

# Creating Knowledge Based Economies in Southeast Asia

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## 1. Introduction

The economic environment in Southeast Asian countries has changed dramatically in the last decade in ways that have revolutionized business styles. China's economic acceleration with its open door policy since 1992 and as a cheap labour export production base has attracted foreign direct investment (FDI), in this regard overtaking Southeast Asia. The Asian currency crisis of 1997 had also affected China less than vis-a-vis Southeast Asian countries. Rates of economic growth have declined in Southeast Asian economies while China has maintained high growth rates. Moreover, China by opening its markets to a greater extent with its entry to the World Trade Organization (WTO) has encouraged overseas investment firms to expand their business operations, not only for export but also for access to the domestic market. Even Japanese firms, which have always been pro-Southeast Asian countries in their investment operations, are expanding their business activities in China. There is increasing concern that entry of China with lower labor costs and a growing market will gradually pull away the bulk of FDI flowing to the Southeast Asian region. There is widespread concern in some Southeast Asian countries that they may be losing their edge in competition to China.

As Southeast Asian countries are still relatively weak in local technological capacity to innovate themselves in the face of competition from China, they still view FDI as an important channel for gaining access to foreign technological capacities in the immediate future. Even though Southeast Asian countries in the short-term will have to depend on FDI for their continued industrial technological development strategies, these may not be adequate in the long run to compete with the economies of China and India.

The changing economic environment in East Asia has propelled Southeast Asian countries to seek strategies that will allow them to overcome the challenges individually as well as collectively. As Southeast Asian countries are gradually losing their comparative advantage of abundant unskilled labor, they are faced with a number of strategies to follow in order to retain their edge in industrialization. Among the range of strategies that Southeast Asian countries can follow, there are two strategies that will increase their human resource potential. Firstly, there is a need for them to transform themselves from a mass production based

economy to a knowledge-based economy (KBE). Secondly, there is a need in many Southeast Asian countries to increase the national levels of technology and skills. The former strategy will require Southeast Asian economies to transform themselves from mass production-based ones relying on unskilled or semi-skilled labor to knowledge-based ones. The pursuit of knowledge-based economic activities will comprise research and development, product and service design, high value added processing and marketing for the domestic, regional and global destinations. Knowledge-based economic activities will require human and intellectual capital with a mass of creativity and innovation potential (Ariff, 2003). The latter strategy involves the increase of local levels of technology and skills. Both rapidly industrialized economies as well as those starting out on industrialization either have low levels or inadequate levels of technology and skills. In all Southeast Asian countries, the capacity of technology transfer from foreign firms to indigenous firms has brought only limited successes. In Thailand, for instance, most firms do not invest in technological development (Punyasavatsut and Pooponskorn, 2003). Most firms in the Philippines are not aware of the importance of technology and how to improve their technological level (Lamberte et. al., 2003). In Singapore, which has gone far ahead of other Southeast Asian countries to invest in increasing local levels of technology and skills, upgrading has been hampered by lack of skills, absence of a local technology base and lack of other capabilities that are evident in developed economies (Lim, 2003). Because of their limited knowledge, indigenous firms are unable to develop core technologies and climb up the technology ladder.

Thus, each Southeast Asian country needs to change its industrial policy from the often followed types, that provide subsidies and protection to specific sectors, to types encouraging more market competition of a kind that strengthens the formation of capacity for human resource development, and for technological and skill development.

This paper examines the attempt by Southeast Asian countries to develop their human resource potential in order to meet the new challenges at continued growth. The first part of the paper comments on the individual approaches undertaken or lack thereof of efforts by individual countries. The place of education in the macroeconomic performance of Southeast Asian countries is examined in the second section. The third part of the paper describes the restructuring efforts undertaken by Singapore to further strengthen its manpower resource. Singapore is used as case study to point out the path that may be followed by other Southeast Asian countries depending on their position in the industrialization ladder.

## 2. Education in the macroeconomic performance of Southeast Asian countries

It is interesting to note that among the developed countries of Europe, significant growth of formal education appears to have followed, rather than preceded economic growth. In the developing countries, in general, the process is reversed in having economic growth following expansion of formal and informal education. In the case of East Asian countries educational growth preceded economic growth, as by the early 1960s there were high rates of literacy

