups and technology upgrades and obtained funding approval to make a further capital injection of HK\$525 million into the renamed ARF, ARF pooling the remaining capital of HK\$225 million of the previous programs. Thus, ARF had a 1998 start-up capital of HK\$750 million. During its operation, ARF disbursed approximately half of its funds																					
<b>Number of people directly working for the initiative:</b>	The fund is disbursed through ITC to qualified VCs, invest in private ventures. On the government side, the fund is monitored by the board of directors, which is composed of 10 persons including representatives of the academia, various industries and the government.																					
<b>Resource type:</b>	Government funds. Investment follows the VC model whereby the VC disbursed fund takes an equity stake and the VC sits on the investee board. The involvement of the VCs in investee management is inversely proportional to the performance of the investee.																					
<b>Growth mechanism addressed:</b>	Investment decisions are primarily delegated to VCs but each investment requires approval from the ITC panel. Investees can source additional funding from elsewhere, subject to terms of VC agreement.																					
<b>Firm life cycle stage :</b>	Start-up and early growth firms..																					
<b>Sector addressed:</b>	At the discretion of VCs, but technology businesses with commercial potential were favored																					
<b>Number of firms financed</b>	Before 1998, 27; after 1998, 25																					
<b>Number of firms or projects per annum:</b>	Before 1998, about 5 firms per year; after 1998, about 3.5 per year.																					
<b>Examples of notable success cases and particularly successful graduates (provide web sites if possible):</b>	Some of the companies in which the fund managers invested remain profitable as of today. For example: <table border="1"> <thead> <tr> <th>Investee Company</th> <th>Funding Approved</th> </tr> </thead> <tbody> <tr> <td>ecVision Ltd.</td> <td>HK\$27.24 million</td> </tr> <tr> <td>LECCO Technology</td> <td>24.59</td> </tr> <tr> <td>Wiser Information Ltd.</td> <td>33.84</td> </tr> <tr> <td>InfoTalk Corporation Ltd.</td> <td>24.15</td> </tr> </tbody> </table> <p>For the above investments made, as of 2005, LECCO Technology has been sold to a listed company, and the others remain profitable but have not yet been sold</p>	Investee Company	Funding Approved	ecVision Ltd.	HK\$27.24 million	LECCO Technology	24.59	Wiser Information Ltd.	33.84	InfoTalk Corporation Ltd.	24.15											
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In general, VC investing is a high risk, high expected return activity. Regardless of whether, they invest in the US, Hong Kong or elsewhere VCs pool institutional investor money into limited partnership funds of from US\$50[PC78] to over US\$1 billion funds and make investments into promising rapid growth firms. For example, if a VC funds 10 firms, over the decade-long life of the fund, five may be "written-off", two may live but never achieve real profitability, two may be modestly successful, and one may be a tremendous success, whose return on being sold or listed in an initial public offering (IPO) makes up for the other failures. The architects of the ARF understood that bureaucrats did not have the training or incentive to make these kinds of investment decisions. As one interviewee noted, prior to the ARF,

[Government] people back then were requesting that there be a 5 percent annual return on investment, making it necessary to seek personal guarantees and all kinds of collateral. It was not a viable model. The numbers on investments of this kind just don't work that way. Hi-tech investments are risky but the government does not seem to be familiar with this concept.

To solve this fundamental mismatch, the ARF was structured to give private VCs the mandate to run the funds as they saw fit. One of the leading private sector VCs in the ARF called the government's decision to allow VCs to make the investment decisions "...a brave move." However, while the government gave VCs the mandate, it retained the final authority: i.e. each investment had to be approved by the ITC panel.

<sup>61</sup> See Hong Kong SAR Government Audit Commission (2004)



Unfortunately, after the appointment of VCs to run the ARF, the discrepancies between the cultures of the government and the VCs hindered its operation. As one senior government official expressed it,

it doesn't work because it is public money. The VC hopes that one project is successful but the government has to explain to LegCo every cent that it spends.

The degree of government control varied widely during the life of the ARF. The internet bubble rapidly expanded just as the ARF was being launched. One VC firm initially pursued an aggressive investment strategy, while another was more conservative, following a co-investment strategy: for every ARF dollar the conservative firm invested, it added \$3 to \$4 from other funds under its management<sup>62</sup>.

VCs are typically compensated on the basis of a small percent of total funds under management plus a large percentage of the cash returns over the original principal contributed by the limited partners of the fund. Originally the government followed this format, but later it changed the fee structure to a percentage of the funds disbursed, not funds under management. This move penalized co-investment policies for their "slowness".

The bursting of the internet bubble devastated VCs throughout the world. As a result, VC investing dropped by 80 percent<sup>63</sup>. The Hong Kong government tightened its control over ARF management, making life more difficult for the VCs. A former government official commented:

One of the VCs really messed up everything as their investments were highly controversial. In the end, most of the investments ...went down the drain. The ARF had to write off these bad investments and the result was a public outcry for better control and administration of the program.

...

Looking back, the ITC should have done a thorough study of how VC funds are operated, and designed a co-investment strategy that attracts VC monies into ARF. This spreads the risk of the government investments and reduces the political "blame" when investments turn sour. The failure of the ARF is a case of poor execution, although the vision and the intentions of setting up the program were noble.

One of the VCs commented about working with the government:

Managing the government funds was difficult...The government tied [our] hands. Normally, VC funds do not restrict the manager as to nationality of the investee. ARF only allowed Hong Kong firms and, initially, only Hong Kong registered firms; however, the government later changed the rule to allow companies registered in places like the Cayman Islands [a tax-free offshore jurisdiction favored by Hong Kong companies] to participate as long as they were Hong Kong based companies. ...

The mindset of the [ITC review] panel members was very short term focused. Basically they were not familiar with what a VC does. The VC fund manager therefore had to explain to them how venture capital works. The problem was that the government changed the panel every two years and the VC had to repeat the process every time a new panel was formed. Even mundane questions had to be responsibly answered for the panel. The panel oversight created a second structure of approval in addition to the internal structures of VC company. This gave the VC extra work load.

...

[In ARF], there were political pressures that compelled [the VC] to look at projects that were obviously not viable....The useless review process [was] a waste of resources.

... In practice, the lack of knowledge of the government officials and other non-VC personnel involved brought along so much trouble for the VC manager that it was not worthwhile as a commercial undertaking to manage ARF funds. If a second ARF fund were available, ...[we]...would not bid on it.

