Hong Kong's IT Future

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> Part of what makes the industry work in places like Silicon Valley (the area around San Jose, California) and Route 128 (an area outside of Boston) is the abundance of talent. (Dataquest …. P.8-4)

America's boom economy is being driven by a broad sweep of information technology industries, and this huge home market provides a solid base from which US companies can launch their assault on world markets and win market share globally. Although many areas of the IT sector -- from the core computer-related industries, telecoms and cable entertainment networks, to all the sectors within other industries which now rely heavily upon electronic and inter-active communications to run their businesses -- are quite mature, and economies of scale and scope already make it difficult for new entrants, there are many other areas opening up, especially those related to the 'new media' industries.

I will argue that Hong Kong has two ways to take advantage of these 'new media' developments. First, they represent markets which require hardware, computer software, content software and telecommunications products and services, which Hong Kong industrialists are capable of making and selling. Second, Hong Kong is among the world's first in developing and marketing a new raft of inter-active broadband services that will become global in character within the next decade. Hong Kong has a genuine opportunity to leverage its pioneering role in 'new media' services.

But there are major drawbacks. This briefing paper reviews some of the positives and negatives over-hanging Hong Kong's IT future by summarizing some points raised in two industry consultancy studies for the Industry Department: *Hong Kong's Electronics Industry, 1993-94* (Dataquest and Boston Consulting Group) and *Hong Kong's Software*

Industry, 1993-94 (Dataquest); and an ongoing innovation study being conducted by the Telecommunications Research Project and funded by the University of Hong Kong.[1]

A. Innovation in Hong Kong

The TRP undertook a Phase 1 questionnaire-based survey during 1997 to establish the extent to which the transfer of IT (telecoms and computer-related products) had taken place over the previous 18 months. Of the 185 valid respondents, 133 were service-based companies, and the remainder manufacturing. The full results will be available when the results of Phase 2 (currently in the analysis stage) are prepared later this year. Phase 2 is an interview-based survey of IT and electronics companies to determine the extent of process or product innovation over the previous 18 months, and the role of technology transfer, R&D and other factors.

The results from Phase 1 suggest that although IT is acquired by the great majority of respondents, very little technology transfer, as opposed to outright purchase of equipment, takes place – overall, less than 10%. Lack of any perceived need seems to be the reason, although insufficient funds and lack of professional skills were reasons stated by over one-quarter of respondents. (These are issues that technology transfer can address.) But perhaps the key finding of Phase 1 was that IT was adopted not so much to promote innovation -- less than 20% -- but to increase output and cut costs. Similarly, in less than one-quarter of cases were modifications to acquired IT (mostly to software) used to develop new processes or products.

Initial feedback from Phase 2 suggests IT-focused companies are much more involved in innovation, and with local R&D being the key driver, but technology transfer playing a role. The majority of non-innovating companies, by contrast, have no R&D activity. But one intriguing piece of qualitative evidence suggests that the most innovative local firms maybe those managed by people with direct experience of the US IT sector. If this turns out to be an important factor it would support one of the lessons from Taiwan, where close ties between the IT industry in the US and Taiwanese start-ups have played an important role in the transfer of professional expertise, of technology and in the way of running an IT business (what Dataquest refers to as the ‘paradigm’).

[1] In June 1998 the University of Hong Kong’s research grants committee decided against further funding for this project. Their stated criteria for research grants are: ‘merit of the proposal, track record and expected research outputs.’ Also in June the RGC of the University Grants Committee decided to fund Dr John Ure $575,000 for a study of telecommunications trade-in-services and Hong Kong’s future as a regional hub. Ironically it seems that the University of Hong Kong may have to decline the award from the RGC owing to the fact that the School of Business has decided to drop telecommunications and information technology study from its programmes with the consequence that Dr Ure’s contract expired on 30 June 1998. Dr Ure will continue to act as director of the Telecommunications Research Project, based at the Centre of Asian Studies. The TRP relies entirely upon private sector support and contract research for funding.