**Table 1: School Enrolment in Southeast Asian countries**

Country	Levels	1960-65	1970-75	1980-85	1986-90	1991-96
Brunei	Primary	N.A.	N.A.	106.8	114.2	109.8
	Secondary	N.A.	N.A.	63.8	65.3	77.5
	Tertiary	N.A.	N.A.	1.8	4.2	5.9
Indonesia	Primary	71.5	83.0	113.7	116.0	114.5
	Secondary	9.0	18.0	35.3	46.4	45.3
	Tertiary	1.0	N.A.	5.3	9.2	10.5
Korea	Primary	97.5	105.6	104.3	100.6	99.3
	Secondary	31.0	49.0	84.2	92.0	96.0
	Tertiary	6.0	N.A.	24.3	38.6	48.1
Laos	Primary	32.5	55.5	110.3	108.4	107.5
	Secondary	1.5	5.0	22.3	25.6	25.3
	Tertiary	0.1	N.A.	1.0	1.3	1.7
Malaysia	Primary	93.0	89.0	97.2	95.8	100.5
	Secondary	23.5	38.0	50.5	57.2	58.2
	Tertiary	2.0	N.A.	5.0	7.2	10.0
Myanmar	Primary	63.5	83.0	96.5	104.0	120.6
	Secondary	12.5	21.0	23.3	24.3	26.5
	Tertiary	1.0	N.A.	4.6	4.1	5.3
Philippines	Primary	104.0	107.5	109.2	110.4	111.5
	Secondary	33.5	50.0	65.3	70.6	76.8
	Tertiary	19.0	N.A.	24.6	27.4	28.6
Singapore	Primary	108.0	107.5	108.8	104.4	102.7
	Secondary	38.5	49.0	57.5	68.8	67.0
	Tertiary	10.0	N.A.	10.7	18.6	28.7
Thailand	Primary	80.5	83.0	97.7	98.0	92.5
	Secondary	13.5	21.5	30.2	28.6	45.0
	Tertiary	2.0	N.A.	16.8	16.2	19.3
Vietnam	Primary	N.A.	119.0	105.5	104.0	110.2
	Secondary	N.A.	46.0	42.5	39.0	37.4
	Tertiary	N.A.	N.A.	2.0	1.9	2.9

Source: World Bank Index, CD Rom.

and enrolment ratios in schools (Tilak, 1998:22).

Booth (1999) has noted that Southeast Asian countries, in coping with cultural and colonial barriers, were forced to undertake drastic measures, which included a heavy investment in education and family planning programs in Singapore, affirmative action in Malaysia, compulsory nine-year cycle in Thailand, and increased government expenditures following the oil-boom in Indonesia.

The gross enrolment ratios (GER) for Southeast Asian countries from 1960 to 1996 are shown in Table 1. Korea is used to compare the performance of Southeast Asian countries, as it represents a case that was similar to many countries in Southeast Asia but became a developed country rapidly. The year 1960 is indicative as a base year before the rapid economic growth began while 1996 indicates the year before the onset of the Asian financial crisis. In the 1960-1965 period, Singapore and the Philippines appear to have a better human capital endowment with gross primary enrolment exceeding 100% and secondary GERs reaching 33-39% and tertiary GER reaching around 10-20%. The GER for Singapore and the Philippines were actually better compared with Korea during the period.

**Table 2: Total mean years of education attained in Southeast Asia.**

<b>Country</b>	<b>1960-65</b>	<b>1966-69</b>	<b>1970-75</b>	<b>1976-79</b>	<b>1980-85</b>	<b>1986-87</b>
Indonesia	2.0	2.0	3.0	3.0	4.0	4.0
Korea	3.2	4.0	4.8	5.8	6.7	7.5
Malaysia	3.0	3.5	4.0	5.0	5.5	6.0
Myanmar	1.0	1.0	1.5	2.0	2.0	3.0
Philippines	5.0	5.5	6.0	6.5	7.0	8.0
Singapore	2.5	3.5	4.5	5.5	6.5	7.0
Thailand	4.0	4.0	4.5	5.0	5.2	6.0

Source: Easterly W. and Ross Levine, 1999: 22.

During the 1970-1975 period, Philippines and Singapore were still leading with Vietnam starting to follow up. The primary and secondary GERs of Philippines and Singapore were already comparable with Korea during this period.

In the 1980-85 period, almost all Southeast Asian countries had universal primary education. The highest GER for secondary schooling was the Philippines with 65.3% followed by Brunei (63.0%). Philippines also had the largest GER for tertiary (24.6%) followed by Thailand (16.8%). Korea in this period had outpaced the Philippines and Singapore in terms of GER for secondary schooling.

During the 1986-1990 period, Philippines and Singapore led again in the GER for secondary and tertiary education. During the 1991-1996 years, Brunei outpaced Philippines and Singapore in terms of secondary GER while Philippines and Singapore still led in GER for tertiary education.

The above observations indicate that Singapore and the Philippines were front-runners for educational achievement in Southeast Asian countries between 1960 and 1996. The two countries also had the highest educational attainments for Southeast Asia with total mean years of education during 1986-1987 reaching as high as eight years for the Philippines and seven years for Singapore (see Table 2).

However, Singapore seems to have made more improvement since the 1960s as its human capital stock was lower than the Philippines, Thailand and Malaysia during the 1960-65 period. By 1991-96 period, Singapore had the highest numbers of scientists and engineers in R & D compared with Korea and other Southeast Asian countries (see Table 3).

Comparison of GDP growth also shows that Singapore is the only country with growth rate at or even higher than 7% for the period 1991-1996 (see Table 4). For the Philippines, some observers have argued that natural disasters have often stalled the growth process, while Thailand, Indonesia and Malaysia show good growth records in GDP. Soon (1992) has noted that the Singapore government's early and continued emphasis on education and manpower development and its subsequent upgrading of its skilled manpower have contributed significantly to its rapid economic growth.

Since 1960, Singapore has produced the highest output per worker. This is followed closely

**Table 3: Scientists and Engineers in Southeast Asia, 1991-1996.**

<u>Country</u>	<u>Per million people</u>
Brunei	N.A.
Indonesia	N.A.
<i>Korea</i>	2,636
Laos	N.A.
Malaysia	87
Myanmar	N.A.
Philippines	157
Singapore	2,728
Thailand	119
Vietnam	308

Source: Akhmad Bayhaqui, 2001.