<sup>62</sup> Although the Tien report (1999) recommended a co-investment approach to venture capital stimulation in Hong Kong, the government did not pursue the idea. The co-investment described here was not a requirement of ARF

<sup>63</sup> USVC investment flows dropped from about US\$100 billion per year in 2000 to US\$20 billion in 2002, while venture capital-backed IPOs fell by 90 percent. See North American Venture Capital Association statistics

One senior government official summed up the experience as follows:

The capital market would probably have taken up the most promising projects and therefore the ARF was left probably with projects that were mostly more risky or offered less return. The high degree of transparency and accountability expected of the ARF as a policy tool does not sit in well with the *modus operandi* of a venture fund, given the rapid changes of the market and business, the speed for decision making and the need to "pull the plug" on non performing projects. Timing was an issue as the ARF was contracted out to professional fund managers at the time of the Internet bubble. The political process also does not cater for long incubation periods, lest there are queries for lack of visible return in a two to three year horizon.

Among our interviewees, there was unanimity: the government should not in future play the role of a VC. What can the government do, given the clear importance of VC capital to high technology enterprise development? Its role in Hong Kong should be restricted to creating an environment where private sector VC funding can prosper. It is useful to recall that a seminal event leading to the rise of venture capital in the US was the Department of Labor's clarification of the "prudent man" investment rule for the purposes of US pension funds in the 1970s. This rule clarification allows pension funds to invest in venture capital if they so choose, because it is now deemed prudent. One of our interviewees suggested:

The government can ...enact legislation to help support the local VC market....Even if local pension funds could invest 2 percent in alternative investments like VC funds, that would be a very large pool of capital.

### The Growth Enterprise Market (GEM)

Financial academics frequently describe market based financial systems as bringing greater wealth and economic stability than bank based systems.<sup>64</sup> This belief in the allocative efficiency of markets, plus the lack of financing for rapidly growing enterprises noted above, led the Hong Kong government to broaden the equity capital markets by implementing GEM in November, 1999. GEM's purpose was "...to provide capital formation for emerging companies to facilitate their business development and/or expansion."<sup>65</sup> GEM's target was companies (1) with high growth potential, but without sufficient capital, and (2) that were unable to meet the profitability/track record requirements of the Main Board. The GEM market was to allow sophisticated investors to make value-maximizing investment decisions. As GEM's parent corporation, the Hong Kong Exchanges and Clearings Limited (HKE), expresses it, "GEM operates on the philosophy of "buyers beware" and "let the market decide" based on a strong disclosure regime." Figure 21 summarizes the main listing and reporting features of the GEM market to differentiate it from the Main Board<sup>66</sup>.

Prior to setting up GEM, HKE analyzed the costs. Out-of-pocket costs of setting up GEM were estimated to be from HK\$100 million to HK\$200 million. Other potential costs stemmed from the risks that GEM's failure to achieve its goals might tarnish the image of the HKE. The costs were considered small relative to the potential for helping high growth companies finance their plans and, in the process, for enhancing Hong Kong's role as a financial center.

In the seven years since GEM was set up, it has had notable successes - raising of HK\$45 billion capital, listing of 220 companies and graduating of 12 GEM companies to the Main Board - but its successes are exceeded by its failures. It has been widely criticized for bending listing rules, attracting spin-offs from Hong Kong's property companies rather than tech start-ups, having pathetically low liquidity, losing its competitive edge to mainland exchanges and, worst of all, causing shareholders to lose most of their investments<sup>67</sup>. The GEM index return is approximately one ninth of its value at inception, as Figure 22 shows. The HKE has conceded that

<sup>64</sup> Proof of this contention is almost impossible to obtain, but correlations between wealth and the national system in place provide support for this contention. See for example Levine and Zervos (1998)

<sup>65</sup> See Stock Exchange of Hong Kong (1998)

<sup>66</sup> The GEM Board objectives and listing requirements have changed from the time of the proposal to today. In particular, the restriction of years in operation, management continuity, the size of the public float, the lock-up period and the minimum transaction size have been reduced through waivers and rule changes.

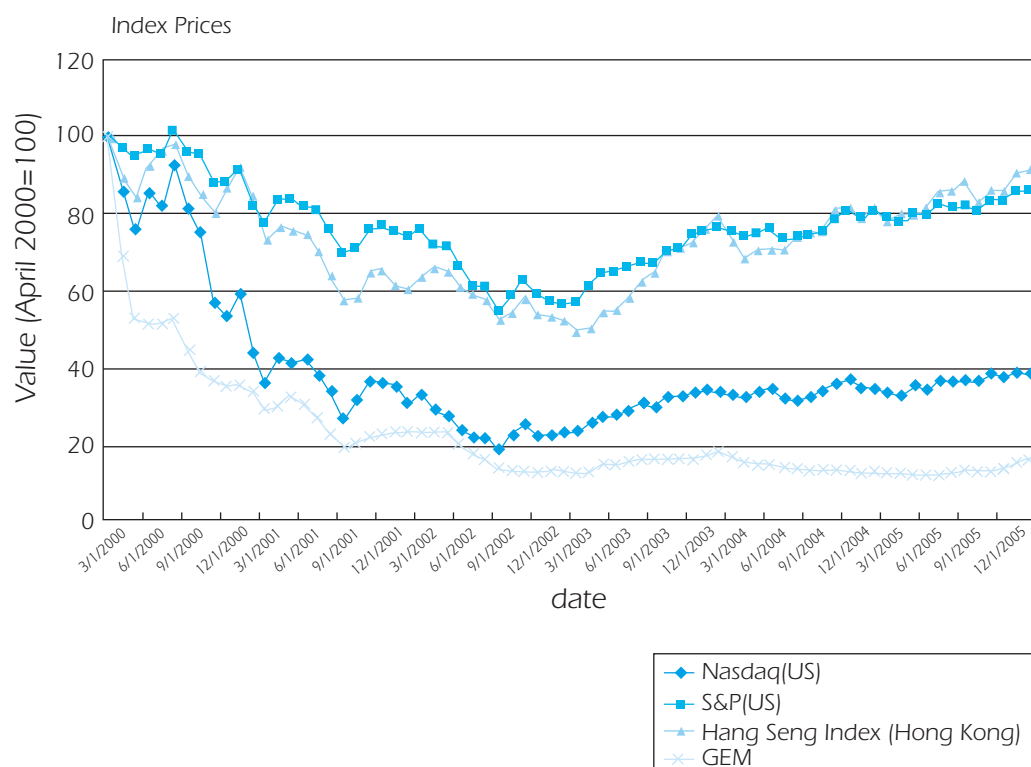
<sup>67</sup> See, for example, Clifford and Balfour (2000) and So (2005)

