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Commission on Strategic Development
Executive Committee

Development of High Technology Industries in Hong Kong

Preamble

Should Hong Kong develop our own high technology industries? Or does Hong Kong have the capabilities to develop high technology industries? These questions have been asked a number of times and there are differing views over them. They are however important questions to be addressed in our current economic development road map to go down the road of a knowledge-based economy. This paper examines the various factors necessary to create successful high-tech industries, draws on some examples from other territories around us and sets out the current Government strategy on enhancing our research and development (R&D) capability to support the technology upgrading of the manufacturing industry in the Pearl River Delta (PRD).

Definition of High-Tech Industry

2. There exists no single authoritative methodology to define high-tech industries. The Organisation for Economic Co-operation and Development (OECD) identifies high-tech industries based on a comparison of industry R&D intensities, a calculation dividing industry R&D expenditures by industry sales. Industries identified as high-tech are: aerospace, pharmaceuticals, computers and office machinery, communication equipment, and scientific (medical, precision, and optical) instruments. They are considered as science-based industries that manufacture products while performing above-average levels of R&D. Ranked as the most R&D intensive for the OECD countries, these industries are also identified as the most R&D intensive by the United State

(US) using a similar approach[1].

3. In the Mainland, the high-tech industry broadly covers enterprises that are knowledge-intensive and technology-intensive. These enterprises engage in R&D, production and sales of one or more high technologies, that would in turn account for more than 60% of their annual gross revenue. High and new technologies in the Mainland are grouped into the following categories:

(a) electronic information technology;
(b) aerospace and aeronautical technology;
(c) biological engineering and new medical technology;
(d) new materials and applied technology;
(e) new energy and high efficient energy conservation technology;
(f) new environmental technology;
(g) ocean engineering;
(h) advanced manufacturing technology;
(i) nuclear application technology;
(j) modern agricultural technology; and
(k) other new process or new technology applicable in the traditional industries.

High-Tech Industry as an Economic Driver

4. According to the Global Insight World Industry Service database, which provides production data for the 70 countries that account for more than 97% of global economic activity, the global market for high-tech goods is growing at a faster rate than for other manufactured goods. During the 24-year period examined (1980–2003), high-tech production grew at an inflation-adjusted average annual rate of nearly 6.4%, compared with 2.4% for other manufactured goods[2].

5. In 2005, the US high-tech industries employed 5.6 million people,

[1] "Science and Engineering (S&T) Indicators, 2006" National Science Foundation.
[2] Quoted from "Science and Engineering Indicators, 2006 - National Science Foundation".

paying salaries 85% greater than average private sector jobs[3]. It was also the largest exporter among all industry sectors, accounting for 32% of total manufactured exports in 2004[4].

6. South Korea and Taiwan typify how R&D-intensive industries have grown in the newly industrialised economies. In 1980, high-tech manufactures accounted for 9.6% of South Korea's total domestic manufacturing output; this proportion jumped to 14.8% in 1990 and reached an estimated 21.5% in 2003. The transformation of Taiwan's manufacturing base is even more striking. High-tech manufacturing in Taiwan accounted for 9.7% of total domestic output in 1980, 15.9% in 1990, and jumped to an estimated 28.5% in 2003[5].

Learning from International Examples

7. To gain better understanding of how best to foster the development of high-tech industries, below is a brief overview of the approach taken by the US, Taiwan and South Korea to develop their high-tech industries.

United States

8. America's leadership position in high-tech owes much to the diversity of its businesses, entrepreneurs, and research laboratories which generate multiple and competing technological visions[6].

9. Rich networks of businesses, universities, government labs, and hundreds of partnerships and collaborations have played an important part in US high-tech success. Most funding for basic research - research that may not have an immediate economic payoff - comes from federal spending. Most funding for market-oriented research comes from private industry. In 2004, the shares of total US R&D funding were 63.8% from

[3] "Cyberstates 2006: A complete state-by-state overview of the high-technology industry." American Electronics Association, 2006.
[4] "World Competitiveness Yearbook 2006"

[5] "World Industry Service database, 2005." Global Insight, Inc.
[6] "Entrepreneurial Dynamism and the Success of U.S.High-Tech, 1999." Joint Economic Committee, US Congress.

industry, 29.9% from the federal government, and 6.3% from universities and other institutions[7].

