

Technology Roadmap for the Electrical and Electronics Industry of Penang – Brief Highlights of the Study

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Background

The Electrical and Electronics (E&E) industry plays a prominent role in Penang's manufacturing industry. It generates about half of the total employment in Penang's manufacturing industry. The electrical, and particularly the electronics industry is primarily driven by technology advances, which is extremely rapid. The possibility of real value added contributions depends very much on the local company's ability to create the competencies necessary to make these rapidly evolving technologies work for them.

In August 2003, Frost & Sullivan, an international market research house, has been commissioned by MIMOS, to undertake a study on 'Upgrading the E&E Industry in Penang', with the aims to analyze and highlight the potential technologies to adopt for the Malaysian E&E industry. The study has further recommended five new technologies, in addition to the two existing major technologies, namely semiconductors and PC/Peripheral, for Malaysia to focus on. These five new recommended technologies were Micro-Electro Mechanical Systems (MEMS), photonics, advanced electronic flat panel displays, high density magnetic & optical storage and conductive polymers. Nonetheless, these recommended new areas of focus did not take off as expected.

In June 2007, the Penang State Government, through the Industry Research Task Force (IRTF), has commissioned a study on 'Technology Roadmap for the Electrical and Electronics Industry of Penang', with the objectives to assess technology and market trends in key markets that are driving investment directions; to assess critical human resource needs to support future investments by MNC's and local industries; to identify challenges of the local SMIs and what capabilities they need to help build an attractive supplier and partner base for global companies; and to identify strategies and support needed to grow local SMI's to be global companies themselves.

This E&E technology roadmap study aimed to leverage and to achieve continuity from the former Frost & Sullivan's study. The formulation of a technology roadmap is to provide the State with a clearer vision of its future progression path and establish the criterion needed to offer itself as the preferred investment location for higher end, research and design development activities. The study team comprises of Penang Skills Development Centre, Bizwise Consultancy Sdn Bhd, and Socio-Economic & Environmental Research Institute. The study was completed in October 2007 and a forum to present the findings and gather feedback was held on 4 December 2007 in Penang.

This article summarizes the highlights of the study report: A brief electrical and electronics (E&E) technology landscape in Penang, the challenges faced by the electrical and electronics industry, suggestions and recommendations to address the obstacles, and identifies new pockets of growth within the existing E&E industries while leveraging the present core competencies of the local MNCs and local enterprises.

E&E Technology Landscape in Penang

The development of Free Trade Zones in Malaysia has resulted in a rapid growth of the Electrical and Electronics industry, particularly in Penang. In the early days, growth came rapidly as Multi-National Companies (MNCs), taking advantage of the lower cost of labor, started to move more responsibilities here. In addition to providing jobs, it also spawned a significant local service industry, primarily focused around supporting the semiconductor manufacturing operations transferred here.

The principle market segments for these local industries are centered on process equipment and machinery. Over the years, a core competency began to emerge around production automation, particularly with regards to precision machining, back-end automation, test auto-handling and later, contract manufacturing. Today, some of these local industries have grown to become public listed companies. Such companies are beginning to take the first steps towards extending their reach into the regional markets. However, these success stories are not as pervasive as desired. Most local companies continue to play a support role to deliver maintenance and upgrading services based on their proximity advantage.



As regional competitiveness for foreign investment increases, MNCs are presently diversifying their operations to include these new and growing economies. Low cost and labor intensive activities are gradually being transferred to cheaper countries. This in itself is a good thing as it allows Malaysian operations to move up the value chain to reflect its relatively higher cost of operations. The problem is that China and India, both low cost countries, have executed technology leapfrog and is now also capable of supporting the higher value added activity space that Malaysia is moving into. There is also the added factor of Malaysia's technically advanced neighbour, Singapore. To make matters even more challenging, new participating countries will be able to leverage on the deep learning base developed over the years by first movers like Malaysia, to enable them to bridge the competency gaps in a much easier and faster manner.