B. SOFTWARE IN HONG KONG AND SOUTH CHINA

Packaged Development Software

The following section draws upon *Hong Kong's Software Industry, 1993-94* (Dataquest). The starting point must be recognition that Hong Kong is relatively weak in the software industry. Dataquest identifies four broad categories of software business: packaged software development, custom software, systems integration and software channel distribution. *(See appendix for summary*). If Hong Kong's aim is to promote a tradable (ie. exportable) IT industry then the choice is between the first two. Of these, Dataquest states emphatically:

> So the question becomes whether to focus on custom software development or packaged software development. Dataquest's position on this issue is solid. As the Asian market in general (and especially Japan) continues to shift from custom toward packaged, there is an excess capacity in the custom area and a dearth of capacity in the packaged area, while the market will continue to demand more packaged software localized for specific needs of the region. (p.8-2)

Dataquest identifies three ingredients for the success of packaged software development: technical skills, management skills and *specific product management and marketing skills*. Technical skills exist, but can also be regionally imported from China, India and the Philippines. Hong Kong has management skills in abundance. But the key missing ingredient Dataquest concludes is the role of *product* manager/product marketing manager -- not to be confused with *project* management. The product manager works with the technical guys to 'get the product on to the shelf'. The product-marketing manager works with sales and marketing people to 'get the product off the shelf'. This dual role defines packaged software development as belonging to a services paradigm, not (as *project* management) to a manufacturing paradigm. Dataquest emphasize this point as the most important.

> Notably, both in visiting Hong Kong and South China ourselves and in studying the Phase 1 team's report, it became clear to us that Hong Kong software vendors are not following the Software Development Paradigm, but instead are applying a manufacturing paradigm to software development. If there is one thing that should be taken away from this report, it is that **the manufacturing paradigm will not work for packaged software development**. Rather than using the manufacturing paradigm as the model, industries like book publishing, entertainment, pharmaceuticals and fashion should be studied. Intellectual property is a crucial issue and creative genius is worth its weight in gold. This trend is accelerating as development tools grow in sophistication. The "grunt work" of coding isn't gone, but is decreasing. (original emphasis)

Dataquest propose the following actions to solve this problem:

1. Transfer packaged software development knowledge and skills
   (a) bring in product managers from overseas to transfer knowledge into Hong Kong
   (b) send Hong Kong industrialists overseas to learn the business
   (c) share product management skills around Hong Kong
   (d) revise the university and tertiary education curriculum to include a product management focus
   (e) encourage multinational software developers to shift their regional marketing centres to Hong Kong, and some individuals will move to local software firms
   (f) as far as possible transfer product management knowledge (e.g. branding managers) from existing consumer goods industries

2. Cyberspace is the key place to be
3. Ease-of-use is more important than sophistication of products
4. Intellectual property protection is critical issue – piracy will destroy the industry before it gets off the ground – major role for government here.
5. Quality of products is a psychological barrier for the market – Government could promote quality-awards.

Note: giants like Microsoft may dominate the US software market, but as Dataquest reports, in 1993 there were more than 1,500 companies in the US who say their primary business is packaged software, and most are small. Altogether, they account for 0.75% of US GDP, compared with Hong Kong's software industry which contributed just 0.044% to GDP - Dataquest propose urgency to develop Hong Kong's packaged software industry. If the Dataquest report were updated they would no doubt identify many emerging growth areas within this sector, for example, management documentation software, 'intelligent agent' software for the automatic filtering and searching of documents, software specializing upon different industries, such as transportation or law, and so forth.

C. HARDWARE - THE ELECTRONICS INDUSTRY IN HONG KONG

The following section draws upon *Hong Kong's Electronics Industry, 1993-94* (Dataquest and Boston Consulting Group). This report identified four broad sectors of the electronics industry in Hong Kong .