10. American industry has done successfully in encouraging downstream industries to take full advantage of innovations, as a result of its open and flexible markets, and high levels of entrepreneurship. One important reform which helped spur quick adoption was the Bayh-Dole Act of 1980, which gave universities greater incentives to commercialise technology. The Act allowed universities to patent the results of federally-funded research and license the resulting technology to businesses and other entities.

11. U.S. high-tech entrepreneurs have relied on a uniquely strong and diverse mix of private and public equity to fuel their growth. While initial public offerings have been a high-profile part of the high-tech boom, private equity provided by "angel" investors and venture capitalists has been important in fueling the initial growth of many well-known high-tech successes including Cisco Systems, Intel, Apple, Microsoft, and Genentech. America's workforce diversity and efficiency - fed by an inflow of immigrants - is also an important strength contributing to its high-tech success.

Taiwan

12. Technology-intensive industries in Taiwan has had an outstanding performance as a result of the joint partnership between the private sector and the government. In terms of production value, Taiwan ranked among the top three producers worldwide for more than 30 products in 2002, including digital still cameras, ADSL modems, flat panel displays, integrated circuit (IC) design, IC packaging, motherboards, monitors, notebook computers, optical disk drivers, semiconductors, and wireless LAN, among others[8].

13. The government's initiative to create science-based industrial parks

[7] "Science and Engineering Indicators, 2006" National Science Foundation.

[8] "Changing Roles – A High Tech Adventure, 2004" Taiwan Review.

and Industrial Technology Research Institutes (ITRI) was a critical factor for the high-tech industry success.

14. The Taiwan approach can be best characterised as one involving the promotion of indigenous small and medium sized enterprises (SMEs) coupled with heavy investment in public research institutes (PRIs) to facilitate technology assimilation/transfer and cooperative R&D promotion to the SMEs. The PRIs have been most successful in promoting the diffusion of industy-relevant technologies. The ITRI has been widely credited with helping to create an advanced semiconductor industry cluster in Taiwan through a well-designed and well-executed strategy of assimilating foreign technologies and transferring them to local enterprises through spin-offs.

15. The successful execution of this strategy depended on a number of factors, including careful long-term technology development planning, an abundant supply of well-trained engineers, and significant presence of, and strong linkage with, competitive local industries which provided market and customer feedback. It is also important to note that "reverse brain drain", in the form of returnees from the US who were well-qualified and experienced technologists, had played a critical role.

South Korea

16. The strategies that have shaped the development of Korean high-tech industries can be summarised as follows: (a) government-led mobilisation of strategic resources for achieving development goals; (b) utilising foreign technologies; (c) selective industrial promotion; (d) government support for the growth of big business, *the chaebols*; (e) export promotion *cum* rapid market expansion; and (f) constructing science and technology (S&T) infrastructure, institutions and R&D programmes for industrial demands[9].

17. During the early period of industrialisation, the South Korean

[9] "Korea's Innovation System: Challenges and New Policy Agenda, *Joonghae Suh*, 2000." INTECH, United Nations University.

industry structure was characterised by the existence of the *chaebols*. Their large size and ready access to finance gave them "deep pockets" to acquire imported technologies. This resulted in the rapid technological catch up by such sectors as consumer electronics, semiconductors (especially DRAM), and active matrix LCD in the 80s.

18. The process of technological capability building in South Korea is characterised by the interplay between imported technologies and indigenous R&D efforts. During the earlier period of development, systematic in-house R&D efforts were hard to find. It was in the 1980s that Korean firms endeavoured to build in-house technological capability by institutionalising R&D activities.

19. Prior to the 1997 Asian financial crisis, the focus of S&T promotion had been on fostering domestic capabilities in the large firms. After the crisis, South Korea saw the need to balance the policy orientation between large firms and SMEs.

Does Hong Kong Need High Tech Industries?

Building New High-Tech Industries?

20. Hong Kong's high-tech industries, according to OECD's definition for high-tech industry, are not prominent. Drawing from the experience of the US, Taiwan and South Korea, does Hong Kong have what it takes to develop the high-tech industries?

21. Hong Kong has an open and flexible market, and high levels of entrepreneurship to exploit innovations into commercial success, the S&T infrastructure, namely the Hong Kong Science Park and Cyberport, for nurturing high-tech companies, and the R&D Centres to conduct industry-oriented R&D. However, R&D culture in the private sector is weak, domestic market for high-tech products is insignificant, public and private funding to nurture local startups is scanty and access to a diverse background of researchers and engineers is limited.