Note: Korea is included for comparative purposes

**Table 4: Annual GDP growth in Southeast Asia (%).**

<u>Country</u>	<u>1960-65</u>	<u>1970-75</u>	<u>1980-85</u>	<u>1986-87</u>	<u>1991-1996</u>
Brunei	N.A.	2.5	-3.9	0.4	0.8
Indonesia	2.0	7.9	6.2	7.1	7.8
<i>Korea</i>	5.9	8.1	6.3	10.0	7.4
Malaysia	3.0	3.5	4.0	5.0	5.5
Laos	N.A.	N.A.	N.A.	10.5	6.5
Myanmar	N.A.	N.A.	N.A.	N.A.	N.A.
Philippines	5.2	5.4	-0.1	4.7	2.8
Singapore	7.0	10.4	6.8	8.4	8.3
Thailand	7.2	6.7	5.4	10.3	8.1
Vietnam	N.A.	N.A.	3.8	4.8	8.4

Source: Akhmad Bayhaqui, 2000: 25.

**Table 5: Output per worker in ASEAN.  
[International price]**

<u>Country</u>	<u>1960-65</u>	<u>1966-69</u>	<u>1970-75</u>	<u>1976-79</u>	<u>1980-85</u>	<u>1986-87</u>
Brunei	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Indonesia	1,635.5	1,673.5	2,158.5	2,892.0	4,013.7	4,593.0
Laos	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Malaysia	4,499.5	5,178.3	6,962.8	8,392.8	10,594.8	10,793.6
Myanmar	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Philippines	3,177.5	3,598.5	4,125.5	4,844.0	4,917.5	4,529.4
Singapore	5,344.5	6,782.3	11,278.3	14,017.0	17,136.8	21,325.0
Thailand	2,0648.0	2,646.3	3,195.3	3,908.8	4,519.5	5,709.0

Source: Akhmad Bayhaqui, 2000.

**Table 6: Expenditure on education by governments in Southeast Asia and Korea (% of GDP).**

<u>Country</u>	<u>1960-65</u>	<u>1970-75</u>	<u>1980-85</u>	<u>1986-87</u>	<u>1991-1996</u>
Brunei	N.A.	N.A.	N.A.	N.A.	N.A.
Indonesia	1.4	1.8	2.0	1.8	1.6
Korea	2.3	2.6	3.2	2.9	3.3
Malaysia	5.4	5.4	5.6	5.9	5.2
Laos	N.A.	N.A.	N.A.	N.A.	N.A.
Myanmar	2.2.	1.6.	1.8	2.1	1.6
Philippines	N.A.	N.A.	N.A.	N.A.	N.A.
Singapore	2.9	3.1	4.6	4.6	3.8
Thailand	2.9	3.5	3.9	3.1	3.3
Vietnam	N.A.	N.A.	N.A.	N.A.	N.A.

Source: International Monetary Fund, 2000.

by Malaysia (see Table 5). By the late 1980s, Singapore had outstripped all Southeast Asian countries in output per worker. Philippines lacked improvement as the amount of output per worker outpaced by Thailand in the 1980s. The depreciation of the baht in 1986 improved the price competitiveness of Thai exports, resulting in manufacturing exports increasing by an average of 29% per year in volume in the 1986-1990 period. Thailand also benefited from the surge of direct investment from Japan and the Asian newly industrialized economies in their effort to generate offshore production. The booming Thai economy of the 1980s brought strains on both the physical and human infrastructure (Wahawisan, 1992). Shortages of skilled labor, like engineers and technicians, critically affected the growth of the Thai economy. This is reflected in the number of scientists and engineers who were engaged in R & D (see Table 3).

From the available data on educational expenditure by ASEAN governments, we notice that Singapore devotes more resources especially in tertiary education. Malaysia again emerges second in Southeast Asia, in allocating resources to education. During the period 1965-1995, developed and developing countries spent 5-6% and 3-4% respectively of their GNP for education. When this figure is translated into the share of education in the governments' total budgets, the developed countries appear to have spent 15 to 20 percent (Tilak, 1998:31-32). In the case of Malaysia and Singapore, the share of education in the governments' budgets is only 5% and 4% respectively (see Table 6).

### 3. Role of education in human resource development

Industrial upgrading and the formation of knowledge-based economies require a large and highly qualified human resource, in particular scientists and engineers. In order to meet the

human resource demand, Southeast Asian countries need to build broad and deep human resources. Southeast Asian governments are cooperating in the implementation of high quality education programs.

The Singapore government is restructuring its education sector so as to accommodate a shift towards a knowledge-based economy. In line with its goal of becoming a knowledge-based economy, Singapore is building up an education hub in the rapidly growing Asia Pacific region. This will provide Singapore with its own talent pool to engage in research and work in new knowledge-driven companies. The Singapore government is planning to increase the number of foreign students studying in the country. Many of them will be provided with scholarships and will be sent to work for various Singapore based organizations, after their education is finished. Singapore is also concerned with the issues of entrepreneurship and risk-taking among its people.