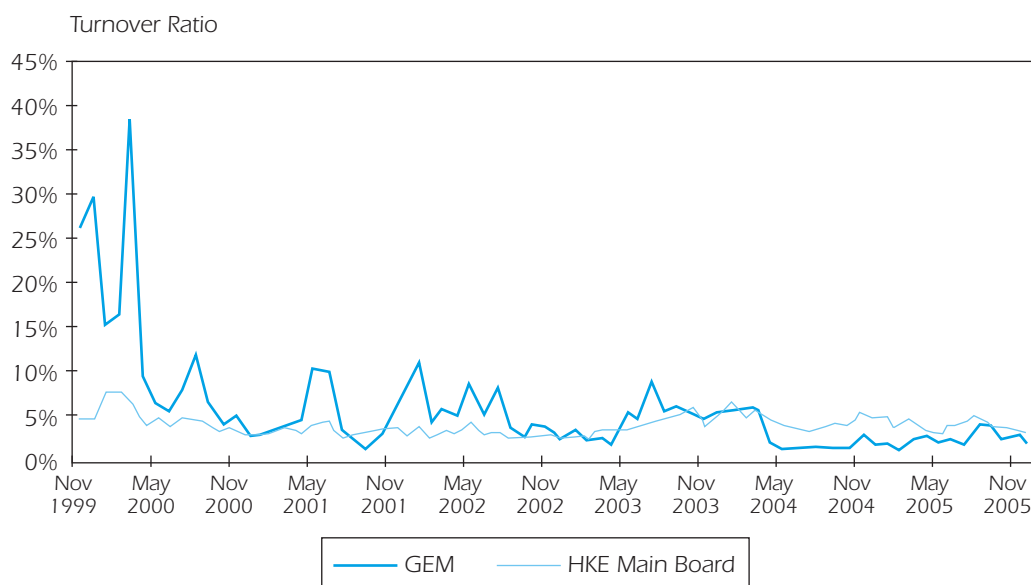
**Figure 21: The Listing Requirement and Trading Differences between GEM and the Main Board**

Requirement	Main Board	GEM in 2006
Revenue, Profit and Cash Flow	HK\$50 million profits: HK\$20 million in last year and HK\$30 million in preceding two years OR HK\$2 billion capitalization plus at least HK\$500 million revenue in last year plus positive cash flow from operations of at least HK\$100 million in last 3 years OR HK\$4 billion market capitalization plus revenue of at least HK\$500 million last year	None
Minimum Market Capitalization	HK\$50 million	HK\$30 million
Public Float	25% (dropping to 15% if market capitalization exceeds HK\$10 billion)	25% (dropping to the higher of HK\$1 billion or 20%)
Management Continuity and Issuer Purpose	3 years	2 years (or 1 year if firm is sufficiently large) in one focused active business pursuit
Spread of Holders	Less than 50% of public float in hand of 3 largest holders	At least 100 persons or 200 persons if the one year active business pursuit restriction used
Lockup Period	Six Months	Six months
Target Investor	All retail and wholesale	Minimum transaction HK\$50,000; subject to buyer beware warning
Financial Reporting	Annual audited and semiannual un-audited reports	Annual audited and semiannual and quarterly un-audited reports
Additional Self-governing Appointees	Needs sponsor but role ends with listing (H-shares sponsor continuing for 3 years)	Needs Sponsor and Compliance Advisor for two years following listing

Source: HKE Listing Rules

**Figure 22: GEM Board Prices and Turnover Ratio**





Turnover ratio gives the ratio of monthly trading volume to market capitalization

GEM is a problem<sup>68</sup>.

The opinions of our interviewees were critical of GEM's inability to achieve its goals. One senior civil servant commented:

GEM is supposed to be modeled on NASDAQ to enable small firms or start-ups that are by definition risky but otherwise offer high potential for growth and return to raise funds in the capital market. The listing requirements are less stringent to reflect this objective. The relatively disappointing performance may be attributed to three factors. First, a high standard of investor education and sophistication is a prerequisite. Second, the timing of the inception of the GEM shortly before the Internet bubble burst in 2000 was unfortunate. Third, there is effectively no success story vis-a-vis the many successful start-up-turn-industry leader cases that mark NASDAQ. This applies to the few companies that were listed in a high-profile manner given their relationship and backing from major property developers. All in all, confidence in the GEM needs a major boost and this has presented a major challenge.

But one interviewee summarized the continuing need and hope for GEM.

The GEM market in Hong Kong, like the NASDAQ market when it started off [in 1971], is nowadays a "dog". GEM has to evolve and it takes time. The exit mechanism needs to be in place.

China in general, and Hong Kong in particular, lack market solutions to the problem of raising expansion capital for rapidly growing enterprises. Second boards can be effective, as NASDAQ has shown over the last quarter century. More recently, the London Stock Exchange's Alternate Investments Market (AIM), the Toronto Stock Exchange's TSX-V Exchange and the Korean Kosdaq Market provide possible models of successful second boards. The German Neuer Markt, on the other hand, was opened in 1997, rode the internet/technology bubble to great success, and then failed: it was disbanded in 2003, after having lost 97 percent of its value.

Policy with respect to GEM is now at a crossroads. The HKE, in its January 2006 Discussion Paper, set out the questions it faces (see Appendix IV). Here, we present our views on the questions the HKE has raised.

<sup>68</sup> While the HKE in its *Discussion Paper on the Growth Enterprise Market* (January 2006) does not actually state that GEM is a problem, its third clause states "... this paper does not propose a solution for GEM at this stage ...". The discussion paper gives a balanced and detailed assessment of the problem.

We believe that GEM should continue to strive to meet the needs of growth companies looking for expansion capital from public sources. This should be unrestricted as to issuer industry. With the integration of Hong Kong into the PRD, and given the role of the HKE main board, GEM should continue to target Mainland-based companies keen to tap global equity markets. As of 2004, Shenzhen has its own second board, which may become be a competitor of GEM for mainland based companies. But Hong Kong credibly claims to have a comparative advantage in its capital markets and should be able to leverage that advantage. Second boards should be lightly regulated to reduce costs. Because analyst followings are likely to be insufficient for retail investors to make informed decisions, the target investor group should be restricted to institutional investors (above a substantial threshold – say HK\$100,000 per transaction, an identical amount as the maximum deposit insurance newly provided to Hong Kong banks' retail depositors).

The GEM has become more closely integrated into the regulatory system of the HKE in recent years. One advantage that GEM can offer over its mainland competitors is the possibility of graduation to the Main Board. It is natural that it adopt a tiered structure that allows simple and inexpensive graduation into the Main Board if relevant performance criteria are met. To preserve symmetry and the integrity of the Main Board, however, failure to maintain performance criteria should also lead to companies on the main board being demoted to the GEM. In this way, the HKE can help close the financing gap faced by rapidly growing entrepreneurial companies.