22. Private sector has been hampered by weak R&D culture. Over the

period 1995-2001, business sector made up around only one quarter of the gross R&D expenditures (GERD). During 2002-2004, the contribution of business R&D expenditure (BERD) grew rapidly to 48% of GERD in 2004. Despite the recent growth, the level is still low compared to South Korea (76.7%) and the US (70.2%) (see Table 1).

Table 1. Comparison of Key Science and Technology Indicators of Selected Economies

Indicators	Year	Hong Kong	Taiwan	South Korea	USA
Gross Expenditure on R&D (GERD) US$ billion (as a % of GDP)	2004	1.22 (0.74%)	8.25 (2.44%)	21.25 (2.85%)	312.07 (2.66%)
	2003	1.10 (0.69%)	7.15 (2.35%)	15.92 (2.63%)	291.86 (2.65%)
	2002	0.97 (0.59%)	6.46 (2.20%)	14.43 (2.53 %)	275.80 (2.63%)
Business Expenditure on R&D US$ million (% of GERD) [a]	2004	589 (48%)	5,336 (64.7%)	16,306 (76.7%)	219,226 (70.2%)
	2003	455 (41%)	4,492 (62.8%)	12,114 (76.1%)	204,004 (69.9%)
	2002	321 (33%)	4,016 (62.2%)	10,809 (74.9%)	193,868 (70.3%)
Higher Education Expenditure on R&D US$ million (% of GERD) [a]	2004	604 (50%)	951 (11.5%)	2,109 (9.9%)	42,431 (13.6%)
	2003	615 (56%)	850 (11.9%)	1,614 (10.1%)	40,173 (13.8%)
	2002	616 (64%)	795 (12.3%)	1,497 (10.4%)	37,185 (13.5%)
Government Expenditure on R&D US$ million (% of GERD) [a]	2004	27 (2%)	1,916 (23.2%)	2,840 (13.4%)	37,660 (12.1%)
	2003	27 (2%)	1,764 (24.7%)	2,193 (13.8%)	35,657 (12.2%)
	2002	30 (3%)	1,603 (24.8%)	2,127 (14.7%)	33,183 (12.0%)
Private Non-Profit Expenditure on R&D US$ million (% of GERD) [Note]	2004	NA	47 (0.6%)	NA	12,750 (4.1%)
	2003	NA	44 (0.6%)	NA	12,031 (4.1%)
	2002	NA	44 (0.7%)	NA	11,561 (4.2%)
R&D Personnel FTE per 1,000 Labour Force	2004	5.31	13.54	8.30	NA
	2003	4.82	12.67	8.13	NA

Indicators	Year	Hong Kong	Taiwan	South Korea	USA
	2002	3.70	12.04	7.53	NA

Note: The sum of the percentage on R&D expenditure of various sectors may not equal to 100 as there are R&D activities which may be performed by organisations not under any of the categories.

Source:
Hong Kong - Census and Statistics Department
Taiwan - Statistical Yearbook
South Korea - Ministry of Science & Technology, the Republic of Korea; Korea National Statistical Office, the Republic of Korea
USA - The National Science Foundation/Division of Science Resources Statistics

23. The private equity provided by "angel" investors and venture capitalists, which has been important in fueling the initial growth of many well-known high-tech successes in the US, is not available to local companies. With capital under management amounting to US$30 billion (accounting for about 30 % of the total capital pool in the region), Hong Kong is the largest venture capital centre in Asia (as of June 2005, there were 173 Hong Kong-based funds). However, figures for 2000 show that 91% of all funds under management by venture capital firms directed outside Hong Kong, and the bulk of these funds financed companies in the region, principally those in the Mainland[10].

24. Our researchers have a good track record. In 2004, the number of utility patent granted by the United States Patent and Trademark Office (USPTO) to Hong Kong amounted to 16.5 per 1,000 researchers which compares favourably with other economies in Asia. However, the supply of researchers and engineers is limited. Hong Kong has only 5.3 full-time equivalent (FTE) R&D personnel[11] per 1,000 labour force as compared to 13.5 in South Korea and 8.3 in Taiwan (see Table 1).

25. In short, Hong Kong is likely to face some challenges in developing high-tech industries.

[10] Asian Venture Capital Journal, 2005

[11] R&D personnel includes researchers, technicians and other supporting staff

Developing High-Tech as a Supporting Service

26. Technology and innovation are the twin engines for industry growth, be it high-tech industries or low-tech manufacturing sectors. OECD has classified "textiles and textile products" as low-tech manufacturing industry. However, when one examines the technologies embodied in the production of a garment, it is not surprising to find material technology, advanced textiles and clothing production technologies, design and evaluation technologies, just to name a few.

