Strategic Management of Educational Development in Singapore

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By

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1. **Introduction**

Singapore was described as a “somnolent, swampy fishing village” back in the early 1960s (Neher, 1999). With no natural resources, Singapore faced severe racial, religious, and political turmoil, intensified by its 1965 separation from Malaysia (Lee, 2000).

The only significant resource Singapore had was manpower. Yet in the early 1960s, the population was divided by race, language, religion, culture, and lifestyles. The literacy rate was 57 percent. The number of local university graduates numbered a few thousand. However, by the end of the 1990s, 40 percent of eligible youths (compared to 5 percent in 1970) were enrolled in higher education. In 1965, only 51,959 persons were employed in the manufacturing industries. By 1975, the number had climbed steeply to 218,096 (Chiang, 1998).

In a span of 40 years, the Singapore government has managed to eliminate persistent poverty, unemployment, crime and achieved a per capita income from US$530 in 1965 to US$24,560 in 2004. The annual export of S$60 billion worth of high-tech products was about one-third more than China exported in 2001 (Economist, November 10, 2001, 11).

In the area of education, Singapore has consistently performed well in international studies such as the Trends in Mathematics and Science Study (TIMMS). TIMMS conducts their study once every four years and Singapore has been ranked first in Science and Mathematics achievement since 1995.
The economic and educational successes of Singapore did not happen by accident. Strategic planning, a strong political will and a stable government are key factors in charting the success of Singapore. This paper discusses the parallel phases of the strategic industrialization and educational reforms in Singapore. In education, the focus of the discussion is on primary, secondary and technical education. The analytical framework employed in this study is from the strategic triangle alignment of core strategy, organizational design and the external environment between the government and academic institutions.

2. **Background**

2.1 **The Government**

Economic planning has played a very significant role in the development of Singapore's industrialization, education, and manpower needs. Since 1965, Singapore has undertaken four distinctive industrialization phases for its economic transformation. The following table summarises the industrialization phases.
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<thead>
<tr>
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<tbody>
<tr>
<td>Expulsion from Malaysia; British military withdrawal</td>
<td>Oil and commodity price shocks; Labour shortages</td>
<td>High labour costs; Over-investment in real estate</td>
<td>Asian Financial Crisis; Challenge from China; Economic maturity; High land costs</td>
<td></td>
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<tr>
<td>Promotion of investment; Promotion of labour-intensive manufacturing; Wage restraint</td>
<td>Emphasizing capital-intensive industry; Importing foreign workers; High-wage policy</td>
<td>Emphasizing services as second engine of growth; Regionalization</td>
<td>Emphasizing knowledge-based economy; Domestic entrepreneurship</td>
<td></td>
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</table>

2.11 First Industrialization Phase

The first industrialization phase began in early 1960s with factories producing garments, textiles, toys, wood products and hair wigs. But along with these labour-intensive industries, there were also some capital and technology-intensive projects such as Shell Eastern Petroleum and the National Iron and Steel Mills.

2.1.2 Second Industrialization Phase

The second industrialization phase began in the early 1980s where Singapore moved into knowledge-intensive activities such as Research and Development (R&D), engineering design, and computer software services. In this phase, the
introduction of a flexi-wage system where pay hikes would be relative to a company's profitability was first introduced.

With the goal of selling Singapore as a Total Business Centre, the Economic Development Board (EDB)\(^1\) set out to attract international service corporations in the financial, educational, lifestyle, medical, IT and software sectors. The economy was to be supported by twin engines of growth: manufacturing and services. The promotion of local enterprises also became increasingly important.

2.1.3 **Third Industrialization Phase**

The third industrialization phase began in the 1990s where Singapore builds on the knowledge-based economy to meet the challenges of the new millennium. Knowledge, creativity and innovation were the key determinants of long-term competitiveness. The development of a highly educated and flexible workforce is therefore very important. A wide pool of skilled knowledge workers were developed via strong industries dealing with innovation and technology.