Existing MNCs continue to find Penang an attractive investment location for their respective companies but are faced with increasing competitive cost pressures from other countries like China and Vietnam. In response, they are gradually moving up their value chain to focus on higher value added manufacturing such as test, high mix and high engineering content activities. The key value added activities are in R&D, Supply Chain and Shared Services Hubs, including Customer Support Centers.

For R&D, many MNCs have invested significant design centers in Penang. Currently, companies like Intel, Motorola, Agilent and Avago have large R&D centers on their premises. The activities range from being part of a global design team to complete product development, including the definition of products and technology roadmaps. Products developed locally are primarily focused on IC design, software, PC mother boards, PC peripherals, RF/MW products, semiconductor packaging, test equipment and test systems. There is also a significant amount of work being invested in development programs on continual process improvements, product re-engineering, etc.

From a technology standpoint, MNCs in Penang are focused on semiconductors, storage, electronic equipment, electronic devices, manufacturing services, supply chain management and shared services hubs.

Local companies are predominantly structured to support the needs of their MNC customers. Traditionally, this is the manufacturing and component piece-part businesses. The local automation industry also plays a significant role in the automation of the back-end sections of the semiconductor processes, namely, forming, final test, sort, mark and packing. In addition to automation, a few large local contract manufacturers have also emerged, especially for semiconductor production to help MNCs off load their capacity and reduce cost. On a smaller scale, there are a large number of PC Board assembly companies serving a large customer base, primarily for low cost or low volume specialty applications.

A few lead companies have emerged over time to become key suppliers of automation solutions to the MNCs. Behind these companies is an established and deep supplier and technology partner base to support the wide spectrum of components and sub-assemblies required to build these machines. An important point to note is that for most local companies, product definition is still primarily defined by specific customers – in most cases the MNCs, either locally or internationally. From this standpoint, local companies, even those with international markets, are still not at par with the large competitors which are capable of defining and developing market disrupting new platforms.

From a technology standpoint, local companies are categorised into the following broad segments: semiconductors, mechanical engineering, components and sub-assemblies as well as electronics components.

Key Challenges

Six key challenges were highlighted:

- a) The creation of a mega-cluster in Penang and the surrounding areas for the E&E industry, with particularly emphasis on the semiconductor, electronic equipment and electronic device business segments. This cluster should not be a committee made up of a companies in similar businesses, but rather made up of the majority of businesses and government institutions in Penang that are aligned towards value creation around the target E&E segments.

Challenge: To create an environment where companies in the area are motivated to establish commercial relationships with each other to create the entire value chain for the businesses.

- b) Take a leap forward in setting up processes to improve the quality of technical human resources. This gradual degradation of the quality and availability of excellent people is a serious setback which, if not addressed quickly, will be the single most important reason for Penang (and Malaysia) to lose its industrial competitiveness. Many previous studies have also highlighted this shortfall, but this study indicates that no significant progress has been made so far.

Challenge: To realize full alignment of local human capital to the cluster objectives through a three step process:

Step 1: Review the curriculum of the current school system to instill a higher level of creativity and communication skills

Step 2: To do the same with the university system with the added tasks of more industrial exposure and re-examining the minimum passing standards

Step 3: Significantly expand training and development on specific relevant skills whilst on the job. With the current situation, 'Step 3' should be aggressively pursued by encouraging more experienced locals to set up or work with existing training and development companies to help fill the huge skills vacuum. In addition, the government should make funds available for this activity so that training and development becomes more affordable, especially for the smaller companies.



- c) To motivate local SMIs to re-engineer their traditional management methods. The local IT infrastructure is weak and ICT applications are expensive. This causes SMIs to neglect investments in these areas and become less competitive as global reach and connectivity start to become significant factors for supplier selection.
- d) A proposed cluster with significant hardware content should be established. Hardware R&D requires laboratories and Electronic Design System (EDS) tools, some of which will be beyond the ability of SMIs to afford individually. For an E&E cluster to be successful, countries like Taiwan have “Open Labs” with resident experts where SMIs can utilize to develop their own products.

Challenge – To allocate sufficient funds and establish partnerships with MNCs to provide expertise to define, construct and manage such facilities.