Electronics Sector	HK Employees	HK Establishments
Computers and Peripherals	16,400	158
Consumer Products	19,500	636
Parts and Components	22,600	33
Telecommunications Equipment	5,500	81

Computers and Peripherals was the only sector growing in Hong Kong, showing a compound 5-year annual growth of 40% by 1991. The sector was worth $19.9 billion in 1991. Consumer Products output was falling in Hong Kong but production owned by Hong Kong firms in mainland China was rising. The sector was worth $19.8 billion in 1991. Parts and Components output was falling in Hong Kong and also weak in the mainland. Output in Hong Kong was $10.9 billion in 1991. Output from the telecommunications equipment sector was falling in Hong Kong, worth $3.3 billion in 1991. Data from the mainland was not available.

Overall, the report concluded that the electronics industry was weak in Hong Kong, and recommended a focus upon the following Type A and Type B opportunities. (This list would no doubt require revision today.)

Type A Opportunities: Emerging High Growth Markets			
Computers and Peripherals	Telecommunications	Consumer Electronics	Parts and Components
Pen-based computers	Intelligent Hubs	Mobile GPS terminals	PCMCIA cards
CD-ROM drives	Cordless phones	Digital Camcorders	
Magneto-optical disk drives		Digital Compact cassette players	
Scanners		satellite TV decoders	

Source: Dataquest (June1994)

Type B Opportunities: Low Growth but High Volume (for Five Years)			
Computers and Peripheral	Telecommunications	Consumer Electronics	Parts and Components
Workstations	Fax Modem cards	Camcoders	None
Non-impact printers	Network interface cards	facsimile machines	
Hard disk drives			

Source: Dataquest (June 1994)

An extract of the report's major recommendations is reproduced in the Appendix, along with a selection of the Electronics Committee's responses. Two items are commented on briefly here:

Science Park: The Science Park is almost an act of faith. Numerous studies of Science Parks have been conducted worldwide. Most so-called Science Parks are not very scientific (i.e. R&D - intensive) and few of them realize the symbiotic relationship between universities, research institutes and industry upon which they are predicated. Probably the key missing ingredient is talent. Talent either attracts or is attracted, that is it either forms a cluster around itself or it migrates. If it clusters it helps to create its own environment. If it migrates it hollows-out what it leaves behind.

Can Hong Kong create an environment, and incentives, to attract the right talent in sufficient critical mass? The Science Park will be 68 hectares, of which 22 hectares will be in actual use. For comparison we may note that Taiwan's Hsin-chu science-based Industrial Park is over 600 hectares. It is one of several in Taiwan. On the other hand Singapore's Science Park is scheduled to be 63 hectares. Phase One, already operating, is 30 hectares, and has attracted 166 companies, 109 of them overseas, and 96 of them electronics/IT establishments.

Singapore offers incentives which Hong Kong may decide against. Hong Kong has the advantage of being part of China, but leveraging that advantage may require much closer cross-border co-ordination and cooperation at all levels than current takes place. Hong Kong, like Singapore, has many universities which should be able to play a major role. However, before they are able to do so they themselves may have to rethink their roles, and how they are to perform them, and the philosophy behind UGC funding may have to change.

Environment: is the Science Park to be an oasis of green tranquility within a blighted Hong Kong? Air pollution, water pollution, traffic pollution, noise pollution, litter pollution, etc., - can Hong Kong really ignore these problems and hope that Hong Kong becomes a world city people internationally *choose* to live and work? Will Hong Kong be able to retain, let alone attract, the brightest and the best?

IT and telecoms in the broadband era have an enormous role to play in the restructuring of Hong Kong industry and society, in influencing where people live and work, what they do and how they do it, where and how they live their leisure and recreational time, where and how they bring up their families. We can no longer look at IT and telecoms issues as 'sectors'. They are integrating the world around us, and a holistic approach is therefore required of policy-makers. All aspects of Government, for example, need to be involved in IT policy and its applications, from trade and industry, to telecoms and broadcasting, to housing and environment, to education and manpower, and so on. How will these different government responsibilities be organized together? These are issues which go

beyond the Science Park issue, but they are part of the environmental factors which will determine the success or failure of the Science Park.