Malaysia has launched many education programs to meet the demand for human capital in a knowledge-based economy. The government aims to achieve a 60:40 ratio of science and engineering course students from the present ratio of 40:60. The teaching of science and mathematics in English was introduced in schools and universities in 2003. The government has converted all secondary vocational schools to secondary technical schools. A consortium of eleven public universities has provided a distance learning course for students, and technical and business courses have been set up. Meanwhile several advanced skill training courses have been set up. At the Japan-Malaysian Institute, German-Malaysian Institute, British-Malaysian Institute, and Malaysia-France Institute specialized courses are offered in mechanics, industrial engineering technology, and avionics engineering and multimedia development. Besides these formal types of education, employers in all economic sectors can apply to the Human Resources Development Fund, which provide financial assistance for apprenticeship training and computer purchases, enabling firms to retrain and upgrade the skills of their workers. To increase the number of skilled employees, the government has awarded 'Multimedia Super Corridor' status to companies to employ foreign knowledge workers.

Most workers in Thailand have completed only elementary school education. In addition, entrepreneurs themselves also lack modern management insights. As a result, Thailand will find it difficult to shift to a knowledge-based economy. The 9<sup>th</sup> Five Year National and Social Development Plan, which started in 2002, includes a human resource development strategy for increasing the number of those who have completed secondary school and who have graduated in science fields. Subsidies will be given for tuition fees and food, and plans that promote science study will be exempted from taxation. By initiating teacher training projects, Thailand plans to develop and promote basic knowledge at all levels of education, and especially in elementary, secondary and vocational education. Meanwhile teachers will be trained in the special techniques necessary for teaching entrepreneurs to improve their knowledge and skills. Training will be provided in fields necessary for business operations, and links will be established between educational institutions and the business sector, with the aim of facilitating teaching in educational institutions by industrial specialists.

Indonesia has an education policy for improving the quality of primary school and secon-

dary education by reforming the examination system, curriculum, text-books, teachers and the management and administration of education. Tertiary education institutions such as universities have been given autonomy in the administration of education activities. But, Indonesia has a budgetary constraint in supporting much needed vocational schools.

The Philippines government has not been able to align its education system toward a globally and technologically-competitive economy. Schools in the Philippines do not provide the requisite technical skills and knowledge. Recognizing the importance of education, policy-makers have implemented in the school year 2002-2003 a new curriculum called the Basic Curriculum, which aims to raise the quality of school graduates. Tertiary education is expected to supply the higher-level skills needed for competitiveness while middle-level skills will be acquired during the technical and vocational education and training for which the Technical Skills Development Authority is responsible.

In its 2001-2010 strategy on education and training development, Vietnam will give priority to improving the quality of education and training in human resources among managers, entrepreneurs and skilled workers. The Vietnamese government plans to revise the school curriculum and will introduce textbooks that combine theory with reality, and knowledge with experiment. Teaching capacity and education methodology will be improved, and education management will be reformed so as to provide more autonomy. Schools and universities will develop in directions conducive to promoting collaboration between Vietnamese schools and foreign partners in providing education and training. In order to meet the social needs of a changing country, education is expected to be standardized, diversified, modernized and systematized. The government is also studying the possibility of establishing an indicator system needed for training, which will help to provide education services to meet the practical needs of the economy.

From the above it will be evident that formal education has been emphasized with regards to development. It has received subsidies to a large extent for human capital development. As formal education alone is not seen as sufficient for indigenous technological and skill development strategy, a broad policy framework is needed for indigenous firms to develop their technological and skill levels. The Southeast Asian governments, apparently, have not provided enough programs and facilities to nurture indigenous technology and skill development.

Issues of creating a cadre of entrepreneurs in centrally planned educational system has received much public airing in Singapore. The Singapore government is planning strategies to overhaul the education system. Malaysia too has to initiate systematically changes to its science and technology policy so as to persuade MNCs to foster technopreneurship so that indigenous technology development will follow. Thailand has not established a skill and technological learning system to enable it to compete with new technologies. Skill formation and technological capability development obviously depends not only on economic incentives but also on policy environments. Improvement of education may be inadequate for skills formation and production activities. Supporting institutions are necessary for industrial upgrading processes. Provision of public goods such as an educated labor force, physical infrastructure, a R & D environment, law and order will foster clear signals to development



orientation.

Singapore, Malaysia and Thailand have definite plans for developing knowledge-based economies, whereas Indonesia and the Philippines do not have substantive plans due to budgetary constraints. Vietnam has an industrial policy for the period 2001 to 2010 aimed at targeted industries, but has no overall policy framework for the improvement of indigenous technological and skill levels.

Singapore has established a task-force and committees to review the economic and industrial restructuring for the knowledge-based economy. One of these is the Technopreneurship 21 Ministerial Committee, set up in 1999, aimed to develop pro-enterprise environment.

Malaysia has launched an industrial master-plan, IMP2 (1996-2005) which focuses on raising competitiveness. An aspect of IMP2 is to promote and nurture local small and medium enterprises (SMEs) to become reliable and competitive manufacturers and suppliers to leading industries. Other supporting strategic supplements include fiscal incentives, business matching, programs supporting technological development, skill upgrading, export and market development, and provision of industrial sites for SMEs. Malaysia's industrial technology planning also provided for research and development grants, tax incentives for research and development, loan and venture capital programs, and a venture capital fund.

Thailand's 9<sup>th</sup> Five Year Plan from 2002, has planned to implement a plan for encouraging technological development. The government has planned to allocate budgetary expenditure to stimulate enterprises that are currently unaware of their development potential. A Skill Development Fund has been started to promote training courses in cooperation with the private sector and the educational institutes. Subsidies for firms investing in technological development have also been announced. A testing center for the products of SMEs will also be established. While planning for improving entrepreneurship skills, the government has also volunteered to provide long-term credit for the purchase of new technological machinery.