EDB continued to play a prominent role in charting strategies to realize Singapore's vision for the 21st century which is, to be a relevant and competitive centre for goods, services and information. The strategies included:

- Strengthen industry clusters

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\(^1\) The Economic Development Board (EDB) is a statutory board of the Government of Singapore that plans and executes strategies to sustain Singapore as a leading global hub for business and investment. It was set up in 1961 with a budget of $100 million.
• Identify and grow new clusters
• Nurture innovation-driven enterprises
• Develop new geographies
• Make Singapore’s environment conducive and competitive for global business

2.1.4 Fourth Industrialization Phase

The fourth industrialization phase began after 1997 (and is ongoing), where Singapore aims to be a developed nation. The manufacturing sector and service industry continue to be the twin pillars of growth. This new phase promotes entrepreneurship among domestic companies - encouraging people to be innovative and improve the ability of firms to develop new ideas and businesses, tapping new export markets and broadening the economic base.

2.2 Academic Institutions

The government has always been clear about the objective of education. The Ministry of Education’s (MOE) mission is to mould the future of the nation. Thus, MOE works closely with various other government ministries and agencies such as the Ministry of Trade and Industry (MTI), Ministry of Manpower (MOM), and EDB in order to formulate and implement education policies. The Ministry of Education (MOE) oversees Singapore’s educational system.
The following section describes the three tiers of the Singapore educational system.

Free\textsuperscript{2}, compulsory primary education for up to 7 years leading to a common national examination, the Primary School Leaving Examination (PSLE)\textsuperscript{3};

Free, non-compulsory secondary education for up to 5 years, in an academic stream that leads to the Singapore-Cambridge General Certificate of Education at the "Ordinary" level or a technical stream that leads to the Certificate at the "Normal" level; and

Highly subsidized tertiary education at a university (following two years of pre-university education), polytechnic, or technical institute.

The medium of instruction is English for most subjects. Students take the national examination administered by the Cambridge University Local Examinations Syndicate at the end of the secondary education. With this international qualification, they can apply to tertiary institutions worldwide.

The government has invested heavily to enhance the quality of the school system through recruitment of more teachers and improvement of the physical and Information, Communication Technology (ICT) infrastructures. It has further set a target of developing Singapore's universities into world-class institutions in

\textsuperscript{2} Primary and secondary education is free, though there is a fee of up to SGD 13 monthly per student that goes to the school to help cover miscellaneous costs.

\textsuperscript{3} The Primary School Leaving Examination (PSLE) is administered by the Ministry of Education. This nationwide examination tests the English language, mother tongue languages (Chinese, Malay, or Tamil), mathematics, science and social studies.
part through collaborations with selected international institutions including MIT, Georgia Institute of Technology, Technical University of Eindhoven and Technical University of Munich.

The two comprehensive universities - National University of Singapore (NUS) and Nanyang Technological University (NTU) - play a major role in the public-sector research and development effort in conjunction with the Agency for Science, Technology and Research (A*STAR) research institutes. The NUS aims to be a leading public research institution. In January 2000, a third institution - the Singapore Management University - was established. The new university explicitly adopted a North American educational model.

In technical education at the tertiary level, five polytechnics offer diploma programmes in a range of disciplines from engineering to business and media. Republic Polytechnic admitted its first batch of students in 2003. The Institute of Technical Education (ITE) provides tertiary-level vocational education. It comprises 10 regional centres that provide both full-time education and part-time training in support of continuing education and training initiatives of other ministries.

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4 A*STAR’s focus is to conduct cutting-edge research in specific niche areas in Science, Engineering and Biomedical Science. It comprises the Biomedical Research Council (BMRC), the Science and Engineering Research Council (SERC), Exploit Technologies Pte Ltd (ETPL), the A*STAR Graduate Academy (A*GA) and the Corporate Planning and Administration Division (CPAD).
Tertiary-level enrolments have been carefully regulated to ensure a balanced mix of graduates, in line with the manpower estimates based on projected GDP and productivity growth.

In particular, the Singapore government has always exhibited a bias towards science and engineering education because of the economic policies and industrialization needs. In each industrialization phase, manufacturing has always been one of the twin pillars for economic growth. An inter-ministerial committee\(^5\) comprising of the Ministry of Education, the Ministry of Manpower, the Ministry of Trade & Industry and the Economic Development Board, chaired by Minister of State, (Education and Manpower) Ng Eng Hen reiterated the need for this slant in order to avoid shortages of technical manpower experienced by other developed countries (Ministry of Education, 2003).