- e) R&D is a long-term strategy with high risks for high return potential. SMIs must be encouraged to take this view in business decision making. Improved access to grants will assist in mitigating this risk. The current “matching grant scheme” is a good way to establish the necessary commitment. Grants, in theory, are given both to SMIs and MNCs. For MNCs, there is limited requirement for them to utilize some portion of the grant to collaborate with local partners and develop them along the technology curve. On the other side, SMI grants are given to develop technologies and products based on the strength and strategic nature of their business plans. SMIs normally find this very difficult to justify due to the risk adverse nature of the process. There is no provision for grants to be given if SMIs can prove that it will be used to collaborate with a high-tech MNC to support the latter’s product development in exchange for technology transfer.

Challenge – to create a situation where grants are efficiently disbursed to deserving candidates. This will require a strong technical and business assessment team with decision making authority to review and approve the proposals. The current process is drawn out and thus many good ideas and opportunities are lost. Also, grants provided to MNCs need to tie them to assist local technology partners succeed.

- f) The lack of market intelligence is a handicap for SMIs to enable them to set their business strategies around key technology and consumer trends. Constrastingly, MNCs invest a substantial amount of money and marketing resources to establish market trends and projections before making investment decisions. SMIs with their limited reach and financial resources, are less able to take advantage of these channels of information. The result is much less confident projections and lower probabilities of hitting the right business sweet spot. This study indicates that SMIs rely on their personal relationships with customers and suppliers to guide their strategic business decision making. One major consequence of this situation is the compromised abilities of SMIs to justify for financial support versus their MNC counterparts.

Challenge – to set up a strong market research arm within the government around the prescribed cluster of businesses. The objective is to provide the necessary market intelligence and consultancy to SMIs so that they can get better visibility of market and technology forces in play. For this to be successful, this organization must be given sufficient financial and expert resources to purchase and analyse commercially available market intelligence and integrate into their own research which should include collaboration with existing MNCs.

Recommendations

(a) Mega Cluster Development¹

- An empowered taskforce is required to steer the development of a vibrant cluster of companies that is focused around the E&E value chain. Lead roles for each cluster segment should be given to the larger companies, regardless of whether they are MNCs or not.
- For the public sector, universities should be chartered to expand their research activities and continually share findings with the industry at large. The original intent of PECO, and subsequently the IRTF, was towards the development of such a cluster.

Clusters will only work if there is an economic reason for it to exist. The objective of the cluster taskforce is to strive to create an environment where dialog is continually established between companies to explore opportunities to work together to create value. To achieve this, the taskforce should establish a business connection medium, such as a website, to serve as a place for companies, universities and government organizations to interact and share information. In addition, the taskforce should focus on championing the efforts to address the six challenges stated earlier.



(b) Improve the Quality of Training and Development

Seeking alignment between universities and industry has proven to be a difficult task based on history of past efforts. However, the clear message obtained from this study that graduates do not meet acceptable competency standards must be addressed. Whilst it may be difficult to change the formal curriculum, it is possible to add deeper exposure to industry through industrial exposure for university lecturers and courses aimed at improving creativity and communications skills.

The task force should also seek to bring high technology training and consulting to the existing technical workforce at affordable prices. Training needs are in most cases, specific to the immediate business requirements of companies. The objective is to closely track these training needs and bring affordable or subsidized training and consulting to fill the skill gaps. Public and private organizations such as the PSDC, KDI, DreamCatcher and Inti College are some potential contributors in this category.

(c) Adoption of Productivity Tools

SMLs must be encouraged to adopt productivity enhancing tools brought about by the ICT industry. The ICT companies within the cluster, need to be motivated to provide cost effective solutions to SMLs. These solutions need to enable companies to connect their business processes to global customers and become part of their virtual value chain. In addition, SMLs need to adopt system driven tools to help manage their internal processes to ensure optimum use of resources, as well as use the internet effectively to reach potential customers. Here, affordability is the biggest concern. The task ahead is to ensure that companies take advantage of existing incentives available for the adoption ICT in their business processes and successfully utilize and implement them.