27. Hong Kong itself does not have a manufacturing base to drive the demand of technologies. However, when Hong Kong positions itself to serve the ever increasing technology needs in the PRD region, tremendous opportunity will arise when our technology capability is strengthened to help upgrade this manufacturing base.

Reaching Out to the PRD

28. Hong Kong has been the single largest source of foreign direct investment (FDI) in the PRD, according to the latest study of the Federation of Hong Kong Industries. Hong Kong-funded enterprises account for 72% of the total number of foreign-invested enterprises, and these enterprises account for approximately half of the manufacturing enterprises in the PRD. It was estimated that these Hong Kong-funded enterprises established about 57,500 factories in the PRD, hiring 9.6 million employees.

29. Hong Kong industrialists have helped transform the PRD into the world's factory which now produces about one third of China's exports, dominates the world's supply chain for products such as textile garments and accessories, consumer electronics and watches.

30. However, the past model of success in the PRD, i.e. reliance on OEM, is now under threat. Long gone are the days of competition based on cheap labour. It is now an era of competing on high value added products and services which embody knowledge, technology, innovation – a result of intensive R&D activities. A lot of companies in the PRD are

striving to cut their reliance on low-end manufacturing and putting greater emphasis on innovation and technology development to improve their competitiveness. Ignoring the technology needs in the PRD is not a viable option for Hong Kong.

Hong Kong's Strengths

31. Hong Kong's intrinsic environment is conducive to innovation and technology development. We have internationally recognised universities, robust intellectual property (IP) protection and enforcement regime, state-of-the-art S&T infrastructure, good understanding and relations with the Mainland market, and the preferential treatment under Closer Economic Partnership Arrangement (CEPA). Hong Kong is therefore well placed to engage in downstream R&D, nurture technological development, expedite industrial development in Hong Kong and the Mainland, in particular the PRD region.

32. Government funding for the university sector has been and remains generous by international standards. Our universities have also developed into world class research universities in selected areas, which help attract diverse sources of talent.

33. State-of-the-art research and technological infrastructure has been built to support the development of technology-based enterprises. The Hong Kong Science Park has attracted a cluster of technology companies since its inauguration in 2002. It provides a wide range of advance technological supporting facilities such as Integrated Circuit (IC) Design and Development Support Centre, Wireless Communication Testing Laboratory to support corporate R&D activities. It also operates incubation programmes to nurture start up companies. As at end March 2007, around 100 local and overseas companies, such as Philips Electronics, have been approved for admission and the take-up rate is around 90%. Construction for Phase Two is underway, with the buildings expected to be completed in stages from mid 2007 to 2009. The Hong Kong Science and Technology Parks Corporation also operates three industrial estates by providing developed land at cost to companies with new or improved technologies and processes, which cannot operate in multi-storey buildings.

34. With a view to creating a strategic cluster of information technology (IT) and information services (IS) companies as well as a critical mass of professional talents in Hong Kong, the Cyberport commenced operation in 2004. It has already attracted more than 60 IT/IS companies as its office tenants including multinational corporations, overseas and Mainland companies as well as local SME enterprises. In addition, the Hong Kong Wireless Development Centre, the Digital Media Centre, the iResource Centre, the Digital Entertainment Industry Support Centre and the Digital Entertainment Incubation-cum-Training Centre have been established at the Cyberport, with funding support from the Government, to provide hardware, software, technical and marketing support for companies in the local wireless and digital entertainment industries.

35. CEPA clearly harnesses Hong Kong's strengths in exploring the Mainland market. Given easier or preferential market access to the Mainland and the rigorous protection of IP rights in Hong Kong, we are well placed to supply technology intensive products and services embodied with high IP content for the Mainland market.

36. The national 11th Five-Year Plan places emphasis on "autonomous innovation" and the need to expedite the building up of the national innovation system, to promote closer integration of technology and the economy as well as to upgrade overall high-tech capability and technology level of the industries. The HKSAR Government recognises that strengthening cooperation with the Mainland is a vital element to promote innovation and technology. In this connection, the Government has established collaboration mechanisms with the Mainland at various levels:

(a) Ministry of Science and Technology - the Mainland/Hong Kong Science and Technology Cooperation Committee was set up in 2004 to formulate and coordinate technology collaboration programme between the Mainland and Hong Kong.[12]

(b) Cooperation with Pan-PRD Region – the Pan-PRD Joint Conference on Regional Cooperation in Science and Technology has been formed to foster collaboration in innovation and technology in the Pan-PRD region. A planning study on regional cooperation in science and technology for 2006-2010 has been completed, putting up various proposals to help achieve this purpose.