D. Shortage of Capital for IT in Hong Kong?

One further issue is looked at briefly. It is frequently said that small and innovative IT companies have difficulty finding funds. What are the sources normally available, and how available are they in Hong Kong?

Government: industrial policy in the USA has been traditionally linked to military spending. Satellite technology, digital mobile communications, the Internet all benefitted from defence budget allocations. (And in some cases their civilian applications were held up!) In Asia, industrial policy has been pursued more directly, but this model was already showing signs of withering before the currency crisis. In its place perhaps, is recognition that the national information infrastructure (NII) is a significant 'public good' that warrants government encouragement, if not too much direct government involvement.
IPOs: evidence from the US suggests that the IPO is used not for first or second round financing but much further downstream – sample of 10 IPOs in US quoted by Dataquest showed average age of the business was over nine years.
Banks: and other investment houses are usually conservative and risk-averse, looking for evidence of guaranteed revenue streams and collateral.
Investment funds: looking for established smaller companies with good product, management track-record and lots of growth potential. Higher-risk/higher-rates of return than banks.
Venture Capital: although venture capital is more readily available to companies in the US, the idea that venture capital is quite easily come by is a myth. Again, Dataquest's figures for 1993 suggest that if venture capital were distributed equally to all software companies they would get just US$25,000 each (or US$35,000 if companies with annual revenues of more than US $500,000 were excluded). Venture capital is often treated more as a form of 'exit' policy, like the IPO. VC's look for the few big IPO successes to cover the inevitable failures.
Spin-offs: especially in areas such as Silicon Valley, software engineers working for established software developers or for research institutes or universities (eg Stanford, Caltech, Berkeley) spin-off their own start-ups. The track-record can attract sources of funding, e.g. from the parent company. Talent and ideas are simply attracted by the prospects of success (technical as well as commercial – motivation is not solely financial in the hot-house atmosphere of Silicon Valley where peer-judgement, cooperation and competition produce a powerful blend of motives, opportunities and challenges)
Personal resources: the most important source of capital in the US for small start-ups is personal savings, and loans from family and friends – as it is in Hong Kong.
Angels: entrepreneurs with access to finance for small-scale funding for start-ups or spin-offs before resource to venture capital, major banks, investment funds or IPO.

Hong Kong: Supply-side

Government: in Hong Kong provides direct and indirect support to manufacturing and service industry research and development; directly through applied research grants and other funding, at arms length through the activities of the HKITCC, the Productivity Council, the VTC, the TDC and other bodies (eg Industrial Estates); and indirectly through mechanisms such as UGC-funded universities and research. But evidence suggests that (a) the community may not be very well aware of many of these initiatives, (b) that a review of the coordination between all these bodies could add to the effectiveness of funding, (c) that other initiatives may be necessary (eg Science Park, backing for a venture capital fund, a second tier stock exchange, calls for tax-incentives for R&D, changes in the importation scheme for skilled workers, setting up of applied research institutes, etc) The other area widely recognized as the role of government on the supply-side is the provision of a legal and ethical framework within which the information society can develop. For example, to facilitate e-commerce government must either set up a 'public key' function to safeguard the privacy and legitimacy (authenticity) of the transactions that take place, or ensure that industry does so. Consumer protection is the other side of this coin, an area currently lacking much substance in Hong Kong.
IPOs: there is no second tier-market yet, and most IT firms in Hong Kong lack the critical mass to go for an IPO;
Banks: are conservative, especially when the dollar-peg is threatened, and need significant collateral;
Investment funds: look regionally;
Venture capitalists: do not see significant opportunities among IT firms in Hong Kong either in terms of products, in markets or in terms of the scale of thinking of Hong Kong's SME industrialists;
Spin-offs: are small in number because the number of successful IT firms capable of spinning-off new businesses are low in number; so far, spin-offs from universities have more to do with individual initiative than with university policies
Start-ups: are common but their scale is very small and they have great difficulty securing large customers on a sustained basis, which means they never grow;
Angels: only fools rush in where angels fear to tread.