¹ The E&E Mega Cluster as highlighted in the report includes: (1) Semiconductor assembly process equipment; (2) Developing and integrating semiconductor test systems to existing test handlers; (3) PC assembly process equipment; (4) Wafer fabrication equipment; (5) Advanced substrate technologies; (6) Advanced polymers; (7) Sensor and sensing devices; (8) Disk drive platters and mechanisms; (9) Semiconductor manufacturing consumables; (10) Industrial / mechanical / electronics design with rapid prototyping; (11) Technical / engineering software development; (12) ICT development; (13) LED applications and solar cell technology; (14) RF/MW device design and manufacturing; (15) Wireless devices for peripherals and consumer applications; (16) Portable medical electronics design and manufacturing; (17) Medical mechanics design and manufacturing

(d) Setting up Shared Laboratories

The lack of adequate test laboratories is a serious drawback in setting up R&D for small companies. Labs that are up-to-standard are too expensive for individual set-up. The role of the cluster taskforce is to lobby for funding for the set-up of shared labs so that SMIs can utilize on a pay-per-use system. These shared labs should be adequately staffed to provide consultancy and testing services for users. Defining the composition of the labs will need to be established in collaboration with the MNCs. It is expected that these labs will contain test instrumentation, including RF measurements, test environments, mechanical stress testing and Electronic design tools.

(e) Access to Grants

There is a need to set-up a consultancy center in close collaboration with SMIDEC to assist SMIs to access if their initiatives justify grants. The feedback from many companies is that although grants are available, the bureaucratic application and approval process is time-consuming and discouraging. This study indicates that a portion of the problem lies in the fact that the forms and the research required to fill them need to be done properly, otherwise the rework processes can be tedious. The government is urged to pressure the local industries to utilize the SMIDEC expert advisory panel (SEAP) which is staffed with outsourced consultants to this advantage. The next recommendation on this topic is for the taskforce to work with the government approving bodies to help provide the necessary exposure to them so that they can better understand the nature of the industry and why grants are being asked for. This is an important initiative both for the SMIs and the government officials as it provides an environment of understanding so that the justification process can proceed smoothly without multiple rounds of explanations of terms.

(f) Market Intelligence

A library or resource centre with access to market research and market intelligence information about potential areas of products and technologies should be made available to cluster companies. In addition to housing all relevant government documentation with regards to business policies and public research, this resource centre can also archive commercially obtained market research information on the key E&E business segments.

The taskforce should set up this resource centre and obtain the funding to purchase commercial market research required to support proper business planning activities. It is also recommended that market intelligence be shared by the MNCs in the form of sharing sessions. This will help SMIs have an updated understanding of the critical market forces at play within their industry.



The Technology Roadmap: Moving Forward

The proposed E&E mega-cluster is primarily focused around the semiconductor assembly, test, measurement, precision components and sub-assemblies business segments. The current situation where existing industries are highly fragmented will not serve Penang well. There is a need to provide continuity of purpose around Penang's core competence which, in this case, is in Electronics, and provide an environment where competencies can be deepened to world-class levels. Fragmentation caused by 'flavor-of-the-month' planning should not be encouraged for a small cluster like those in Penang.

For practical reasons, it is not possible to address all market segments at a single instance. It is necessary to prioritize the key categories and to create an infrastructure to support the systematic development of these industries. This prioritization is based on the following criteria:

1. An existing market / demand from local MNCs for these products;
2. The ability for local companies to penetrate the new product offerings further up and down the value chain of the industry of which they are currently serving; and
3. The ability to expand existing core competencies to serve horizontal markets without major financial investments.