3.1 **Challenges faced by the Government**

In August 1965, the separation of Singapore from the federation of Malaysia posed three main challenges. Prior to the separation, Singapore had decided on an export orientation to build its economy. The immediate challenge caused by the separation resulted in the abortion of the import-substitution strategy because regional markets such as Malaysia were raising barriers against imports. The second challenge was the confrontation with Indonesia that threatened

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\(^5\) Inter-ministerial committees are set up to coordinate efforts to deal with national interests and concerns.
Singapore’s role as a major trading port for the region. In addition, the planned withdrawal of British bases within five years added worries to the high unemployment rate that was estimated at about 10%. British bases in Singapore then were employing around 40,000 workers.

3.2 Economic Strategy

The Economic Development Board (EDB) was set up in 1961 to develop a strong manufacturing sector that would solve the unemployment problem in Singapore. It was given a broad mandate to attract foreign investment in manufacturing and thereby create jobs.

From 1965 to 1978, Singapore’s drive towards industrialization was focused on attracting foreign multinational companies (MNCs) to manufacture in Singapore and export to global markets. EDB began to aggressively promote Singapore as a low labour-cost base for MNCs.

In order to attract MNCs to set up their operations, Singapore had to improve the labour and investment climate quickly. The Employment Act was enacted to lay down standards of employment to help resolve industrial disputes. In addition, the National Trades Union Congress\(^6\) (NTUC) and National Wages Council\(^7\) (NWC) were also formed in 1972 to help promote better labour-management relations.

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\(^6\) The NTUC is the sole national trade union center in Singapore. As of April 2005, it has 63 Trade Unions and 6 Affiliates.

\(^7\) The NWC as a government advisory body recommends annual wage increases for the entire economy; ensuring orderly wage development so as to promote economic and social progress; and assist in the development of incentive schemes to improve national productivity.
relations. The NTUC and the government started off as a symbiotic relationship but quickly developed into a tripartite alliance together with NWC after the labour movement chose, in 1969, to adopt a cooperative, rather than a confrontational policy towards employers. Indeed, tripartism between workers, the government and employers is the driving force behind Singapore's economic and social development.

Union leaders and employers serve on key institutions such as the National Wages Council, the Economic Development Board, the Central Provident Fund\(^8\) (CPF) and the Singapore Productivity and Standards Board\(^9\) (PSB).

Government and employer representatives also give the benefit of their experience to the labour movement, by serving on the boards of cooperatives, business ventures and other organisations affiliated to NTUC.

At the same time, Singapore invested heavily in key infrastructures, including the establishment of the Jurong Town Corporation (JTC). JTC provided manufacturers with their choice of industrial land sites on which they built their factories or provided ready-built factories for the immediate start-up of manufacturing operations.

\(^8\) CPF is a compulsory comprehensive social security savings plan. Working Singaporeans and their employers make monthly contributions to the CPF.

\(^9\) PSB focuses on three areas: domestic sector and SMEs, productivity and innovation promotion, and standards and conformance. As the national standards body, PSB helps to improve market access for Singapore’s exports through its work on standardisation. Standardisation is also used as a major strategy to raise the productivity of industries, especially in the domestic sector.
Right from the early days, various ministries and statutory boards have directly or indirectly acted in concert to address national concerns and interests. The foresight planning of the government led by then Prime Minister, Lee Kuan Yew, was truly remarkable. For instance, the primary mission of the EDB was to promote investment. Yet it has also played a role in human resource training and development. EDB was also responsible to promote the expansion in training and service facilities for the engineering industry in Singapore.

Since 1965, Singapore recognized that a major structural weakness was the relatively low educational attainment of the population. The literacy rate in 1965 was 57 percent and only 63% of primary school students passed the PSLE. The emphasis on education and development of human resource becomes a natural priority in order to promote economic development. Immediate upgrading of the workforce and setting up of a strong educational system began to gather momentum.