(c) Guangdong-Hong Kong collaboration – the Guangdong/Hong Kong Expert Group on Cooperation in Innovation and Technology was set up in 2003 with the objectives to encourage cooperation in innovation and technology between the two places and enhance the productivity and competitiveness of industries. Starting from 2004, the Expert Group launches the Guangdong/Hong Kong Technology Cooperation Funding Scheme every year to support applied R&D projects in technology areas of mutual interest. In 2004 and 2005, the governments of Guangdong Province and HKSAR have supported about 200 projects with total funding of $650 million.

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[12] Comprising representatives from the relevant ministries/bureaux/departments in the Mainland and Hong Kong, the Committee is responsible for formulating and coordinating technological collaboration programmes between the Mainland and Hong Kong. The Committee has agreed to enhance technology cooperation and exchanges between Hong Kong and the Mainland in six areas, namely radio frequency identification (RFID) technologies, automotive parts and accessory systems, integrated circuit design, Chinese medicine, nanotechnology, and energy saving and environmental protection technologies. The Committee has also agreed to set up a mechanism to allow local universities and research institutes to apply for setting up state key laboratories in Hong Kong.

Current Strategy of HKSAR Government

37. To take forward the recommendations by the Chief Executive's Commission on Innovation and Technology in 1999, the HKSAR Government has put in place a series of funding programmes and infrastructural support to promote applied R&D and strengthen the technological capability of the industry, including the establishment of the $5 billion Innovation and Technology Fund (ITF) and the Applied Science and Technology Research Institute (ASTRI).

38. In its first five years' operation, the ITF had supported 668 projects at about $1.69 billion. The ITF had largely adopted a bottom-up approach and most projects were initiated by the local universities with limited industry participation.

39. In parallel, ASTRI is charged with a mission to perform relevant and high quality midstream R&D for transfer to industry. During the first four years of its operation, ASTRI has carried out 29 R&D projects and the technologies developed in 13 projects have been successfully transferred to the industry, including one project which has brought more than $109 million to ASTRI.

40. While there is room for improvement, the ITF and ASTRI have played an important role in strengthening Hong Kong's indigenous applied research capability. In 2005, the HKSAR Government decided to adopt a new strategic framework for innovation and technology development. The aim is to develop technologies that serve the needs of various industry sectors rather than foster high-tech industries. The five principles of the strategy are:

(a) identify technology focus areas for priority development for optimal use of resources to create greater impact;

(b) adopt demand-led, market-driven approach to ensure that our investments are relevant to industry and market needs;

(c) closely involve the industry in defining the key focus areas and other stages of innovation and technology development;

(d) leverage on the Mainland to capitalise on the opportunities presented by CEPA, and to utilise the production base in the Greater PRD as the platform for developing our applied R&D and commercialisation of research results; and

(e) strengthen coordination among different elements of the innovation and technology programme to create more synergy and impact.

41. The major initiative of the new strategic framework is the setting up of five R&D Centres to conduct industry-oriented applied research. The focus is on five areas that Hong Kong has comparative advantages and can be put to use in the PRD manufacturing base. The five R&D centres are:

(a) R&D Centre for Automotive Parts and Accessory Systems hosted by the Hong Kong Productivity Council;

(b) R&D Centre for Logistics and Supply Chain Management Enabling Technologies jointly hosted by the University of Hong Kong, the Chinese University of Hong Kong and the Hong Kong University of Science and Technology;

(c) R&D Centre for Nanotechnology and Advanced Materials hosted by the Hong Kong University of Science and Technology;

(d) R&D Centre for Information and Communications Technologies hosted by ASTRI; and

(e) R&D Centre for Textiles and Clothing hosted by the Hong Kong Polytechnic University.

42. The R&D Centres provide a platform for technology transfer and to accelerate the commercialisation of research outputs. The primary customers of the R&D Centres are manufacturers in Hong Kong and the PRD region, who are in need of expertise and technical know-how. The R&D Centre Programme marks the Government's commitment in supporting indigenous industry to strengthen their technological and

innovation capability. Over $2 billion has been earmarked to support the operation and project funding of the R&D Centres for a five-year period.