Based on these three criteria, six clusters are derived:

| No | Sub-Cluster | Description |
|----|---|--|
| 1. | Semiconductor assembly and test equipment | Full range of semiconductor processing equipment, either automated or manual including product test heads, test equipment and test management software. |
| 2. | Sensor and sensing devices | Wide range of sensing heads, signal conditioners and digitizers to integrate with data processing equipment for monitoring and control applications. |
| 3. | Software development both for ICT as well as for embedded systems | Development of affordable ERP, CRM, HR, Finance and Process Management applications to support extension of SMI's global reach and operating efficiency and the development of enhanced technical software to support equipment and ASIC applications. |
| 4. | Wireless devices for peripherals and consumer applications | Leverage on existing wireless competencies to define and develop products around existing and developing platforms (e.g. Zigbee, Wimax, HSDPA, etc) to create competitive products in the market. |
| 5. | General industrial, mechanical and electronic design services with rapid prototyping capabilities | IP generation, design outsourcing and ODM industries |
| 6. | General industrial, mechanical and electronic design services with rapid prototyping capabilities | Mechanisms and piece-parts such as platters, bearings, journals, stacks, servos, etc., and production process consumables such as blades, spare parts, etc., to be designed locally and manufactured if necessary in lower cost countries. |

Conclusion

The most significant findings from this study can be summarized into three elements: First, that it will not be appropriate to set strategies based on markets that are solely dependent on the local MNCs. SMIs must start to seriously compete and find their own markets internationally. Second, the local SMIs portfolios are very fragmented and lack integration. It is quite difficult for customers to find a complete local value chain from the offerings of the companies around the semiconductor and electronics equipment market segments in Penang. Third, the leadership and support to develop clusters of companies to provide a complete value chain around specific target market segments to serve the regional and global markets is relatively ineffective.



The bottomline objective of this effort is to create a set of SMIs that has value offerings that complement each other, so that innovative new products and services can be realized locally. When this starts to happen, external customers or investors will begin to view Malaysia, specially Penang, as a center of excellence to create and deliver value for them. The good news is that most of these capabilities are already in place, but will need serious help to integrate, align and develop into deeper competencies necessary for the higher value of work that is commensurate with Malaysia's cost structures.

Thus a serious effort needs to be established, led by the State government, perhaps via an organization such as IRTF, investPenang or equivalent, to provide the necessary focus, at least, for a start, around the recommended areas from this report to identify, develop and integrate each key SMIs into a value chain to meet specific market segment requirements.

Knowledge Spillovers in Penang

Introduction

There are various effects MNCs and the corresponding FDI can have on the host country over and above the inflow of physical capital. FDI can lead to the inflow of advanced technology into the local economy, which can be adopted by the host country's local entities. This inflow of advanced technology can result in technology spillovers to the host country's firms, therefore improving their productive efficiency learnt from the MNCs. MNCs are defined as "enterprises that engage in FDI and that own or control value-added activities in more than one country"¹. In conjunction with trade, another medium for international technology transfer is FDI.



Brief Overview on Spillover Channels

Koko (1992) cited in Zhao², indicates that there are three channels of technology spillovers by MNCs³. The first is called the demonstration-imitation effect, or direct technology spillover effect, where local firms improve their technological and productivity level due to the technology gap between the MNCs and local entities by imitating the behaviour of the MNCs. They have a more sophisticated institution and ideas, and are able to provide sufficient advice to local firms' management and culture, as well as bring in new equipment and product to the market of the host country. The second effect is the competition effect where market competition is driven by the technology spillover brought in by the MNCs. This indirect spillover effect puts pressure on the competitiveness of local firms, thus inducing them to use the available resources effectively.

The last channel of spillover is one where the level of human capital in the host country is increased in order to create productivity improvements in local firms and is the main focus of this article. This form of spillover is called the linkage effect. The definition of this effect is "transactions between foreign affiliates and local non-business entities like universities, training centres, research and technology institutions, and other private institutions"⁴. There is potential for FDI spillovers of knowledge to the local labour force. At the same time, the host country's level of human resources determines how much FDI it can draw and whether local firms are able to soak up the potential spillover benefits. There is a possibility that advanced levels of human capital in the host economy will be able to attract a substantial amount of technology intensive MNCs that would in turn extensively contribute to the further development of labour skills.

The FDI spillover in the form of knowledge is realized through the training of local employees, from manufacturing operatives through to supervisors to technically advanced professionals and top level managers. The various skills/knowledge gained through the FDI spillover from the MNCs will spillover when employees move to other firms or set up their own business. Also, there is strong evidence that the FDI spillover effect has an obvious impact on the tertiary education on the host countries⁵. One of the most significant impacts would be in relation to the demand side on the economy. The MNCs provide attractive employment opportunities to highly skilled graduates in natural sciences, engineering and business sciences. This in turn is an incentive for students to complete their tertiary education. In addition, with the MNCs demand for skilled workers, this induces the government to invest in higher education/more human capital.