3.3 First Educational Reform

The young nation of Singapore took stock of its reality. With people as its only and most valuable resource meant that the government needed to look at the quality and relevance of the output from the school system.
Education prior to 1965 was decentralized and based on vernacular and ethnic lines comprising Chinese, Malay and Tamil schools. It provided a chaotic and challenging situation for the newly-elected People’s Action Party Government in 1959. Socially, the main races that comprised the multi-racial society of Singapore (with ethnic Chinese comprising 76% of the population, Malays 15% and Indians 7%) had been exhibiting different loyalties and cultural pulls outside of the country. The Chinese schools, for example, had been established and maintained by the local Chinese community. Such schools were highly politicized and showed a strong China-orientation.

Creating an integrated educational system was needed but it posed difficult challenges because of the reasons stated above. This decision to integrate the educational system was important as the survival of the country was at stake. In addition, the direction set by the Economic policy to attract MNCs to set up manufacturing base in Singapore meant the importance of a workforce that could meet the needs of this challenge. It required a workforce that was able to understand and communicate in English. These MNCs and industries also required a substantial amount of skills at all levels from the machinist working on machine tools to professional engineers with a wide range of background. The following strategies were formulated to create an integrated educational system:
3.3.1 **Strategy 1: Centralization of the Primary and Secondary Educational System**

The first step of integration was to move the educational system from a decentralized into a centralized system. A Five-Year Plan in education was introduced. The main features of this Plan were:

i) Equal treatment for the four streams of education: Malay, Chinese, Tamil and English.


iii) Provision of a common syllabus for all school subjects in the four language media.

iv) Compulsory bilingualism in all schools.

v) A common national examination system for the primary schools.

vi) Universal free primary education.

To achieve the Plan, expenditure on social development constituted 40 per cent of the total development expenditure in spite of the priority given to industrial expansion. Education constituted 27 per cent or S$94 million of the social development expenditure. The social development expenditure was as follows:
Table 2: Social Development Expenditure (1961 – 1965)

<table>
<thead>
<tr>
<th></th>
<th>Singapore $ million (Equivalent US $)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Health</td>
<td>35.80</td>
<td>10.23</td>
</tr>
<tr>
<td>2. Education</td>
<td>94.48</td>
<td>27.00</td>
</tr>
<tr>
<td>3. Social Welfare</td>
<td>1.77</td>
<td>0.51</td>
</tr>
<tr>
<td>4. Housing</td>
<td>153.60</td>
<td>43.90</td>
</tr>
<tr>
<td>5. Sewerage</td>
<td>47.36</td>
<td>13.54</td>
</tr>
<tr>
<td>6. Community Services</td>
<td>6.07</td>
<td>1.73</td>
</tr>
<tr>
<td>7. Culture</td>
<td>10.80</td>
<td>3.09</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>349.99 (205)</strong></td>
<td><strong>100.00</strong></td>
</tr>
</tbody>
</table>

In 1960, the PSLE was conducted in all the four official languages. By 1966, school leaving examination was conducted for all language streams by the Ministry of Education at both the School Certificate and Higher School Certificate levels (Doraisamy, 1969). This means that the management structure for the supervision of schools and the evaluation of the quality of school output was available by 1966.

Standardizing the examination system naturally provided the means to introduce a uniform curriculum (Wee and Chong, 1990). From 1966, the study of a second language was made compulsory in all secondary schools. By 1968 Science and Arithmetic were being taught in English in most non-English medium primary classes.
In 1969, it was decided that Second Language papers would be set and marked at a level two years below that of the student’s First Language. From that year, the Second Language was offered as a compulsory subject in examinations at School Certificate level. Woodwork, Metalwork and Basic Electricity were taught in English, Malay and Tamil-medium Secondary One classes.

By 1974, equal weighting was given to the First and Second languages in the PSLE. In 1974, a new subject “Education for Living”, which integrated Civics, History and Geography was taught entirely in the mother tongue (Ministry of Education, 1972a; Gopinathan, 1974).