The Philippines apparently lacks the comprehensive institutions and support industries to enhance technological capability. A handful of the larger firms benefit from innovative packages, while the government-to-private sector linkages are extremely weak. Though various plans have been formulated, most of it remains largely on paper awaiting implementation.

The 1997-98 Asian financial crisis scuttled all plans by Indonesia to develop its technology base. Macroeconomic stability and economic recovery remains the major focus of Indonesia at the present moment.

#### 4. Education as an industrial sector: The case of Singapore

Singapore facing the challenge of becoming a KBE, believes that building up Singapore as an education hub is one solution to the problem of a technology base like that of developed economies. It has committed itself to develop a talent pool to pursue advanced research and also create the necessary atmosphere and education infrastructure to draw the best talents worldwide so as to engage them in research, teaching, study and work in new knowledge

driven companies. A larger talent pool is not only expected to benefit the existing companies but also attract more global companies. The presence of an international mix of leading universities in Singapore is expected to encourage creativity, and generate more entrepreneurs and companies.

As an effort to boost knowledge based industries, the government has drawn a plan to transform education into an industry. Currently education constitutes 1.9% of GDP and is expected to increase to 5% of GDP in a decade. The government is building on Singapore's long reputation of educational excellence in order to help the number of private institutions to increase by attracting established universities in the developed countries.

In line with reinventing Singapore in the 21<sup>st</sup> century, an Economic Review Committee was established by the government. The group examined the existing economic and non-economic policies and recommended major policy changes for economic growth in a knowledge-based economy. A 'Subcommittee on Enhancing Human Capital' examined the areas related to education.

Singapore has developed a highly positive policy to importing 'foreign talent' to bolster its intellectual talent. The search for global talent has multi-faceted directions. In recent years, students from China, India and Indonesia have been encouraged to come to Singapore. In the case of students from China, there were 50,000 of them studying in 200 schools in Singapore in 2002, and the government hopes to increase this number to 150,000 in a decade. Most of these students are provided with scholarships and bonded to serve in various organizations after their education. It is hoped that at least 15 per cent of them will remain on in Singapore. Foreign research talent is sought after from China and India. The surge in the number of foreign students over the next decade is expected to generate 22,000 new jobs. This will increase the education sector's contribution to GDP from 1.9% to 5% [Straits Times, September 22, 2002].

Malaysia and Singapore are two countries in Southeast Asia to have identified education as a potential area for profitable growth. Many of the institutions in Malaysia, however, are off-shore establishments to tap the Malaysian students need for twinning program and overseas university degrees. Singapore was resistant to similar pattern of development earlier and had concentrated on developing its own national institutions like the National University of Singapore, the Nanyang Technological University, and later the Singapore Management University. Singapore, however, allowed the operation of off-shore university programs operated by self financed universities and colleges for those Singaporeans and migrant students to obtain such degrees but remained reluctant to recognize all degrees obtained in off-campus programs or by distance learning. University of London programs, for instance, remained unrecognized, as long as they were obtained through distance learning. Such practice, however, did not deter thousands of students who were unable to gain admission to the three state universities nor were able to attend on-campus degree programs in countries like the United States, Australia, New Zealand, Canada and the United Kingdom.

By the mid-1980s, Singapore while planning to remain economically competitive recognized the education sector as one of the 18 service sectors to be nurtured and promoted [The

Singapore Economy: New Directions, February 1986]. Education was identified as having potential of high revenue both in adding to the net worth of the economy as well as having export potential.

The orientation to develop education as a business in Singapore was followed through two approaches. At one level, a concerted effort was undertaken to implement the plan to attract at least ten world class universities to establish a significant presence in Singapore within ten years. This was to ensure Singapore as a center of educational excellence at the post-graduate level in the Asia Pacific. At the second level, the contribution of education to becoming an industry generating revenue, jobs and services was examined and plans were drawn up. As the first sector could be easily done through government investment, the Economic Development Board in 1998 embarked on the plan to attract universities with advanced post-graduate research to attract universities with advanced post-graduate research to establish links with the national universities in Singapore. Even though the national universities in Singapore have always been encouraged to link with leading universities in developed countries, the new approach tended to create a talent pool that will contribute to R & D as well to generate revenues.

Table 7 shows the universities that have been attracted to set up joint programs at Singapore. As shown in the table, most of these universities are recognized for their cutting edge research and promoting revenues through R & D.

At the second level, the contribution of education as an industry generating talent, jobs and revenue was taken up for policy formulation. In 2000, the education industry contributed S\$3 billion to the Singapore economy. This accounted for 1.9% of the GDP. When this is compared worldwide, education is a US\$2.2 trillion industry and employs 5% of the global workforce. *Business Week* (2002) has estimated the United States education industry as the world's largest, amounting to US\$800 billion in annual revenue for both public and private institution. Education is a significant service export for Australia and the United Kingdom. Education contributed 5.5% to Australia's GDP, and 5.6% to UK's GDP in 1999. Australia has responded aggressively to create both on-shore and off-shore learning to expand its participation in the education industry.