## 7. Discussion and Conclusions

Our interviews with makers, stakeholders, and implementers of policies to promote rapid growth entrepreneurship lead us to five key observations, show five issues to be addressed and stimulate us to make five recommendations for future investigation.

### Five Key Observations

#### 1. The role of the Hong Kong government in providing capital directly to new and rapidly growing companies is necessarily very limited.

The Hong Kong government conscientiously implemented two programs to provide capital to new and rapidly growing firms, and in the process, came to two clear conclusions. Firstly, relatively modest, un-guaranteed, match-funded, debt capital contributions to small enterprises undertaking applied research can be effective at a relatively low cost: the SERAP program is a modest success. Secondly, the provision of government funds to VCs for investment in rapid growth, pre-IPO/industry sale companies was fraught with difficulties: ARF was a failure. It should be emphasized that the government came to these conclusions and reacted in an orderly manner: on the one hand, to expand SERAP and on the other, to phase out ARF.

The reasons for SERAP's success versus ARF's failure flow from differences both in market imperfections (the most compelling reason for government intervention) and the political realities of Hong Kong. At the start-up, angel investment phase of a company's life, market failure is more problematic than at the later, growth financing stage, for which a well developed venture capital market already exists in Hong Kong. And it is especially problematic for funding of start-up firm R&D, at a time when the firm is typically in a frantic rush to get products to market. Moreover, it is more politically acceptable to lend a modest amount of money (no more than HK\$2 million) to a start-up firm where the entrepreneurs clearly need capital and mentoring, than it is to give an equity investment of several million US dollars to a company whose entrepreneurs typically come from the richer, better educated sector of society. And the nature of the VC investment itself - investment in a portfolio in which, perhaps, 10 percent of the companies have dramatic returns while half may go bankrupt - may appear to a government critic to be closer to a lottery than a stable investment. A final point is that a VC portfolio is less conducive to government oversight than is a match-finding debt portfolio, where control over disbursements is stringently exercised.

#### 2. A reformed GEM is important for providing liquidity to rapidly growing enterprises.

While the GEM's success over the last eight years has been, at best, mixed, experiences from GEM's short, unprofitable life can be used to provide a solid foundation for a better second board in Hong Kong. We believe that GEM's original objective of providing public, institutional investor equity to high growth potential, limited track record companies is still valid. Although, from the point of view of the HKE, GEM might now be an unwelcome diversion from the highly profitable role of providing offshore listings for Chinese stocks, we believe that it is in the general community's interests to develop this path to liquidity for rapidly growing companies. We believe that a light but consistent regulatory regime, coupled with the use of active sponsors and the attraction of graduation to the main board, can turn the GEM, over the long term, into a major success.

#### 3. The government must improve its capacity for effective intervention in formulating technology policies.

This study has found clear demonstration of a new and increased commitment of the Hong Kong government to supporting high growth entrepreneurship. Most of the efforts have been directed at promotion of innovation and technology-intensive aspects of specific industries. The policies in this area have evolved from rather simplistic linear model concepts of support to applied research to more appropriate and realistic programs for R&D and commercialization of new technology for vital clusters.



The new strategy of the ITC thus represents a stronger commitment by the Hong Kong government to steering technological innovation efforts - "supporting clusters" rather than adhering to "non-intervention." Nevertheless, it is by no means certain that this approach will improve conditions for high growth entrepreneurship. There has been evidence of considerable influence by established industries or public organizations with vested interest in selection of focus areas; such interests may not be representative of current or future high growth firms, or highly innovative technology-based industries.

The government has, we believe, improved its capacity for policy learning, gradually phasing out less effective programs, revising policy concepts, and introducing more focused initiatives. However, doubts continue to be expressed as to the capacity of the government to maintain a consistent policy, to analyze the key problems facing new ventures, and to learn systematically from both domestic and overseas experience. The government also needs analytical capacity in order to enter into a constructive dialogue with relevant stakeholders without getting locked into inappropriate projects dominated by vested interests. In our view, the solution to this problem is not "non-intervention", but more competent intervention.

#### **4. The education system must be further reformed to develop entrepreneurial and innovative talent.**

Hong Kong is still far from realizing the goal of becoming a KBS in which technology and innovation are created and supported by a ready and abundant pool of high caliber professionals and entrepreneurs. While Hong Kong has an excellent education system that has helped build a literate and educated populace, there are still insufficient graduates who desire careers related to research and development of science and technology. The long standing examination-oriented education system has not helped develop in its graduates the capacity for creativity, curiosity and independent thinking, which are essential for innovation and entrepreneurship. The impact of the reforms these addressing problems by will take time to take root, and it will take years for the results to be apparent. There is a need to push the reforms from the secondary schools to the universities. The planned change in university education from three to four years is a positive step. The additional year gives sufficient time for the students to gain a more well-rounded education and to experience learning and skills in creativity and discovery.

#### **5. The shortage of domestic talent can be remedied with immigration.**

There is a consensus that the lack of engineers and scientists has hindered innovation and commercialization of technology in Hong Kong. Companies have been unable to find enough local graduates to fill increasing positions. Local firms also need to build up their capacities to absorb R&D-to understand and integrate available technology. However, many engineering and science graduates are more interested in marketing and sales or government jobs instead of working on R&D. Business organizations must adjust their compensation and management policies, so that engineers are adequately motivated and rewarded to work on technology projects. To fill the talent gap, Hong Kong is on the right track by initiating short to medium term solutions with immigration policies designed to bring in much needed R&D talent. Even so, more proactive and strategic ways of bringing R&D talent to Hong Kong are needed instead of passively waiting for the inflow to happen.

### **Five Issues to be Addressed**

The changing government policies towards stimulating high growth potential entrepreneurship expose five issues.

#### **1. How should targeted support for entrepreneurs be aligned with the fundamental market-based approach to industrial policy?**

Given the prevailing principles of positive non-intervention in Hong Kong policy-making, and the national and international trend towards emphasizing the primacy of market forces as drivers of innovation, the various support schemes need to be targeted very precisely at measures that solve problems related to market failure or institutional constraints. Traditionally, these kinds of measures have included limited, stand-alone initiatives such

as the public financing of research, the construction of inexpensive office space, and the provision of venture capital.