¹www.angelfire.com/alt/ps126a_am/outlines/SH_ch4_ii.doc

²Date of conference not available

³<http://conference.tnc-online.org/papers/Zhao.doc>

⁴Hansen, M, W., Pedersen, T., & Pedersen, B., (2007), "MNC Strategies and Linkage Effects in Developing Countries", *SMG Working Paper No. 2*.

⁵Blomstrom, M., & Kokko, A., (2001), "FDI and Human Capital: A Research Agenda", *FDI, Human Capital and Education in Developing Countries Technical Meeting*, 13-14 December 2001 in Paris.

Knowledge Spillover in Penang

MNCs and their affiliated industries in Penang are expanding R&D operations and hiring more engineers. There is an increase in demand for engineers; for example design and development engineers by Motorola and Intel⁶. In addition, there is also a strong demand for highly skilled engineers for the R&D department by Advanced Micro Devices (AMD) Export Sdn Bhd, where the company expanded its value-added functions such as customer services and the development of new materials and processes.

“Invisible college” is the horizontal integration that induces technological diversity and fosters a diverse pool of collective knowledge⁷. In its own way Penang is a successful electronics cluster as it has attracted many leading electronic firms. Best (1999) indicates “...the invisible college of company skill formation is considerable in Penang. An audit of the quantity and quality of invisible college graduates from these programs would reveal a considerable regional asset or ‘social capital’. These skills represent a sizable regional asset which has been accumulated over 25 years”. An example would be Dell computer co-sponsoring hands-on work experience and training facilities for chief executives. This gave senior managers real experiences in using IT.



In addition to providing scholarships and sponsoring the formal education of individual employees in the host country, MNCs are also active in supporting the development of universities and related institutions in several ways. The PSDC has been established jointly by the government, local business and foreign MNCs and has been lauded for its success in facilitating this support role⁸.

Dynacraft and Micro Components Technology, both Penang subsidiaries of Fairchild provided training to many of the host country’s engineers in terms of precision engineering and metal working. Based on the training obtained, they now established successful local firms, which include Prodelcon, Metfab and Rapid Synergy. In addition to the training received, these engineers, professionals, technical and skilled personnel that branched out to become successful entrepreneurs in running local firms also acquired the dynamic MNCs tacit and experimental knowledge from learning by doing. “A number of electric and electronic MNCs have played a major role as training grounds for the hiring and nurturing of entrepreneurs who have stepped up the creation of new firms in Penang”⁹. Other examples include Globetronics, Shinca, Semitech Unico, Prodelcon, Metfab and Rapid Synergy, all of them established by local entrepreneurs that gained the training, knowledge and experience from working in MNCs in Penang.

Studies have shown that there are knowledge spillovers in local divisions of MNCs fostering technology transfer, especially through skilled personnel moving to local firms, those former employees, who worked at the MNCs and that set up their own firms actually offered training support to other local firms. The increase in the creation of entrepreneurs, managers, technicians and human capital has helped MNCs upgrade their own operations. The increased movement of human capital between firms has been a great catalyst for larger outsourcing of dissimilar activities, as well as in the meantime allowing MNCs to upgrade and specialize in higher value added operations.

⁶ “MNCs in Penang Expand R&D Operations”. Adaptation from Star article 5 May 2004.

⁷ Rakesh, B (2002), “Knowledge Firms and Industrial Clusters: An Analytical Review of Literature”, [IIMA Working Papers](#) 2002-02-01, Indian Institute of Management Ahmedabad, Research and Publication Department.

⁸ Similar to footnote 2

⁹ Rasiah, R., (2002), “Systemic Coordination and Human Capital Development: Knowledge Flows in Malaysia’s MNC-Driven Electronics Clusters”, *The United Nations University Discussion Paper Series*, 7.