3.3.2 **Strategy 2: Growth of Technical Education**

The tumultuous years (1962 - 1966) saw an aggressive plan to develop skilled manpower for the needs of the first industrial phase. In the first industrial phase, the urgent need to develop a strong manufacturing sector to solve the unemployment problem and to attract MNCs was instrumental in the aggressive plan to develop skilled manpower. Twelve vocational schools and seven technical schools were built and equipped (Chiang, 1998). This emphasis on technical education was very different from the rattan-weaving, cloth-making, batik-printing crafts seen in South East Asian countries. The technical schools introduced courses such as Mechanical Engineering Practice, Electrical Fitting, Electrical Installation, and Radio Servicing among others. These courses were meant to feed the skilled manpower needs of industrialization.
3.3.2.1 Technical Education Department

The phenomenal growth of technical and vocational education in Singapore required much coordination and management. The Technical Education Department (TED) was created within the Ministry of Education. All the technical and vocational schools, and industrial training centres came under the coordination and management of the TED.

It was through the TED that basic workshop subjects like Metalwork, Technical Drawing and Basic Electricity were made compulsory for all male students and 50 percent of girls in their first two years in secondary schools. The other 50 percent of girls took up other courses such as Home Economics (Chiang, 1998). It was not possible to provide every secondary school with workshop facilities. Centralized workshops, strategically located near most of the secondary schools, were set up to give students hands-on training in the handling of basic tools and materials. As a result every morning and afternoon, thousands of students traveled a few kilometres to the nearest centralized workshop.

In 1969, the TED made several changes to technical education based on recommendations from MOE, MTI, and MOM. These policy changes once again reflected the inter-ministerial collaborative working relationship. It discontinued the vocational stream in secondary school education. This vocational stream introduced in 1964, was a stop-gap measure to keep the Primary Six failures and primary school dropouts off the streets in the early turbulent and politically
volatile days. With the economy growing, the need in the industrial sector changed from unskilled or semi-skilled labour to technically trained workers. To meet the new challenge, the TED converted four vocational schools into Industrial Training Centres (ITCs). Six other vocational schools were amalgamated with secondary schools adjacent to them.

3.3.3 **Strategy 3: EDB Training Centres**

Singapore’s success in establishing a thriving manufacturing sector surfaced an increased demand for more skilled manpower. There was a need to meet this demand immediately as the time taken for students to complete their secondary education and then proceed to technical education was too long. The EDB’s response was to set up training centres. This was achieved with technical and financial assistance from the United Nations Development Programme\(^\text{10}\). By 1968, six EDB Training Centres were set up (Chiang, 1998).

These centres were very different from the workshops that provided basic hands-on knowledge to secondary school students. They provided direct training for workers through the production of actual components or parts needed by manufacturing companies in Singapore. The training was therefore relevant and up to date. This was important as the graduates could go directly into new factories and be productive in a very short time with minimal on-the-job training.

\(^\text{10}\) UNDP is the UN’s global development network, an organization advocating for change and connecting countries to knowledge, experience and resources to help people build a better life.
3.3.4 **Strategy 4: EDB and Company-based Training Centres**

The success of the first industrialization phase resulted in a continuing need for specialist training which could not be provided through the technical schools or the training centres. Thus, the EDB began working with large industrial companies to set up facilities to train personnel for the industries’ needs. As an example, the Tata Group of India which was the largest engineering company in India set up a precision engineering plant in Singapore. EDB helped Tata to set up a training facility – to train sufficient numbers of workers for the Tata plant. In the process, the number of extra workers trained doubled the number required by Tata and these extra workers could meet similar manpower needs of other factories (Chiang, 1998).

The Tata experience was a prototype for other cooperative projects between the EDB and other MNCs. These MNCs were provided facilities to set up their own training process for the type of workers required. These company-based training centres gave Singapore a jump-start in the training of skilled workers for the precision engineering, optics and electrical appliances industries that would otherwise not be able to be trained through the technical schools.

The EDB training centres did not duplicate the training provided by technical schools. It complemented their efforts and sought to provide technical education faster and aligned to the needs of the industries in the first industrialization phase. Therefore through cooperation with MNCs, centralized workshops, and
technical and financial assistance from the United Nations Development Programme, EDB adopted multiple approaches to train and produce the technical workers needed for the industrialization phase.