There is a need to assess the effectiveness of such stand-alone initiatives and the potential benefits of stronger coordination and perhaps additional, complementary measures designed to create a comprehensive environment for high growth firms. For example, both national and regional governments in OECD countries have successfully developed an integrated set of policies to support local clusters of industrial development. Similar potential clusters have been identified for Hong Kong and the PRD, and a coordinated package of policies involving the cooperation of governmental agencies, research organizations and industrial associations could provide vital assistance to high growth firms in such clusters.

## **2. How can the government ensure that policies supporting high growth entrepreneurs are sustained over the long term?**

Many interviewees have observed that most policies aimed at support for high growth firms have suffered from lack of persistence and thoroughness in their implementation. One can point to many reasons for this state of affairs, including the turbulent economic situation characterizing the last five years, a corps of government officials that were relatively inexperienced in this field, and a general focus on short-term goals in the population as a whole. However, several initiatives have also been very slow to take off as originally intended.

For example, less than a third of the financial resources available for the ITF was committed to supporting R&D projects during the first five years of its existence. Another example is that the CEO for the HKSTP has changed four times in five years – a fact that hardly demonstrates continuity to the outside observer. It appears difficult for the government, given the volatility of economic and political conditions, to maintain a stable set of priorities with a time perspective of decades. Obviously, the policies also have to be adjusted to better exploit new opportunities and learn from the experience, so that they cannot be maintained constant forever. Thus the issue of persistence is related to the character of public expectations in Hong Kong, and to the capabilities for systematic learning in policy-making that we discuss below.

## **3. How can public support schemes be managed so that an appropriate balance between ensuring accountability and avoiding government micro-management is achieved?**

When the implementation of government support schemes was examined, it became apparent that these activities are constrained by a serious dilemma. On the one hand, government officials managing the schemes are accountable to the public, especially to legCo. This means that they need to ensure that objectives are successfully met. On the other hand, in order to ensure success and accountability, many government schemes encourage insights and control over management in great detail – in other words, micro-management. This contradicts the principles of non-intervention and additionally places an unnecessary management burden on government institutions.

Such problems were encountered in relation to several initiatives, including the ARF, the ITF, and ASTRI. Notwithstanding the case where the private sector was mobilized for management of the ARF funds through venture capital firms, an elaborate and time-consuming procedure was created to ensure accountability. However, such procedures did not ensure success – and perhaps even contributed to the failure of the scheme. The dilemma is in many ways unavoidable, given the high level of uncertainty and the need for maximum flexibility in the implementation of support for high growth entrepreneurship. Our impression is, however, that there is a need for much more explicit debate on the balance between public accountability and public management when new support schemes are being designed.

## **4. How can talented and skilled people be attracted into high growth entrepreneurial activities?**

One of the key issues facing the growth of new industries – especially technology-based industries – in Hong Kong is the difficulty of mobilizing talented and skilled human resources. The higher education sector has been expanded during the last two decades, and the universities are now training more students in relevant

subjects. Nevertheless, our statistics in Section 1 confirm the opinions of our interviewees. Unlike the rest of the world, in Hong Kong post-secondary study is not a route to involvement in high-growth entrepreneurship. Fewer Hong Kong graduates are interested in pursuing careers in science and technology than elsewhere. Moreover, students in Hong Kong are not sufficiently encouraged to develop creativity, and tend to be oriented towards scoring high grades through rote learning. Therefore the local supply of innovative talent in specialized engineering fields is often inadequate. The situation may improve in the future, if more students are encouraged to take a creative interest in science and engineering. In addition, local firms in Hong Kong need to ensure that they are practicing human resource management policies that encourage and foster creative and skilled people to provide their best.

At the same time, a city-state such as Hong Kong will always have to rely on expatriate talent in addition to the locally trained people. There has been a tradition of attracting overseas talent, and the government is still encouraging the mobility of professionals. However, there is a far larger available pool of skilled people trained in science and engineering in the Chinese Mainland that could contribute significantly to the growth of Hong Kong firms. Various government schemes have attempted to assist the exploitation of these human resources, but a more concerted effort would help.

#### **5. What criteria should be used to evaluate policies' success, so that, in the short term, the government can learn without losing sight of the long term goals?**

A weakness of the policies pursued by the Hong Kong government to support high growth entrepreneurship is that few explicit criteria for long-term performance have been formulated. The tendency has been to become subject to the extreme short-term perspective of rapid and high return on capital that is pervasive in the society. However, the sustained promotion of high growth and technology-intensive firms in Hong Kong will require a long-term perspective, and a willingness to accept "waste" of public funds to ensure the success of a minority of entrepreneurial initiatives.

The current criteria for distribution of funding have tended to over-emphasize academic or technical excellence; it would be appropriate to broaden both the funding criteria and the actual support to ensure commercial viability. Similarly, the evaluation of government schemes has not been based on a systematic formulation of benchmark positions and goals, thus depriving the government of useful lessons for revising and adjusting programs. In our study, we were impressed by the clear benchmark criteria and milestones formulated for performance by ASTRI in both short-term and long-term perspectives. This approach might provide a fruitful model for other initiatives.

### **Five Recommendations**

Our conclusions above are tentative, but they do lead us to make the following five recommendations, each of which requires research to identify the best directions for future policies.

#### **1. Improve Policy-Making Capability.**

The government should look into altering its own mode of operation to improve its capacity for policy making in the field of rapid-growth entrepreneurship in general, and innovation and technology in particular. There are several options available for such improvement. On the one hand, the ITC should continue to enhance its own research capacity, perhaps increasing this aspect of its role as administrative tasks are decentralized to the R&D centers. It is also important, but perhaps more complex and difficult, to ensure that government officials are allowed - and required - to develop more specialist know-how. On the other hand, some of the critical knowledge required for systematic and competent identification of clusters and in-depth analysis of ways to facilitate their innovative growth could be outsourced to other government organizations (e.g. the Central Policy Unit or the Census & Statistics Department), or other public or private organizations.

## **2. Coordinate and Extend Cross-Border Policy Initiatives for High Growth Entrepreneurship.**

Integration of Hong Kong with Shenzhen is inevitable – the question is only the process by which it will occur. As Section 1 of this report has demonstrated in some detail, there exist very dynamic and well-qualified entrepreneurial resources in Shenzhen, which could be very important for Hong Kong. There are great opportunities for mutually beneficial cooperation and support to high growth firms involving both Hong Kong-based organizations and PRD organizations and individuals. It has been noted that the Hong Kong government is moving in this direction with the Guangdong/Hong Kong Technology Co-operation Funding Scheme first launched in September 2004. We were also encouraged that ASTRI increasingly operates within a framework that attempts to reach clients and cooperation partners across borders in the PRD and the rest of the Mainland. These are good initiatives. But only detailed research at the working level of government departments will bring mutual understanding up to the level that it can be harnessed for effective policy coordination..