Firms are able to take advantage of the open system and integrated business network of Penang to encourage entrepreneurial, technical and skilled human capital with tacit and experimental knowledge to leave the MNCs and start up as well as provide training and guidance to new firms. This expansion of MNC-driven synergies is spurred on with the support and active intermediary role of PDC, PSDC and the Penang government. Among the companies that have played important roles as training grounds for the development of new entrepreneurs in Penang are Intel and Motorola. This human capital, along with implicit and experimental knowledge acquired in MNCs has been vital in motivating linkages and the transfer of knowledge in local firms.

Despite the knowledge spillover from MNCs, with the expansion of diversified areas such as IT, telecommunications, electrical and electronics, sales and services, Penang is still in demand for a knowledgeable workforce that are equipped with specialized skills and competencies. Thus, relying solely on the spillover effect is not sufficient to meet the growing demand¹⁰.

According to Dell-Asia Pacific Sdn Bhd Managing Director, Datuk Simon Wong, there is an increase in demand for senior management to tackle this group of diverse workers. In addition, in order to build a workforce with diversified skill sets, it is important that tertiary-level students are thought to have good communication and language skills. He indicates that since industries in Penang have diverged from labour-intensive processes into areas of services that required high skilled workers, it is important that the traditional IT-based courses be replaced with training programs that provide an extensive range of different skills. He also acknowledged that Dell-Asia Pacific was an example of a company with a diversified range of talents. In addition, he was of the opinion that it was vital for Penang to sustain its position as a cybercity that provided a solid platform for a thriving knowledge economy by producing skilled workers that are able to complement and contribute to the needs of the MNCs. He also stressed the need for a constant upgrading in skills and the creation of a common platform for industry professionals to undertake intellectual discussions and exchange ideas as industries move up the value chain.

However, knowledge spillover itself is not enough in face of the growing demand for more knowledge workers. CEOs in the electric and electronics MNCs use the Total Quality Management (TQM) that requires a continuation of improvements in operations at all levels¹¹. Even with PDC and the Penang State government being aware of this problem (leading to the implementation of more diversification in training activities being carried out), interviews still indicate a growing shortfall in the supply of R&D scientists and engineers that are required to broader designing activities in Penang. Also, the lack of supply of human capital and R&D capabilities in the face of increasing production costs and competition from cheaper cost sides like China and Vietnam are threatening to delay and impede further progress of the evolution of high value added activities such as software development and high precision machinery.

Also, at the MSC Malaysia Cybercity@Penang: Catalyst for K-Economy conference held in Penang on the 23rd and 24th of October at the Equatorial Hotel, issues regarding the shortage of talents required by the MNCs were brought up. The issue of the difficulty that some industries face in sourcing local acoustic technology experts, where there is this lack of opportunities for companies to develop educational needs; workplace skills was raised¹². Also, the observation was made where local universities were not flexible in tailor making their courses/syllabus to accommodate the talent required by the industries.



¹⁰Chew, A., (2007), "Industries Seek Diverse Workforce", Star Article, Saturday October 2007.

¹¹Rasiah, R., (2002), "Systemic Coordination and Human Capital Development: Knowledge Flows in Malaysia's MNC-Driven Electronics Clusters", *The United Nations University Discussion Paper Series*, No. 7.

¹²From the Q&A session at the MSC Malaysia Cybercity@Penang: Catalyst for K-Economy from the 23rd – 24th of October 2007

To both solicit and leverage foreign MNCs, the Penang government created the Penang Development Corporation (PDC) in 1969¹³. The PDC then created the Penang Skills Development Centre (PSDC) in co-operation with foreign MNCs. With co-ordinating help and incentives from the PDC, foreign MNCs financial support was provided through membership in the PSDC, supplying equipment and training to help design the set of courses and utilize the centre extensively for their training needs. This open linkage between the government, business and academia is essential in developing a deep supply of technical skills to closely match the needs of the industry, both local and foreign.

Another possible solution would be for the Penang government to assist the transition of firms to innovate and move up the value chain by building R&D labs and offering grants, which in turn provide incentives to attract skilled Malaysians back. This at least would help decrease the gap of the supply-demand co-ordination; between local supply of skilled workers and the demand by the industries.