Hong Kong: Demand-side

Business markets:
(a*) multinational companies* with local or regional offices in Hong Kong are an important source of demand for all areas of software, but they are well able to group-source for major items outside Hong Kong, or use their own proprietary systems; there seems to be a lack of *sustained* demand or support for the software or electronic products of local companies. Quality issues are of primary concern to this market. The main recommendation of Dataquest was for Hong Kong to serve this market with 'localised' packaged software developed products (not to be confused with custom software). The

demand by multinationals for advanced telecommunications services is a market in which Hong Kong is strong.

(b) *SMEs* seem to be relatively low-level users of IT, although the demand for certain commodified products and services, especially cheap packaged software and telecommunications equipment and services, is an important local market for resellers.

Government has committed itself to promoting the information infrastructure and information society in Hong Kong. (For example, providing an Extranet for Hong Kong schools, maybe providing similar access for libraries and community centres.) The government can play a leading role in encouraging IT development through its procurement of local products and services, although it is constrained by WTO principles to provide 'national' treatment to all suppliers. One fruitful way to 'square this circle' would be to encourage consortia or partnerships of international and local companies. This could encourage long-term cooperation and the transfer of technology and R&D skills. Since 'local' should be seen to include mainland China enterprises, this raises the obvious desirability for greater exchange of information and cooperation between the SAR and mainland China in the development of the NII in both economies.

Consumer markets in Hong Kong are typically robust in the adoption of IT, especially computer-related products. Nearly 50 per cent of households have computers at home, all new ones have built-in modems as standard equipment. Telephony is ubiquitous, but new services, such as iTV and VOD, and a raft of other inter-active services (e-commerce from the home) are slow starters. But in broad terms, this must be a priority area for Hong Kong-based IT and software, media and communications companies because Hong Kong is among the world pioneers in these markets. They therefore represent a unique opportunity to development 'localised' packaged software of the kind Dataquest identified. The threat to Hong Kong companies, almost all SMEs, is that the major service (broadband) providers will turn exclusively to software developers in the USA and Europe. Again, the answer may be to encourage partnerships which can generate longer-term relationships between local and overseas companies. This should be an item for the Innovation Commission.

E. Conclusion

This paper only attempts to raise two types of issues as food for thought. First, problems identified by two important consultancy reports and their recommendations for the IT sector. Second, some of, but by no means all, the 'environmental' issues that need to be addressed. The issues themselves require lots more research and hard thinking to identify specific strengths and weaknesses and, above all, ways forward.

In the first TIF background briefing paper (April 1998 – see **Error! Bookmark not defined.**) the point was made that Hong Kong is entering a whole new era of telecoms economics, where basic voice telephony is no longer the cash cow and new forms of

revenue-generating inter-active services based upon broadband access will have to be developed. This is a world-wide trend, although Hong Kong is in the leadership. This offers unprecedented opportunities for Hong Kong's entrepreneurs. All the issues raised above could be fruitfully discussed within the context of this change now taking place.