## **3. Increase Cross-Border R&D and Collaboration.**

Even if there are many contacts between Hong Kong firms and Mainland organizations, and a considerable body of knowledge about the overall economic and political linkages that such contacts entail, there is unfortunately still little data and knowledge available in Hong Kong that could provide more analytical perspectives on the opportunities and risks of further integration and collaboration in R&D. We believe that it is an urgent task to promote research of a more detailed and analytical nature in the field. For example, what R&D has been done cross-border? How? What has the central government of China, the Hong Kong government and the governments of the separate municipalities and provinces done to promote these activities?

## **4. Continue to benchmark and improve education creativity and curriculum change.**

There is a need to measure and study how much the curriculum change in the education reforms has resulted in more graduates being interested in science and technology careers, and being ready for the RBS. Research should be carried out to investigate what pedagogy is being used, and what more is needed to help students become more creative and develop a mindset for independent thinking and behavior. The research should be carried out in all levels of education – primary, secondary and tertiary. It is also important to monitor the qualitative impact of the immigration policies on attracting and retaining quality migrants.

## **5. Take a pro-active stance in recruitment of talent.**

Despite recent schemes to allow talent to move to Hong Kong, it is important to explore ways to complement the passive approach they represent. The government should consider establishing an organization similar to Invest Hong Kong, dedicated to promoting immigration to Hong Kong, targeting talents from overseas, and providing one-stop services for interested individuals. A lot can be learned from Contact Singapore, which is the first point of contact on working, studying and living in Singapore. In addition, the Taiwanese government organizes recruitment tours at the Bay Area for industries, schools, and governmental agencies. Taking advantage of the visibility and economies of scale, individual organizations are able to contact more qualified people and increase their chance of finding needed talents.

# Appendix I

## Interviewees

**Dr. Shen-chang Chao**

Vice President  
Enterprise & Consumer Electronics Group  
Hong Kong Applied Science and Technology Research  
Institute Company Limited

**Dr. Sunny Cheng**

Former manager of ARF

**Mr. S.W Cheung**

Vice President  
Business Development & Technology Support  
Hong Kong Science & Technology Parks Corporation

**Mr. K. O. Chia**

President  
Hong Kong Venture Capital and Private Equity  
Association

**Ms. Sabrina Chow**

Marketing Communications Manager  
SAE Magnetics (H.K.) Limited

**Ms. Subrina Chow**

Assistant Government CIO  
Office of the Government CIO

**Mr. Alan Ho**

Senior Manager  
Innovation & Technology Commission  
The Government of the HKSAR

**Mr. Francis Ho, JP**

Permanent Secretary  
Commerce, Industry & Technology Bureau  
(Communication and Technology)  
The Government of the HKSAR

**Dr. York Liao**

Member of various committees relating to Innovation  
& Technology

**Professor Otto Lin**

Senior Advisor to the President  
Hong Kong University of Science & Technology

**Hon. Chung-kai Sin, JP**

Member  
Functional Constituency - Information Technology  
Legislative Council  
The Government of the HKSAR

**Mr. Alan Wong**

Deputy Executive Director  
Hong Kong Trade Development Council

**Mr. Anthony S. K. Wong, JP**

Commissioner  
Innovation & Technology Commission  
The Government of the HKSAR

**Dr. Robert Jih-chang Yang**

Chief Executive Officer  
Hong Kong Applied Science & Technology Research  
Institute Company Limited

**Professor Kenneth Young**

Pro-Vice Chancellor the Chinese University of Hong  
Kong

**Mr. Frederick Yung**

Senior Manager  
Business Development and Incubation Support  
Hong Kong Science & Technology Parks Corporation

## Global Entrepreneurship Monitor Background

The Global Entrepreneurship Monitor is an international consortium that organizes and conducts research projects relating to entrepreneurship on a global scale. It was founded and continues to be supported by Babson College and the London Business School. Every year, the consortium coordinates its member countries to study entrepreneurship following a consistent framework of analysis in their respective territories. Since its establishment in 1998, the consortium has had 44 countries participated in one or more year of the study, with 34 participated in the 2005 exercise. Given that the consortium keeps the methodology consistent among the participating countries every year, the study results in a unique international database with time series data, allowing scholars and/practitioners to compare entrepreneurship status among participating countries over time. In addition, the consortium also has published over 150 studies including annual country specific analysis, and topical reports on financing start-ups, women entrepreneurs and minority entrepreneurs. This study is a part of a global initiative initiated by Erkkö Autio of the Helsinki University of Technology in Finland. As with most of the the consortium's studies, it takes its statistical data from annual population survey

A survey is conducted where from 1,000 to 27,000 adults per economy are randomly surveyed by telephone. Responses to up to 40 questions are used to measure the entrepreneurial behavior and attitudes of the population. Since the study was started in 1998, over half a million telephone interviews have been conducted and included into the database. Although the questions in the survey have evolved somewhat over the years, the basic questions establishing entrepreneurship are identical from year to year. An entrepreneur, for the purposes of the study is a respondent in the survey who is currently participating as an equity stakeholder in either

- A nascent business , i.e., a business start-up where work has been done to effect the start-up but wages have been paid for less than three months or
- A new firm where the firm is less than 42 months old at the time of survey.

Fuller details of the survey methodology and full downloads of the study are available at [www.gemconsortium.org](http://www.gemconsortium.org)



# Appendix III

## Methodology of High Expectations Entrepreneurship Pooled Survey:

SUPPORTING RAPIDLY GROWING ENTREPRENEURIAL COMPANIES  
SURVEY OF POLICIES IN GEM PARTICIPATING COUNTRIES  
PROJECT UNDER THE GLOBAL ENTREPRENEURSHIP MONITOR GROUP

Excerpts from research proposed by Professor Erko Autio Universite de Lausanne Ecole des Hautes Etudes Commerciales Institute of Strategy

### Objectives

This Global Entrepreneurship Monitor research addresses the challenge of providing effective support for high-growth entrepreneurial companies. We plan to leverage the Global Entrepreneurship Monitor consortium for data collection on specific initiatives directed at promoting rapid growth in entrepreneurial companies. Our specific objectives are to:

Identify and describe policy and support initiatives specifically aimed at supporting rapidly growing entrepreneurial firms; for example,