3.4 Educational Achievements

The first educational reform resulted in a systematic increase in student enrolment, particularly in the secondary schools. Part of the contributory factor to the increase in student enrolment was the provision of universal free primary education.

<table>
<thead>
<tr>
<th>Year</th>
<th>Primary Schools</th>
<th>Secondary Schools</th>
<th>Total Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1965</td>
<td>357 075</td>
<td>114 736</td>
<td>1,886,900</td>
</tr>
<tr>
<td>1966</td>
<td>364 846</td>
<td>132 088</td>
<td>1,934,400</td>
</tr>
<tr>
<td>1967</td>
<td>368 654</td>
<td>144 448</td>
<td>1,977,600</td>
</tr>
<tr>
<td>1968</td>
<td>371 970</td>
<td>150 641</td>
<td>2,012,000</td>
</tr>
<tr>
<td>1969</td>
<td>366 881</td>
<td>147 981</td>
<td>2,042,500</td>
</tr>
<tr>
<td>1970</td>
<td>363 518</td>
<td>145 740</td>
<td>2,074,500</td>
</tr>
<tr>
<td>1971</td>
<td>357 936</td>
<td>153 522</td>
<td>2,112,900</td>
</tr>
<tr>
<td>1972</td>
<td>354 746</td>
<td>161 371</td>
<td>2,152,400</td>
</tr>
<tr>
<td>1973</td>
<td>345 284</td>
<td>173 109</td>
<td>2,193,000</td>
</tr>
<tr>
<td>1974</td>
<td>337 816</td>
<td>174 177</td>
<td>2,229,800</td>
</tr>
</tbody>
</table>
The process of standardizing school output was spearheaded by a common examination system and a uniform curriculum. The common national examination therefore becomes an important measure of the changing quality of the output from the school system. The quality of the output of the school system saw a steady improvement in this first phase of reform.

The PSLE results improved gradually from 61% of the candidates passing the examination in 1965 to 83% in 1980. In the GCE ‘O’ (Ordinary) level examination, the percentage of students obtaining at least three ‘O’ level passes (or credits) increased from 53% in 1965 to 69% in 1980. Using a more stringent criterion, the percentage of students with at least 5 ‘O’ level passes increased from 9% in 1965 to 40% in 1980.

<table>
<thead>
<tr>
<th>Year</th>
<th>% PSLE Candidates Passed</th>
<th>% GCE ‘O’ Level Candidates Obtaining 3 ‘O’ Level Passes</th>
<th>% GCE ‘O’ Level Candidates Obtaining 5 ‘O’ Level Passes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1965</td>
<td>61</td>
<td>53*</td>
<td>9+</td>
</tr>
<tr>
<td>1971</td>
<td>53</td>
<td>53</td>
<td>28</td>
</tr>
<tr>
<td>1980</td>
<td>83</td>
<td>69</td>
<td>40</td>
</tr>
</tbody>
</table>

* School Certificate (Div 1, 2 & 3) Malaysia Certificate of Education (MCE)
+ School Certificate (Division 1 only)
Source: Ministry of Education, Singapore
3.6 Economic Achievements

In this first reform, the economy grew by an average of 10%. The steady increase in the manufacturing sector’s share of GDP was evident. Manufacturing sector grew from 14% in 1965 to 24% by 1978. As the economy grew, unemployment fell to a low of 3.6% in 1978.


4.1 Challenges faced by the Government

The 1980s saw Singapore embark on what the government called the "Second Industrial Revolution", a move into knowledge-intensive activities such as R&D, engineering design, and computer software services. In his 1981 Budget speech, the then Minister of Trade and Industry, Mr Goh Chok Tong said, "The prime objective of the plan is to develop Singapore into a modern industrial economy based on science, technology, skills and knowledge."

In the region, many countries were also moving into industrialization. These countries have comparative advantage in terms of land and low cost labour and had become strong contenders for MNC investments. Success in the economies in these countries resulted in a tight labour market. The government’s view was that there were economic and political costs in trying to sustain high economic growth through labour force expansion. There was a need to restructure the
economy towards higher value added activities and move away from a labour-intensive to capital-intensive production. As Singapore’s leaders put it, “…need to move out of the overcrowded, over-competitive third league and up into the second league.”