APPENDIX: *Hong Kong's Software Industry, 1993-94* (Dataquest)

Findings and Recommendations Summary

Finding	Related Recommendation(s)
Packaged software is more leveragable, exportable, and will see more growth than other types of software Hong Kong has relatively weak software industry in general, including its packaged software industry	Focus efforts on packaged software industry. Focus on something; Don't try to be all things to all people (the item of focus should be the company's sustainable competitive advantage)
Software does not follow the manufacturing paradigm	Abandon the manufacturing paradigm for software Nurture, even pamper creative geniuses. the "rock stars"
Software companies should operate on a sustainable competitive advantage intrinsic that company Historically when individual company strategies have been handed out and followed by a country's industry en masse have been doomed to failure	Pick product/market opportunities that complement your competencies that complement your core competencies This will vary by company, but could include: Banking, trading, etc. applications Entertainment/education software for Greater China Market Add-on products to successful products Security products
Hong Kong developers don't know what a successful software firms looks like	Increase knowledge base in software industry Join cyberspace Distribute this report to industry
Hong Kong lacks product management skills	Close the product management gap through: Importing skills Exporting industrialists to pickup skills Longer term methods such as locating a multinational firm's software marketing center in Hong Kong, sharing the knowledge base already in Hong Kong, and university training.
The current piracy rate in Hong Kong is too high to nurture Hong Kong software firms	Crackdown on software piraters (sellers and distributors of pirate software) Crack down on corporations pirating software Launch education campaign similar to Japan's "No Copy" campaign, directed to consumers

China is a tremendous resource and a tremendous threat	Cooperate with competitors in China. Flexible partnerships are particularly important for South China firms
Few Hong Kong software firms are connected to cyberspace Cyberspace has become a critical forum for developers to share information, even for software distribution	Join cyberspace Build networking infrastructure
Hong Kong firms lack presence in global distribution channels	Consider all channel options, including: Traditional channel Hardware Bundling Shareware online distribution
There is a quality problem both in perception and reality with many Hong Kong software products	Improve quality standards Government -sponsored satisfaction surveys Investigate ISO 9000 and other quality certification programs
Hong Kong lacks "available" capital for its software industry	Encourage investment in software through promotion and education Set up small business loan program Publicize success Continue efforts to monitor overall health of real estate investments in Hong Kong
Hong Kong lacks a unitary positioning statement	Recommend positioning for Hong Kong: The best place to conduct software business in the entire Greater China region
North American, Japanese firms targeting South China market and looking for partners	Target North America, Japan, holding Hong Kong up as the "Window to Greater China"
Japanese firms are outsourcing much code development to China	Target Japanese firms as potential outsourcing market

Source: Dataquest (January1995)

FOUR AREAS OF SOFTWARE BUSINESS – SUMMARY OF DATAQUEST

Customer Application Development Services: design or development of new applications, or modification and enhancement of existing software – ie. adding new functionality for the client.

- costs of entry falling as more tools for writing programme code come onto the market
- requires high technical skills – the number one quality demanded by clients.
- Major source of demand come from:
  (a) the shift to client-server architectures and the use of object-oriented programming software (OOPS) to leverage existing databases from older systems and adapting them to new applications;

(b) software re-engineering by large companies wanting to upgrade their systems;
(c) outsourcing of either technical tasks or even of project management.

Key Investment Area: training.
Markets: world market for exports, but local agent in foreign market is a key issue.

Packaged Software: ready-to-use and off-the-shelf commodified or mass-produced software requiring little modification; on a price-list; being driven by:

- multimedia computers are now standard, especially for home use for entertainment, education, but also increasingly for inter-active communications – eg Internet/ the Web
- convergence of 'Silicon Valley' and 'Hollywood' through growth of new media TVs – e.g. video servers are currently a bottleneck facility
- business use until now has been largely for 'presentation, education, training and advertising (kiosks)' = niche markets but attracting many vendors
- CD-ROM technology is increasingly providing the preferred delivery format
- Networked computer systems is a possibly emerging area for online multimedia delivery (vs. online long-haul transmission but off-line local delivery systems)
- Broadband transmission and delivery networks (optical fibre cable, broadband microwave and satellite, cable TV, xDSL, etc) will eventually carry the heaviest revenue streams.
- Mobile computing
- Shift to client-server architectures is creating new demands for interfaces, eg 'customer service, help desks, problem analysis, trend-spotting, and mining databases … the coming years will see a great demand for vertical packages that perform such functions for front-end horizontal tools', *But 'technology overloading' is a serious problem, and the 'major issue in C/S is one of reliability and management rather than cost. Spreading heterogeneous computing resources across a wide area network is a difficult and problematic task. Until there is a breakthrough in network theory, the industry will have to implement systems on an ad hoc and stepwise basis.'*

Key Investment Area: research and development.
Markets: worldwide exports, and intensely competitive, but localization is a key issue.