- a. Creation of entrepreneurial companies with a good potential for rapid growth
  - b. Supporting and enabling rapid growth with entrepreneurial companies that have demonstrated potential for it
  - c. Dealing with (e.g., organizational) issues caused by rapid growth
- (2) Identify and describe successful practices invented in different Global Entrepreneurship Monitor countries and develop frameworks for understanding their anatomy
  - (3) Develop a framework for categorizing policy practices aimed at rapidly growing entrepreneurial companies
    - a. Firm development stage
    - b. Modes of operation
    - c. Growth mechanism or constraint addressed
    - d. Resource type addressed (e.g., financial, human, IP, other)
  - (4) Develop a measure that tracks firm growth dynamic within the country's economy
  - (5) Publish a catalogue of growth-oriented policy measures across participating Global Entrepreneurship Monitor countries

### Methods

The following methods will be used in the study:

- 1 Identification of policy measures directed at high-growth entrepreneurial companies. Creating an overall view of the country's policies oriented at high-growth entrepreneurial companies.
  - a. Here, 4-5 policy-makers in the country should be interviewed, with the aim of identifying policy measures directed specifically at high-growth entrepreneurial companies. The policy-makers should also be interviewed regarding the country's policy choices in general.
  - b. A snowballing technique should be used to identify policy-makers [and policy measures] knowledgeable

about high-growth policies. Each interviewee should be asked: who knows most about this kind of policy initiatives? Can you name 2-3 individuals who are particularly knowledgeable about policies and support measures directed at high-growth entrepreneurial companies?

- 2 Interviewing identified policy measures. Collecting documents and background information regarding the measures identified. Assessing the success and outcomes of the measures.
  - a. Description of the history of the support initiative: when proposed, by whom, for what reason; how financed, organized, resourced.
  - b. Description of the initiative as currently operated
    - i. Organization (participating institutions, associations, affiliations, responsible organizers, incentive structures, performance metrics and monitoring, resourcing, etc)
    - ii. Focus (resource type, mechanism, venture life cycle stage, region, sector, etc)
    - iii. Performance and results: numbers of firms, achieved growth rates, notable graduates, received VC funding, other measures of the success of the support initiative. Complement these with qualitative assessments (e.g., achievement of objectives initially set for the support initiative).
    - iv. Lessons learned from past experience: what was found to work well, what was changed, how they would organize it today
- 3 Collection of background information, documents, evaluation reports, brochures, marketing materials, study reports relating to the support initiative. Be sure to collect:
  - a. Web links
  - b. Written material (brief summaries in English should be provided if possible)
- 4 Production of structured summary sheets describing each support initiative (template attached)
- 5 Collection of country's stock exchange data, in an effort to develop metrics of the dynamics of corporate sector as well as of the small and medium-sized firm sector
  - a. Listing of top 20 national firms (as measured by market capitalization) in the country's stock exchange, in year-end 1984, 1994, and 2004 (as per December 31 of the year, or the last day of stock market operation).
    - i. For each company in each year's list, indicate previous or future ranks in case the firm has not made it to all top-20 lists
    - ii. For each disappearance, indicate whether (a) the company is still listed under the same name; (b) the company has been merged with, or acquired by, another company; (c) whether there has been a name change; (d) whether the company has been de-listed or gone bankrupt.
  - b. Description of country's SME listing activity. In many countries, there are specific lists for new entrants into the stock exchange, often populated by new firms that recently went through an IPO. Often, such stocks are listed in a dedicated 'NM' (Neuer Market, Nouveau March, New Market) list. IPO activity

provides one index of the country's entrepreneurial growth dynamic. Therefore, we attempt to collect data on this aspect:

- i. Is there a specific NM equivalent in your country?
- ii. What was the total market capitalization of the NM equivalent on 31 Dec 1994; 31 Dec 1999; 31 Dec 2004?
- iii. How many firms were listed in the NM list on the above dates?
- iv. How many new firms entered the list in 1994, 1999, 2004?
- v. How many IPOs were carried out in total in the country during those years?
- vi. How many of the companies listed on Dec 31, 1994 were still listed on Dec 31, 1999? How many of the companies listed on Dec 31, 1999 were still listed on Dec 31, 2004?

## Policy-Maker Interview Questionnaire (Open-Ended Interview - Careful Notes Should Be Taken)

Dear xx

The Global Entrepreneurship Monitor is carrying out a major inquiry into policy measures specifically designed for, and targeted at, entrepreneurial companies with a potential for rapid growth. Studies from different countries show that as few as 3-5% of all new firms end up generating as many as 75% to 80% of all new jobs created by the cohort. For this reason, entrepreneurial companies with a potential for rapid growth constitute a particularly interesting target group for policy measures. As the realization of the importance of high-growth entrepreneurial companies for job creation is quite recent, however, relatively little is known about whether, and how, policy-measures could be targeted to address high-growth entrepreneurial companies in particular. Our study addresses this gap.

First, we would like to hear your general view of how entrepreneurship policies in your country specifically target high-growth entrepreneurial companies.

- Do you feel there exists sufficient realization of the importance of high-growth entrepreneurial companies for job creation among policy-makers?
- Is support for high-growth entrepreneurial companies a high priority in your country? Please describe the policy attention given to high-growth firms in your country.

Second, we would like to learn about specific policies targeted specifically at high-growth entrepreneurial companies.

- Do policy measures exist that specifically target high-growth entrepreneurial companies? Please consider policy measures in different areas such as, for example, (the list is not exhaustive):
  - o Access to finance - e.g., easing access to venture capital finance; strengthening business angel activity
  - o Firm creation - e.g., encouraging entrepreneurship among individuals deemed particularly likely or able to start high-growth entrepreneurial companies
  - o Firm management - e.g., providing mentoring support for high-growth potential firms; encouraging the formation of management teams capable of generating and supporting rapid growth
  - o Consulting advise - e.g., consulting support targeted specifically at firms with a high growth potential
  - o Internationalization - e.g., supporting early and rapid internationalization among entrepreneurial companies
  - o Access to technology - e.g., supporting access to university research for high-potential entrepreneurial companies
  - o Infrastructural arrangements - e.g., creating business parks designed specifically for firms with a high growth potential
- Finally, could you please point us to:
  - o Individuals knowledgeable about policies and support measures targeted specifically at high-growth entrepreneurial companies?
  - o Policy and support measures that meet this criterion?
  - o Any policy documents and other materials that discuss the relevance of high-growth entrepreneurial companies in your country?

Thank you very much for your help!