### 4.2 Economic Strategy

To resolve the contradiction between labour-intensive and capital-intensive production and address the rapid intake of foreign labour, Singapore embarked on a wage correction policy. The purpose of this strategy is to induce efficient use of labour and to accelerate Singapore’s transition to a more sophisticated technological base economy.

The government intervened to raise wage costs in order to discourage low-skill, labour-intensive investments. Tariff revisions and restrictions on imported labour were put in place. Simultaneously, a range of initiatives were introduced such as generous tax and fiscal incentives, expansions and improvements in social and physical infrastructures.

As the government set the directions for economic restructuring – moving into higher-value technological base economy, the then Finance Minister, Mr Goh Chok Tong stated, “Higher wage increase is, however, only one policy instrument for economic restructuring… training must be stepped up to enable our workers to acquire new skills and refine old ones” (MTI, 1981).
This training and development of manpower emphasis resulted in the government’s efforts to expand education at all levels, particularly at the technical and tertiary levels. Government development expenditure on education rose from S$32.75 million in 1978-79 to S$374.68 million in 1982-83, an increase of 1044 percent. Manpower development was closely tailored to the needs of private companies engaged in, or moving towards, higher value-added production.

Efforts to produce a generation of skilled labour force prompted the government to produce more engineers. Total enrolment of students in universities and colleges rose by 49.4 per cent and 7.5 percent in technical and vocational institutes from 1979 to 1983.

### 4.3 Second Educational Reform

Increasing stability experienced in the school management environment throughout the first phase led to the next phase of educational reform. There was greater openness involving discussions among the larger public on various aspects of education. While the first phase of educational reform established authority to the school system, there were weaknesses in the system. In particular, the ineffective bilingual policy, low literacy levels and high wastage in the system raised concerns. The urgent need to reduce such wastages and to improve the quality of education was of great importance.
A review of the educational system led to the recommendation of the New Education System (NES) in the Goh Report (1979). “Now that the hard political decisions on the new structure of education had been taken, most of the remaining problems should yield in ripeness of time to the application of professional expertise directed under an efficient and responsive management system”. The following areas were highlighted for reform in the report:

i) The structure;

ii) The curriculum;

iii) The organization and procedures within the Ministry of Education; and

iv) The management of schools

4.3.1 **Strategy 1: Standardizing School Work Procedures and Processes**

The weaknesses identified from the first educational reform were linked to a lack of emphasis on the quality input of the educational process. In the first reform the focus was on the supply side of the educational equation. Issues critical and central to the quality aspect of education such as pedagogy, content knowledge, assessment, and learning were not given sufficient emphasis in the first reform. These quality issues were linked to a lack of professional management of the schools (Wee and Chong, 1990).

In order to implement the NES, it was felt that there is urgent need to upgrade and consolidate the management mechanism of schools. Borrowing the concept from business organizations, it was felt that systematic performance of work was
obtainable when work procedures and processes were standardized. It began with steps taken by the Ministry of Education at the end of the last phase to revise and liberalize administrative work procedures for school principals.

In January 1979, the Ministry of Education Headquarter was reorganized. The Systems Branch in the Planning and Review Division was created. This Division was in charge of planning of policies and development of programmes, improving the information system, and identifying and developing feedback mechanisms to monitor critical areas in the education system. It also had the function of assisting the Schools Division in implementing programmes for improvements needed in the education system. This reorganization also resulted in the setting up of the Curriculum Development Institute of Singapore (CDIS). The previous emphasis on work procedures shifted to work processes in schools (Wee and Chong, 1990).

The procedures for assessing the work of Education officers for purposes of putting up the annual Staff Confidential Reports, confirmation in appointment and crossing of efficiency bars were put in place. Principals and vice-principals were responsible for assessing and reporting on all teachers in their schools.

In 1979, the Pupil Data Bank was introduced as part of the computer-based management information system for prompt and accurate decision-making, planning and control. Besides the production of the necessary statistics, the Bank
could also cater for the retrieval of data of individual pupils by approved users for research or other purposes. These statistics were extracted from the Pupil Record Card and updated annually. Schools now have ready access to pupil data for planning and monitoring purposes.