Systems Integrators: design, development and integration of local and wide area networks and software support – enhance the value of existing software products and operating systems. Driven by:

- Open systems
- Any-to-any connections
- Decentralization or distributed computer systems based on LANS

- Spread of LANS-to-WANS
- Shift to client-server architectures
- Rising importance of Internet, Intranets, Extranets
- Growth of 'new media' industries, e.g. VOD
- Legacy problems as older systems become obsolete
- Complexity of modern software, software-software and software-hardware compatibility problems
- Outsourcing

Key Investment Area: training.
Markets: need to be close to market to win business and to provide skilled people locally to provide ongoing service to clients.

Software (Channel) Distributors: retailers in Hong Kong traditionally sell bundled hardware/software or off-the-shelf software boxes, and face falling margins (10% or less from business customers) as alternative distribution channels become increasingly available to users, such as:

- Online downloaded software and upgrades
- Mail Order by phone, fax, EDI, e-mail
- Packaged software manufacturers provide unbundled after-sales technical support and hardware/software vendors provide direct sales and support – usually through single 0-800 number
- Technical distributors provide specialist and support services, eg CAD Value-Added Retailers (VARs)

Key Investment Area: inventory.
Markets: need to be close to market; little foreign competition.

EXTRACTS FROM INDUSTRY DEPARTMENT REPORT ON … HONG KONG'S ELECTRONICS INDUSTRY 1993-94

TECHNOLOGY TRANSFER

Consultants' Recommendation

Dataquest Inc. (DQ) recommends the local electronics industry to develop the 18 Type A and Type B product areas in which it considers Hong Kong may have some potential.

Electronic Committee's Views

Of the 18 Type A and Type B product opportunities recommended by DQ, the electronics Committee consider 12 as within the capability of Hong Kong. This include pen-based computers (e.g. PDA and PCS), CD – ROM drives, intelligent hubs, cordless phones, PCMIA cards, mobile GPS terminals, satellite TV decoders, network interface cards, camcoders, facsimile machines, fax modem card and workstations. While information on the enabling technologies and the markets relating to the Type A and Type B product areas may be made available to the industry through the publication of the consultancy reports by BCG and DQ, the decision on whether or not to exploit the opportunities must rest with the individual manufacturers.

SCIENCE PARK

The electronics Committee takes the view that traditionally, technology transfer is achieved through the presence of multinational companies. A Science Park , with low cost living accommodation, would be very useful instrument to attract multinationals to come to Hong Kong. The electronics Committee notes that the need for a Science Park in Hong Kong has been confirmed and the Industry Department has commissioned a further study on the establishment, location, and management of a Science Park.

The Electronics Committee notes that the present pilot scheme for bringing 1000 professionals and managers from PRC to work in Hong Kong is inadequate and the selection of successful applicants by balloting does not needs of the electronics industry.

ESTABLISHMENT OF R&D INSTITUTE

Consultants' Recommendation

Boston Consulting Group International Inc. (BCG) recommends that an institute to undertake R&D and product design activities should be established on behalf of or jointly with industrialists.

The Electronics Committee takes the view that:

(A) design skills, software skills, and specific technology skills are lacking in Hong Kong. While some measures have been taken by the government, they are very

inadequate in relation to the growing needs of industry.