43. In May 2007, we signed a cooperation agreement with Shenzhen which aims to enhance exchanges in expertise, information and resources in innovation and technology services, with a view to taking forward the proposal to establish a "Shenzhen-Hong Kong Innovation Circle". The long-term target is to develop the two neighbouring localities into a world-class regional hub for innovation and technology activities.

Strategic Issues for Members' Consideration

44. Members are invited to give their views and comments on the following:

(a) Does Hong Kong need to build up our own high-tech industries? Do we have the capabilities to do so?

(b) Are the current measures to support the technology upgrading of the PRD industries sufficient? How could we further collaborate with the Mainland, especially under the 11th Five Year Plan, to leverage on the growth of the Mainland market demand on high technologies?

(c) Should we introduce further incentives to stimulate investment in R&D, such as -

- tax incentives – practically all developed countries, including all our neighbouring economies and the Mainland, offer some form of tax incentives on R&D investments. Currently there is no such specific tax incentive in Hong Kong. Some facts and figures on tax incentives in other countries are at Annex I;
- industrial land policy – the current definition of "industry" in Hong Kong is only restricted to "the production of goods". Given that most of the final manufacturing processes of Hong Kong companies have been migrated to

the PRD and that over 90% of our GDP is from "services", should we consider broadening the definition of "industry" in our land use policy to allow more "services" type of industry to use industrial land? Some examples adopted in other countries are given in Annex II.

(d) How could we improve the supply of talent to support a knowledge-based economy?

- short-term – import of talents; and
- longer-term – improved training and education.

Innovation and Technology Commission
May 2007

Tax-related Incentives

There have been repeated calls from the local industries and overseas/Mainland high-tech companies for some form of R&D tax incentives in Hong Kong. In fact, R&D tax incentives are regarded by a growing number of economies as an effective policy tool to encourage domestic firms to invest more in R&D and seek R&D investments by foreign technology companies. In 2005, 19 OECD countries have R&D tax incentives in place, up from only 12 in 1996[1]. Tax incentives can be broadly divided into two categories:

a) tax allowance which makes it possible for a firm to deduct more than 100% of its current eligible R&D expenditure from its taxable income; and

b) tax credit which enables firms to deduct a percentage of their R&D expenses directly from their tax liabilities.

2. For example, U.S. provides a tax credit of 20% on incremental R&D expenses, whilst Canada offers a volume based tax credit of 20%. As for our neighbours, Singapore has introduced a 200% tax allowance for R&D expenditure by enterprises. It is noteworthy that the UK, which has long been resisting the use of tax incentives to stimulate R&D, introduced tax credits for SMEs in 2000 and for large companies in 2002 as a key measure to promote R&D and innovation. The UK tax credits allow companies to set 125% of eligible R&D against taxable profits (or 150% for SMEs). A summary of comparison is set out in the following table.

[1] Jacek Warda 2006, "Tax Treatment of Business Investments in Intellectual Assets: An International Comparison" OECD Science, Technology and Industry Working Paper 2006/4.

Table: International Comparison of R&D Tax Incentives (2005)

Economy	**Corporate Income Tax Rate**	**Current R&D Deduction**	**Depreciation (Machinery / Equipment)**	**Depreciation (Building)**	**Tax Credit/ Allowance As Rate on Level of R&D** [a]	**Tax Credit Rate on Increment in R&D**	**Base for Increment in R&D (Average R&D of the years specified)**	**Remarks**
Hong Kong	17.50 %	100%	60% p.a. (initial) 10% / 20% / 30% p.a. (thereafter - according to the estimated working life of the particular category)	20% p.a. (initial) 4% p.a. (thereafter)	None	None	N.A.	
Canada (Federal)	22.12% (Large companies) / 13.12 % (SME)	100%	100%	4% p.a.	**Tax Credit:** 20% (Large companies) / 35% (SME)	None	N.A.	Various provincial concessions in addition to federal support
U.K.	30% (Large companies) / 19% (SME)	100%	100%	100%	**Tax Allowance:** 125% (Large companies) / 150% (SME)	None	N.A.	
U.S. (Federal)	35%	100%	5 years	39 years	None	Regular Credit [b]: 20% of incremental R&D expense	Previous 4 years average of gross revenue	