Also, another possible step to be taken is with the strategic plan for higher education towards “Apex” universities. This enables the local universities to have more autonomy power. One way would be to encourage more local universities to be more open to boost the industry-university collaboration, where the MNCs work with universities to scout out talents before graduation. Some universities have already undertaken this initiative. The Wawasan Open University has taken the initiative to discuss with companies in order to identify the training needs and offer E-learning platform, which is more flexible and can be an alternative solution in addressing the shortage of skills issue even with knowledge spillover from MNCs¹⁴.

In addition, in industries where there are insufficient local talent to meet demand, one way of overcoming this skill shortage would be to allow free imports of foreign skilled workers. This solution was used by The Silicon Valley to overcome the shortage of skills and technical workers by offering the workers green cards (working permits). By making it easier for foreign skilled workers to enter the country, this would also assist in reducing the demand-supply gap of skilled workers.

Conclusion

The spillover effect in Penang is not sufficient enough to maintain its position as a Cybercity in wake of the growing demand for more skilled workers as industries move up the value chain. Tertiary institutions in Penang especially those governing the supply of R&D scientists and engineer graduates have lacked the supply-demand synchronization. Thus, in order to prevent the growing deficits in technical and R&D scientists and engineers to undermine Penang’s capacity of electronics firms to enhance and expand higher value added activities on a larger scale, then emphasis should be placed on the strong interface between supply-demand match ups in the value chain, with education institutions working closely with the industries’ needs, as well as encouraging the migration of foreign skilled workers.

§ Ng Ju-Ai

¹³Ritchie, B.K., (2002), “Foreign Direct Investment & Intellectual Capital Formation In Southeast Asia”,

¹⁴OECD Development Centre Technical Paper, No. 194.
Similar to footnote 9.

International Headlines

Unemployment Rate in Surprise Rise

News.com.au, 8th November, 2007

The unemployment rate inched up from 4.2 per cent in September, which was a 33 year low in Australia recently. The male unemployment rate increased by 2 basis points to 4.0 per cent and the female unemployment rate rose to 4.8 per cent. But still, the jobs market is booming. Total employment rose a seasonally adjusted 12,900 jobs to 10,533,800. Full-time employment jumped 70,600 to 7.59 million and part-time employment fell by 57,700 jobs to 2.95 million. A tight labour market could trigger higher wages inflation and push up consumer prices. Across states, the unemployment rate sat at 3.6 per cent in Western Australia, reflecting a mining boom and ongoing skills shortage. That compared to 3.8 per cent in Queensland, 4.6 per cent in New South Wales, 4.3 per cent in Victoria and 5.4 per cent in South Australia and 5.7 per cent in Tasmania. Job ads in Australia are currently sitting at a historic high.



Japan's Economic Growth Rebounds on Consumer Spending

Bloomberg.com, 13th November, 2007

Japan's economy grew faster than forecasted in the third quarter as an unexpected increase in consumer spending countered a drop in housing construction. The world's second-largest economy expanded an annualized 2.6 percent in the three months ended September after a revised 1.6 percent contraction in the previous period. The Bank of Japan kept its benchmark interest rate at 0.5 percent as the biggest drop in housing investment in a decade and slowing shipments overseas threaten the expansion. Consumer spending, accounting for more than half of Japan's economy, grew 0.3 percent from 0.2 percent in the second quarter. Outlays by households are at risk because wages fell in nine of the 10 months to September and unemployment rose to 4 percent from 3.6 percent two months earlier.

India Concerned About High Oil Prices

The Economic Times, 13th November, 2007

India, which imports 70 percent of its oil needs, is much concerned about crude prices rising to nearly 100 dollars. But the government, which heavily subsidises fuel, had no plans to push up prices at the pumps to compensate for losses. Oil futures have pulled back from a record-breaking run that pushed them to all-time highs last week of 98.62 dollars in New York. India is seeking new supplies of oil and gas from abroad and ramping up production from domestic sources to fuel its rapid economic growth.

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