(B) Hong Kong may need three different kinds of R&D institutes instead of one ITRI as is the case for Taiwan. These R&D institutes maybe called centers of excellence. For example, HKPC may become the center of excellence for the end-product electronics industry, the local tertiary institutions may develop a parts and components center of excellence for the electronics industry, and another agency may become the center of excellence supporting the software electronics industry;

(C) In respect of the end product electronic industry, what the industry requires is an R&D institute for product design. Small companies, being constrained by lack of resources, would be more interested in product development. The establishment of the Telecom Technology Centre by HKPC may be regarded as a small –scaled R&D institute;

(D) The potential areas for the software electronics industry are Chinese character recognition and application;

(E) Hong Kong should be promoted as a center of the electronics industry. Hong Kong has the advantage of easy access to South China which is a good place for undertaking labour intensive manufacturing processes. If Hong Kong could further develop its R&D capability, this would not only complement well with the manufacturing capability in South China; it would also help to attract more multinational companies to Hong Kong. Multinational companies are important because they possess the sought–after technologies and they would normally only transfer such technologies to their own subsidiaries.

SUPPORTING INDUSTRIES/INFRSTRUCTURE

Consultants Recommendation

DQ recommends the Government should encourage companies to invest in two major areas which support the electronics industry, through tax incentives, low-cost or no-cost loans, and matching government funds for start-up companies. The first area relates to investing in oil/petroleum exploration (from which plastics and resins are derived and which form the basic material for packaging) and the steel industry (which provides the raw material for frames and computer cases) in South China. The second area relates to investment in key supporting industries (such as tool and die making, integrated circuit design shops, and sheet metal operations).

Electronics Committee's Views

The electronics Committee notes that the provision of tax breaks or direct government subsidies to individual companies goes against the fundamental philosophy of the Hong Kong Government. Also, it would be difficult to justify why this sector should receive special treatment. A more practicable approach maybe to encourage

multinational companies with the relevant technologies to invest in Hong Kong's supporting industries. However the high accommodation costs in Hong Kong is a negative factor in attracting inward investment.

The Electronics Committee considers that it would be necessary to identify which support industries are critical to industrial development. A consultancy study should be commissioned to examine closely what supporting industries are critical for those product areas which the Electronics Committee considers to be suitable for Hong Kong's electronics industry and the conditions and constraints for the development of these supporting industries in Hong Kong.

EDUCATION AND TRAINING

Consultants' Recommendation

BCG recommends that the scope of the Management Development Centre (MDC) under the Vocational Training Council (VTC) should be expanded to cater for the management training needs of the electronics and other manufacturing industries.

DQ also recommends organizing advanced engineering and management courses to be jointly attended by Hong Kong and China workers.

Electronics Committee's View:

The Electronic Committee notes that fresh graduates have a wrong perception of the manufacturing industries. They associate careers in the manufacturing industry with having to work in China and with uncertain prospects since most labour-intensive processes have been relocated to South China. The Committee suggests that more promotional efforts to inform students in the higher educational institutes of the career prospects in the electronics industry are necessary. Some publicity efforts directed at the general public to create a proper understanding of the manufacturing sector are also necessary.

Marketing and Promotion

Consultants' Recommendation

BCG recommends that the Hong Kong Trade Development Council (HKTDC) should provide general and specific support to the electronics industry's marketing efforts, particularly in China, through the use of professional service firms, collective advertising and publication of newsletters and magazines.

Electronics Committee's View:

The Electronics Committee agrees that the Consultants' recommendations on Marketing and Promotion are worth pursuing further.

INDUSTRIAL EXTENSION SERVICE

Consultants' Recommendation

BCG considers that the manufacturers are not well aware of the various government support programmes and recommends Industry Department's Industrial Extension Service to expand efforts to improve awareness.

Electronics Committee's View:

Since most local electronics companies are small with high staff turnover, this may partly explain why manufacturers are not well aware of the various government support programmes. The Electronics Committee recommends that the Industry Department should consider ways to disseminate the information further to the industry.