## Policy-Maker Interview Questionnaire (Open-Ended Interview - Careful Notes Should be Taken)

Dear xx

The Global Entrepreneurship Monitor is carrying out a major inquiry into policy measures specifically designed for, and targeted at, entrepreneurial companies with a potential for rapid growth. Studies from different countries show that as few as 3-5% of all new firms end up generating as many as 75% to 80% of all new jobs created by the cohort. For this reason, entrepreneurial companies with a potential for rapid growth constitute a particularly interesting target group for policy measures. As the realization of the importance of high-growth entrepreneurial companies for job creation is quite recent, however, relatively little is known about whether, and how, policy-measures could be targeted to address high-growth entrepreneurial companies in particular. Our study addresses this gap.

Your support initiative has been mentioned to us as providing a good example of measures that have been targeted specifically at high-growth entrepreneurial companies. Therefore, we would be very interested in learning about your history, operating philosophy, experiences gathered, and results obtained.

First, could you please provide a brief overview of the history of your initiative. When was it proposed? By whom? For what reason? How are you financed, organized, resourced?

Is there any person who knows the history of this initiative particularly well? How could we contact that person?

Second, we would like to learn about how you currently operate.

1. Please describe your current organization. (E.g., participating institutions, associations, affiliations, responsible organizers, incentive structures, performance metrics and monitoring, resourcing, etc)
2. Please describe your focus. How do you define your focus? (E.g. type of resources addressed, spin-off or growth mechanism addressed, venture life cycle stage, geographical region, industry sector, type of support provided, etc)

Third, we are interested in how you measure your performance and results. Please describe the success metrics that you use. Also, could you please provide us with some data describing the scale of your operation (e.g. numbers of firms processed, firm growth rates achieved, amount of received VC funding, other measures of the scale of the support initiative). Please complement these with qualitative assessments (e.g. achievement of objective initially set for the support initiative).

Fourth, can you name examples of particularly successful companies that have benefited from your support?

We would like to learn from your experience. As you know, all support initiatives go through a trial and error process, when some activities work particularly well, while others may run into unexpected difficulties. Could you therefore please describe what are the most important lessons that you have learned from your experience with this initiative: what was found to work well, what was changed, how would you organize this initiative if you were to re-start it today?

We are reaching the end of our interview. Could you provide us with any background information, such as documents, evaluation reports, brochures, marketing materials, or study reports relating to your supporting initiative? How could we access these?

Finally, could you point us to any other support initiatives that specifically target high-growth entrepreneurial companies?

Thank you very much for your help!

## Participating Countries in the Population Sample

	1999	2000	2001	2002	2003	2004
Argentina		✓	✓	✓	✓	✓
Australia		✓	✓	✓	✓	✓
Belgium		✓	✓	✓	✓	✓
Brazil		✓	✓	✓	✓	✓
Canada	✓	✓	✓	✓	✓	✓
Chile				✓	✓	
China				✓	✓	
Croatia				✓	✓	✓
Denmark	✓	✓	✓	✓	✓	✓
Ecuador						✓
Finland	✓	✓	✓	✓	✓	✓
France	✓	✓	✓	✓	✓	✓
Germany	✓	✓	✓	✓	✓	✓
Greece					✓	✓
Hong Kong				✓	✓	✓
Hungary			✓	✓		✓
Iceland				✓	✓	✓
India		✓	✓	✓		
Ireland		✓	✓	✓	✓	✓
Israel	✓	✓	✓	✓		✓
Italy	✓	✓	✓	✓	✓	✓
Japan	✓	✓	✓	✓	✓	✓
Jordan						✓
Korea		✓	✓	✓		
Mexico			✓	✓		
Netherlands			✓	✓	✓	✓
New Zealand			✓	✓	✓	✓
Northern Ireland					✓	✓
Norway		✓	✓	✓	✓	✓
Peru						✓
Poland						✓
Portugal			✓			✓
Scotland		✓	✓	✓	✓	✓
Singapore		✓	✓	✓	✓	✓
Slovenia				✓	✓	✓
South Africa			✓	✓	✓	✓
Spain		✓	✓	✓	✓	✓
Sweden		✓	✓	✓	✓	✓
Switzerland				✓	✓	
Taiwan				✓		
Thailand				✓		
Uganda					✓	✓
UK	✓	✓	✓	✓	✓	✓
USA	✓	✓	✓	✓	✓	✓
Venezuela					✓	
Wales		✓	✓	✓	✓	✓



# Appendix IV

## Discussion Paper on the Growth Enterprise Market January 2006: Discussion Questions

### Need for and Nature of a Growth Company Market

- Q1. Is there a need for a growth company market in Hong Kong?
- Q2. If so, should the market primarily serve local Hong Kong companies, or should it target Mainland-based companies or regional/international companies?
- Q3. At what stage of development should companies be admitted to the growth market - at start-up stage, or at a more mature stage?
- Q4. What should be the core investor group for the growth company market - retail, professional and/or institutional? Should the growth company market be restricted to professional and institutional investors only?
- Q5. Depending on your answers to the foregoing questions, what kind of regulatory regime would be appropriate for the growth company market? In particular, should growth companies have low-cost access to public capital, or should they, because of their higher risk, be required to comply with procedures that dictate relatively higher costs than those for Main Board companies?

### Possible Structural Options

- Q6. Bearing in mind your responses to questions 1 to 5 above, please comment on the suitability of the following possible structural options for a growth company market in Hong Kong
  - (a) GEM as a second board
  - (b) GEM and the Main Board to merge into a single board:
    - i. Universal single board - GEM and the Main Board to merge into a single board, with no distinction between them;
    - ii. Tiered single board - GEM and the Main Board to merge into a single board with the growth market forming the lower tier and the existing Main Board the upper tier. Further tiers might be introduced as well.
  - (c) New alternative market - GEM to merge into the Main Board, and a new market with an enhanced regulatory regime to be launched for growth companies.
  - (d) Others - do you have any other suggested structural options for GEM?
- Q7. Based on your preferred structural option for GEM, do you have any specific views or recommendations concerning:
  - (a) the targeted issuers (e.g. type of business, stage of development) and investors (e.g. retail, professional, institutional),
  - (b) the regulatory approach,
  - (c) the initial listing requirements and the listing process,
  - (d) the process of ongoing regulatory supervision,
  - (e) the disclosure and corporate governance requirements, and
  - (f) the roles of sponsors and other professionals?
- Q8. If you consider that there is no need for a growth company board in Hong Kong, what should be done with GEM and its existing issuers?
- Q9. What, if anything, should be done with de-listed companies? Should there be a separate market for trading these companies?

### Other Issues

- Q10. Do you have any suggestions on how to raise the profile of companies listed on the growth company board?
- Q11. Should more information be provided on growth companies? If so, what information, and who should provide it?
- Q12. Should market making be permitted on the growth company board? If so, what should be the obligations of and incentives provided to market makers?

## Hong Kong Innovation Policy Research Team

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