Economy	Corporate Income Tax Rate	Current R&D Deduction	Depreciation (Machinery / Equipment)	Depreciation (Building)	Tax Credit/ Allowance As Rate on Level of R&D [a]	Tax Credit Rate on Increment in R&D	Base for Increment in R&D (Average R&D of the years specified)	Remarks
Korea	27.50% (Large companies) / 14.30% (SME)	100%	5 years	5 years	**Tax Credit [c]:** 10% (on facilities), 15% (development of tech)	50% [c]	4 years	Tax holidays up to 7 years
Singapore	20%	100% (R&D done locally or overseas)	33.33% p.a.	25% p.a. (initial) 3% p.a. (thereafter)	**Tax Allowance:** 200% enhanced deduction	None	N.A.	
Taiwan	25% (on income >NT100K) / 15 % (on income NT50K-100K)	100%	2-50 years	5-50 years	**Tax Credit [d]:** 30%	20% [d]	2 years	Various other R&D related concessions

Sources:

Department of Investment Services, Ministry of Economic Affairs, Taiwan. Available at: http://www.dois.moea.gov.tw/asp/elaw-9.asp; http://investintaiwan.nat.gov.tw/en/env/taxes.html.

Economic Development Board. Approved Royalties Incentives. The Economic Development Board, Singapore.

Hall B. and J. van Reenen (2000). How effective are fiscal incentives for R&D? A review of the evidence. Research Policy, 29, pp. 449-469.

Hall, Bronwyn H. Tax incentives for innovation in the United States, A report to the European Union, January 2001, p. 8.

Inland Revenue Department (2006). A Brief Guide to Taxes Administered by the Inland Revenue Department 2006 – 2007. Inland Revenue Department, The Government of the Hong Kong Special Administrative Region.

International Trade Canada. A Summary of Research and Development Tax Incentives in Canada, The Advantages of Doing Research in Canada. The Canadian Embassy, Berlin. January 2007.

Mani S. and N. Kumar (2001). Role of Government in Promoting Innovation in the Enterprise Sector: An Analysis of the Indian Experience. The United Nations University,

Institute for New Technologies, Discussion Paper Series 2001-3, Maastricht.
PricewaterhouseCoopers (2005). Corporate Tax Information for Asia Pacific Region - Korea.
PricewaterhouseCoopers (2006). Tax, Facts and Figures 2006 Singapore. PricewaterhouseCoopers, Singapore.
R&D Credit Coalition (2006). International R&D Tax Incentives Survey (Updated May 2007.)
The United States Senate. FY 2007 President's Budget – Tax Initiatives. p. 25. The Government of the United States.
Warda J. (2006). Tax Treatment of Business Investments in Intellectual Assets: An International Comparison. OECD STI Working Paper 2006/4, Paris.

Notes:

[a] Tax Credit is deducted from the corporate income tax. Tax Allowance is deducted from the taxable income.

[b] There are three types of credits. The 20% regular credit is used as reference in the context of this paper.

[c] Tax credit in R&D (10%/15%) and tax credit on increment in R&D (50%) are mutually exclusive: a firm can claim only one of these credits.

[d] If R&D expense is less than the average of preceding 2 years, a firm can claim only 30% tax credit of the total R&D expenses. If R&D expense is over the average of the preceding 2 years, a firm can claim 30% tax credit of the total R&D expenses, plus 20% tax credit of the average increment.

Industrial Land Use Policies in the United Kingdom and Singapore

United Kingdom

National Policy on Use of Industrial Buildings and Land

1. The Town and Country Planning (Use Classes) Order 1987 is a statutory instrument that specifies the broad classes of use of buildings or other land in the United Kingdom. Among the different classes, Class B specifies the scope for other business and industrial uses. It consists of the following sub-classes:[1]

i) B1: business uses such as office (other than financial and professional services); research and development of products or processes; or any industrial process that does not significantly pollute the nearby residential area;
ii) B2: general industry (refers to industrial process other than one falling within class B1 or within classes B3 to B7);
iii) B3-7: special industry groups (e.g. processes of smelting, calcining, sintering or reducing ores, minerals, concentrates or mattes; burning bricks or pipes; or distilling, refining or blending oils.);
iv) B8: storage or distribution.