The global export market for higher education has been estimated to be US\$30 billion in 2000 (APEC services Group). There were already 1.8 million international students pursuing their higher education abroad (UNESCO, 2000). About 45% of these students come from Asia with China, Korea, Japan, Malaysia and India identified as the top five source countries. The demand for quality higher education is expected to increase significantly, especially with a growing middle class in the region.

Singapore's plans to maintain its excellent public infrastructure for quality education has bestowed on it both competitive advantages as well as constraints. Among the first of these advantages is the fact is that Singapore is ideally located in the midst of vast population base countries like China, Korea, Japan, Malaysia, India and Indonesia. It is within flying distance with numerous air-links to all these countries. Second, it has already established itself as a country of educational excellence. It has already evolved an education system, the students of

**Table 7: World Class Universities (WCU) links in Singapore.**

<b>Year</b>	<b>World Class Institution</b>	<b>Links/Alliances</b>	<b>Purpose</b>
1998	Massachusetts	NUS and NTU	Singapore – MIT alliance to set a new standard
	Institute of Technology (MIT)	The Singapore MIT Alliance (SMA)	For global engineering and boost technopreneurship. E.g. Advanced Materials and High Performance Computation for Engineering Systems & Innovation in Manufacturing Systems Technology, Computer Science, Molecular Engineering of Biological and Chemical Systems.
	Johns Hopkins University	Johns Hopkins-NUH International Medical Center.	12 projects focusing on diseases in the region. To produce scientific advances, to produce patents, spin-off companies and international conferences.
1999	Georgia Institute of Technology	The Logistics Institute – Asia Pacific (TLI-AP)	18 month dual Masters Program by adopting leaders in logistics program to work with leading companies like HP, UPS. Research on air-sea cargo transportation, petrochemical manufacturing etc.
	The Wharton School of the University of Pennsylvania	The Wharton-SMU Research Center	Focus on business research in Singapore & the Asian region, E.g. Technological innovation, entrepreneurship, management of technology, e-commerce etc.
2000	INSEAD	S\$60 million campus at the Science Hub	MBA programs, executive programs and Asia related research.
	The University of Chicago Graduate School of Business.	A residential school of business.	International MBA Executive programs to attract executives from the Asia Pacific region taught by same faculty that teaches at Chicago and Barcelona campus.
2001	Technische Universiteit Eindhoven (TU/e), Netherlands	Design Technology Institute (DTI) at the NUS	Master of Technological Design (MTD) degree to train engineers to translate technical concepts into real products for competitive markets.
2002	Technische Universitat Munches (TUM)	Joint Masters degree in Industrial Chemistry	Specialized skills for the chemical industry incorporating business and managerial Concepts.

Source: Various newspaper reports.

which perform well above expectations at top universities worldwide. Thirdly, Singapore already serves as a business hub for all types of corporations from China and India and has clear policies that facilitate the movement of people, goods, money and information. Finally, Singapore remains an ideal place that has low crime rates, high law enforcement, and cosmopolitan and is highly progressive. The constraints for Singapore’s developing education as an industry are embedded in its historical development of education. As education was viewed as highly valued public good requiring the investment of scarce financial resources, education goals have been oriented to providing education for Singaporeans, and even when it was expanded to admit 30% overseas student participation in the tertiary sector, it was done to

meet manpower capability requirements for Singapore's industrial development. The second constraint is that the education provided by the private sector has largely remained non-accredited, where students of private-sector run university programs were not recognized as having had valid training. As a result the private sector provision of education has lacked a quality assurance system. This has resulted in uneven quality among the professors, teachers and instructors employed in privately funded institutions. The third constraint is the high cost of land and building space in Singapore. This is compounded by lack of student housing, stringent immigration rules and shortage of related services.

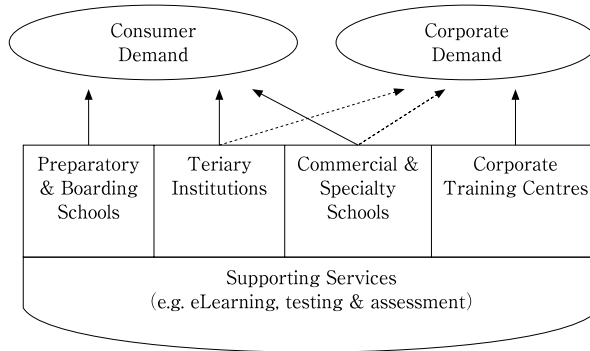
Based on careful comparative study of approaches undertaken by Australia, United States and United Kingdom, Singapore's Economic Restructuring Committee, has proposed to develop a self-sustaining education ecosystem offering a diverse mix of quality education services that can contribute to economic growth, capability development and talent attraction for Singapore. The ecosystem is envisaged to create a network of institutions that will raise education standards, and create more choices for Singapore students. The ecosystem however, will ensure that education as industry will contribute to Singapore. It is expected to increase the contribution of the education services sector beyond the current 1.9% contribute to the Singapore economy. The money from institutional and student spending from fee-paying international students is seen as a form of export earnings for Singapore. Besides providing for broader human capital investment, it is also expected to produce life-long learning opportunities as the government will not be able to cater for all forms of capability development. The education ecosystem is to become a magnet for attracting talent as a result of a larger flow of international students. Even if all the international students do not work in Singapore, they are expected to create a global network of Singapore alumni around the world.

In order to realize the proposed vision, well known institutions are to be encouraged to use Singapore as their off-shore education centers, while providing a wide range of educational service providers. Both approaches in this vision are to attract fee-paying students. Most of the present public investments will continue to be concerned with Singapore's needs, while the private sector will be encouraged look after the needs of international students. Thus, the proposed strategy is to encourage different but regulated education segments such as at the undergraduate, diploma and public school sectors, so that many private institutions will be established to promote education.

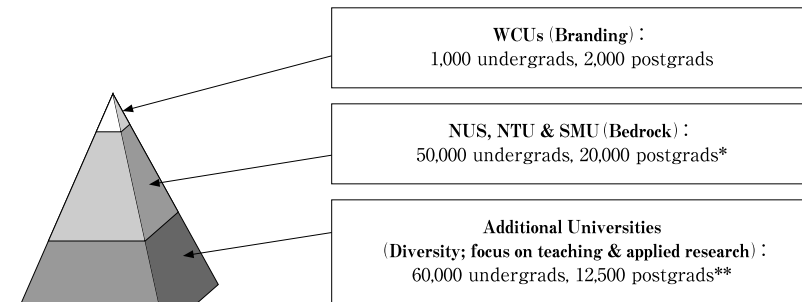
The market opportunities for making education as an industry is immense when Singapore is seen as having an estimated 1% of the global 1.8 million international tertiary students. NUS and NTU have already a regional reputation as among the top universities (Asiaweek, 2001). Both universities attract good undergraduate and postgraduate students from overseas. Thus, with a bigger pool of branded universities, Singapore can become an educational hub for attracting international tertiary students, The presence of branded universities may also attract the talent flight among graduates of Singapore's polytechnics to get a degree at overseas universities. Currently, 40-50% of polytechnics students are estimated to seek a degree outside Singapore.

A segmented approach has been predicted for the education hub concept [Figure 1].The

**Figure 1:** Segments of the Singapore Education Hub.



**Figure 2:** The tertiary sector of the Education Hub.



\* The figures represent organic growth. Currently, NUS, NTU and SMU enrol approximately 37,000 undergraduates and 15,000 postgraduates.

\*\* These would be new students. Of the total, an estimated 50,000 would be international students (40,000 undergrads, 10,000 postgrads).

four educational sectors of the education hub are as follows: the 'preparatory and boarding schools', the 'tertiary institutions', the 'commercial and specialty schools', and the 'corporate training centers'. They would work towards meeting the consumer and corporate demand for skilled manpower. These consumer demands may be both local and regional in nature. As the East Asian region integrates economically more potential students are expected to view Singapore education hub as a destination for education. The four segments would also require supporting services that will include not only education related activities but a range of areas such as housing, food, and health care among many others. Let us next elaborate the generative capacities of each of the four segments of the Singapore education hub.

Tertiary education segment will be of crucial importance as Singapore's economy becomes knowledge based. A multi-tiered system of tertiary education has been planned to attract fee-paying students [see Figure 2]. The highest level would attract the top rated universities from across the world. These universities can be in the form of establishing off-shore campuses in Singapore or running joint programs with established national universities in Singapore. They can help create specific niches for world-class R & D universities and help

transfer knowledge to industry. Thus, the presence of world-class universities (WCUs) will help develop postgraduate education in R & D areas, as well as limited undergraduate education in select areas.

The existing universities — NUS, NTU and SMU — will continue to train adequate manpower along the lines advanced by the Singapore government in directing its human capital growth. The three universities will continue to attract the talented students from the Singapore's schools system, as well as attract top students through incentives like scholarships to study at these universities.

The third tier would consist of all additional private universities. These could be local in origin or foreign universities working together with local partners. They may attract both local and international students. All the students would be fee-paying students.

The above model may require that Singapore reviews its university cohort participation rate (UCPR) among students. As of now, around 21% of each Primary 1 cohort is at the universities in Singapore. In addition, another 8,000 Singapore students who go overseas for their university education, and working adults pursuing degrees in various programs in Singapore can be attracted to study at the new universities. The Ministry of Education is already exploring the possibility of university student population that would have 60,000 undergraduates and 12,500 postgraduates. Of these 40,000 undergraduates and 10,000 postgraduates are expected to come from overseas. This would automatically create a large proportion of international students than Singapore students.

The 'commercial and specialty' schools have already blossomed into an industry. It has been the route for obtaining educational credentials by most youths who were unable to continue farther in the competitive education ladder in Singapore. In 2002, it had a total of 110,000 students, both local and international, enrolled in more than 300 private commercial, information technology, fine arts and language schools (MOE Statistics, 2002). The schools are market driven and are profit oriented. Some of them offer professional diploma and degree programs, but they suffer from challenges such as uneven instructional quality, lack of quality teachers and lack of recognition of such credential holders in the public sector.

Of the 6,000 multinational corporations (MNCs) in Singapore, slightly around 50% of them also undertake regional operations. Many of them provide training to their own employees in technical, operational and management skills. Currently, most MNCs try to have a minimal training staff, preferring instead to hire professional trainers or use online training program. There are no corporate universities or research centers in Singapore. This is an area awaiting significant development, but promises great potential for Singapore becoming an educational hub for corporate and executive education.