Relaxation of Land Use

2. Provisions are given to the Order so that a change of use of an industrial building or land does not require Planning Permission if both the present and proposed uses fall within the same 'class'. For example, Class B2 (general industry) is permitted to change to B1 (business) or B8 (storage or distribution).[2] On the other hand, change of use from one class to another class requires to submit an application of Planning Permission to the local planning authority (e.g. city council) and pay a number of fees at the time the application is submitted. Some of the major fees are: i) alterations/erection/replacement of plant and machinery (for site not exceeding 5 ha, the fee is £265 per 0.1 ha); ii) erection of building (for floor space not more than 3750 m^2, the fee is £13,250); iii) works other

[1] Secretary of State for the Environment, UK, "Statutory Instrument 1987 No. 764, The Town and Country Planning (Use Classes) Order 1987".
[2] Office of the Deputy Prime Minister, UK, "Changes of use of buildings and land, The Town & Country Planning (Use Classes) Order 1987".

than building works (e.g. car parks, the fee is £135).[3, 4]

3. In line with the national policy on use of industrial buildings and land, city authorities have formulated local policies to maximise the use of industrial land in the face of the changing needs of the industries. City of Westminster is illustrated as an example below.

City of Westminster

Specialist Industry and Other Industrial Uses

4. One of the land policy goals of the City of Westminster is to provide the continuation of light industrial uses, and the area containing the most significant concentration of light industrial floor space is the Creative Industries Special Policy Area. This area is primarily located at Soho, East Marylebone and Regent Street. Creative industries cover a range of sectors such as design, advertising, film, television programmes or fashion items. The land policy encourages the provision of floor space for the development of the creative industries within the area, and particularly for sites that are previously assigned for industrial use.[5]

Singapore

5. Singapore enforces the 60:40 space utilisation rule for premises used for industrial and warehousing activities.[6] The general requirements for the industrial lease are:

a) At least 60% of the total gross floor area (GFA) is for predominant use for industrial (or warehousing) activities;
b) The remaining 40% of the GFA may be used as ancillary/secondary use, such as ancillary offices, showrooms, neutral areas or communal facilities.

6. Examples of industrial activities are manufacturing, production, assembly, servicing, fabricating, and research and development.[7] Commercial office usage, retail, trading and wholesale are considered as

[3] Planning Portal, UK (2007). Available at: http://www.planningportal.gov.uk/.
[4] Wirral Borough Council, UK (2002), "Planning applications – fees for planning applications".
[5] City of Westminster, UK, "City of Westminster unitary development plan, adopted 24 January 2007", Chapter 2.
[6] Jurong Town Corporation, Singapore, "Renewing your lease with JTC Corporation".
[7] Urban Redevelopment Authority, Singapore (2007), "Change of use of premises".

non-industrial activities.

Relaxation of Land Use/Lease

7. The government has rolled out new policies for the relaxation of industrial land use/lease in recent years. Most of these policies still comply with the overall 60/40 quantum control, but they provide more flexibility for the alternative use of industrial land. Examples of such alternative uses include media, e-business and retail activities.

8. The change of classification of industry use/lease requires the consent of the Urban Redevelopment Authority (URA) and a fee payment of S$525. In addition, the applicant is required to consult the relevant government departments[8] relating to a change or extension of use or for planning regulations pertaining to prospective building works.

Relaxation on Media Activities

9. The government has relaxed its land use guidelines in 2001 to allow media activities to take place in Industry, Warehouse and Business Park zones. Under the new guidelines, 60% predominant use quantum is allowed for core media activities. These include pre-production services, production services, creative post-production services, technical training, network programming.[9]

Warehouse Retail Scheme

10. The Warehouse Retail Scheme (WRS) was launched in 2004 to allow retail business activities to take place on industrial land. Under the WRS, a minimum of 60% of the total GFA must be used for Warehouse/Industrial purposes, and a maximum of 40% of the GFA is allowed for ancillary retail activities.[10]

Relaxation on e-Business Activities

11. New guidelines in 2000 treat "Type 1 e-businesses", which provide info-comm infrastructure and software applications (e.g. telco companies),

[8] Public Utilities Board, Central Building Plant Unit, Building & Construction Authority, Fire Safety Bureau, Factory Inspectorate, Singapore Land Authority and Maritime and Port Authority of Singapore.

[9] Urban Redevelopment Authority, Singapore (2001), "Media activities within industrial, warehouse and business park zones".

[10] Urban Redevelopment Authority, Singapore (2004), "Warehouse retail pilot scheme".

as “expanded industrial activities” and they are allowed as part of the 60% predominant use in Industry, Warehouse and Business Park zones. “Type 2 e-businesses”, which mainly conduct business electronically (but does not involve in producing software or info-comm infrastructure such as search engines, are able to take up part of the 40% ancillary/secondary use.[11]

[11] Urban Redevelopment Authority, Singapore (2000), “URA revises guidelines to help e-businesses”.