In the preparatory and boarding schools sector, there has been a steady expansion in the number of students coming from outside Singapore. The public schools operated by the Ministry of Education, attract a significant number of students from the Malaysian state of Johore. Most of them study in schools in the northern part of Singapore where they commute daily between their homes in Johore and Singapore. There are also private international schools that cater to the children of multinational corporate families. Schools like the Austra-

lian International School and the United World College take in children of foreign executives based in the region. There is also an increasing international demand for spaces in local schools. Those secondary schools that have become independent from the close supervision of the Ministry of Education admit a large number of fee paying students. If the preparatory and boarding schools sector developed, they are expected play the important feeder role to the tertiary sector of the education hub. The four segments of the educational hub are to promote a range of support service industries related to learning, publishing, content production, testing and assessment sessions, and licensing and franchising.

## 5 . Conclusion

In conclusion, this paper hopes to expand the notion of education as an industry to observe the case of Singapore as well as that of the Southeast Asian region. There is a possibility in some countries of the region to use education as an economic frontier. The experience of Australia and United Kingdom show that education can contribute to a country's GDP. Each country has over 100,000 full-time international studies.

The Southeast Asian regional governments have so far viewed education as a common good to their citizens. Except for meager attempts to make education to contribute to GDP growth, attempts to make education as a growth sector in their economies have largely been sporadic. The Philippines, Malaysia and Singapore had opportunities in the past to develop education as a growth sector. Having had the colonial historical access to English language usage, and a large local market for education, all three could have moved to make education a growth market following the examples of Japan, South Korea and Taiwan. Malaysia, in the last decade, had allowed the creation of twinning programs and establishment of campuses by Australian and British universities. This, however, was an attempt by overseas institutions to establish off-shore campuses and programs in Malaysia to off-set the loss of student numbers as a result of the Asian financial crisis. This has left Singapore as the only country that has a high international reputation for its educational quality and manpower training. It is also the only country that has emerged least unscathed from the financial turmoil that upset other countries of the region.

Singapore, in its economic restructuring effort, has placed the notion of creating an education hub as its immediate aim to make education become a sector of economic growth. This is exceptional to other countries in the region. Singapore hopes to make education an industry in order to make the sector contribute to its GDP. Singapore plans to increase the contributions of the education industry up to 3 to 5% of its GDP. Employment would increase to 22,000 (estimated) jobs, of which 13,000 would be teaching-related, and 9,000 would be in the administrative, managerial and specialist areas. The current existing stock of 50,000 international students would be increased to 100,000 full-time international students and 100,000 foreign executives coming to Singapore for shorter courses of an overage of one week of training. According to the projections, the tertiary segment would be the biggest



incremental contributor to the economy, followed by the commercial and specialty schools, corporate training centers and executive education, and finally the preparatory and boarding schools.

As the participation of fee paying Asian students in the international student movement is expected to rise to slightly more than 50%, Singapore's vision of using education as an industrial sector appears possible, if it removes some of the obstacles that have existed historically. Singapore would face issues related to quality, student visas, manpower, land and space and finally a change in its ideological framework. Singapore would have to extend the quality assurance that it provides for public education to the private sector education. Its current view of education as a public good that is to be given to only those who will benefit the society would have to be abandoned. It will have to treat education as a commodity that can be bought at a price by consumers. Singapore would also have to extend public sector recognition to all forms of educational training in Singapore, and allow the market to identify and rank its institutions of learning. Educational planning may need to be decentralized while providing for minimal guarantees for educational quality. While the government imposes regulatory requirements for the education industry, it has to allow its operators the freedom to develop the sector. The Ministry of Education will have to set up accreditation mechanisms so that consumers will be convinced of the quality and credibility of courses offered by various institutions. These are difficult decisions that Singapore will have to make in order to develop the education hub.

Student visas have always been restrictive by requiring a range of documents from applicants intending to study in Singapore. The documents include original marriage certificates, educational certificates of parents, parental income-tax assessment for 3 years and money in banks. Once a visa is approved, students face problems of work restriction, visas of short-duration, and a lack of transparency in the methods used by the Singapore immigration authorities in issues related to changes in visa status.

Private schools face insurmountable challenges in the availability of quality teachers as all are produced only by one public institution. The National Institute of Education, as the only institution empowered to train teachers is only committed towards training of teachers for the public schools.

As the cost of land and space is comparatively high in Singapore, the existing private schools are uneven in their basic infrastructure. Currently, a section of the city along Bras Basah Road and Selegie Road is being built as an educational area for many institutions. But more purpose built campuses and buildings may be needed to establish an industry. Student housing is another area that needs to be looked into in order avoid exploitation of international students.

All the factors may be easily overcome given Singapore's ability to tailor measures that encourage economic growth. Singapore's land and population size is similar to that of Victoria State in Australia, or the Boston area in the United States. The former supports 8 universities and 40 smaller colleges, while the latter has 65 universities and colleges. Singapore is confident of emulating these models and make education a growth sector. Beyond these

administrative capacity for transformation, however, Singapore would have to come to terms with its ideological views of being a nation-state. So far, students in Singapore have been imbued by socialization at schools to believe in the nation-state. This may have to be adjusted and renegotiated if international students will form the core of the education industry. Education may not serve well to instill the notion of a nation-state ideology. As education becomes an integral part of the industrial sector, Singapore faces a critical challenge of having citizens who may not want to view citizenship as having rights and obligations. Alternatively, the education hub may be more useful if Singapore's neighbours view the industrialization of education as contributing to their individual growth and regional integration.

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