In July 1979, guidelines and format for the School Rolling Plan were distributed to principals at a meeting. From 1980, schools have been writing formal school plans for school improvement and incorporated them into the School Rolling Plan, thus ensuring that the processes of planning, review and monitoring are put in place. These plans are also used for annual internal appraisal by themselves and external appraisals by the Ministry of Education’s Schools Division once in a few years.

By the early 1980s, the process of consolidation and development of the management mechanism for standardizing school work procedures and processes had been put in place. In 1981, the Ministry of Education published the 252-page Principals’ Handbook. It contained a comprehensive reference to policies, administrative procedures and guidelines to help principals in the day-to-day running of their schools (Wee and Chong, 1990).

Through standardization of the work procedures and processes, schools now could systematically work towards school improvement. Some examples of the standardization include common national examinations, annual staff appraisals
by vice-principals and principals, annual internal school self-appraisals, and external school appraisals by the Schools Division of the Ministry of Education. In addition, financial regulations, procedures and processes were also emphasized thus enabling better management control through financial audit.

By the end of this phase of the development of the school management system, the management mechanisms for standardizing school output, work procedures and processes had been put in place to herald in an increasing measure of decentralization of school management by the Ministry of Education.

4.3.2 Strategy 2: Setting up of the Curriculum Development Institute of Singapore

An important development in 1980 was the setting up of the Curriculum Development Institute of Singapore (CDIS). CDIS took over from the Education Development Division the major function of the development of all curriculum and teaching materials.

CDIS’s goal was to improve the teaching-learning process through the provision of quality curriculum packages which comprised printed materials (course books, workbooks and teachers’ editions) and audio-visual materials (picture cards, audio-cassettes, charts and slides, 3-dimensional teaching aids, games and multi-media kits and even puppets, masks and wigs). Among the priority projects
undertaken by CDIS were improving Mathematics and Science in both the primary and secondary schools.

4.3.3 Measures of School Management

One successful outcome of standardization of work procedures and processes in schools was the confidence competence demonstrated by school principals in school management. The drive towards excellence in the management of work processes in schools was best demonstrated through the schools appraisal since 1980.

The basic principle of management adopted by the Ministry of Education since 1980 was to give school principals as much autonomy as possible in the running of their schools. At the same time, the Ministry holds the principals accountable for the quality of education they provide for the students. School appraisal was both an accountability exercise as well as a process to help schools to evaluate their effectiveness and to identify areas for improvement. School appraisal consisted of two components, namely, a self-appraisal conducted annually by the schools themselves and an external appraisal conducted every four to five years by an external team of inspectors from the Ministry of Education.

Self-appraisal was an annual exercise carried out by all schools in four main areas:

1) Management and organization of the school;
2) Instructional programmes;
3) Extra-curricular activities (ECA) programmes;
4) Pupil welfare programmes.

Schools collected information on all four aspects, and used this information to evaluate how well they have achieved set targets and objectives. They identified strengths and weaknesses in their programmes and decided on strategies and resources to achieve desired outcomes. This cycle of planning, implementing, monitoring and review helped a school to assess itself critically and thus gradually increased its effectiveness. Where necessary, the school requested for professional assistance from the MOE such as the CDIS.

The external appraisal of a school took place every four to five years. It was conducted by a team of officials from the Ministry of Education comprising Inspectors of Schools, Specialist Inspectors, and Guidance Officers. Every aspect of the school was thoroughly examined and the effectiveness of the whole programme evaluated. The following table provides a summary of the number of schools appraised between 1980 – 1990.

In the ten years since school appraisal was introduced, school appraisal reports indicated that schools improved noticeably in their organization and management, in the delivery of instructional, ECA and student welfare programmes and in administrative efficiency. This had come about because
schools have consciously focused on specific desired outcomes that they have set for themselves in their action plans.

Table 5: Number of External Appraisals Conducted 1980-1990

<table>
<thead>
<tr>
<th>Number of Times Appraised</th>
<th>Number of Primary Schools</th>
<th>Number of Secondary Schools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appraised once</td>
<td>296</td>
<td>136</td>
</tr>
<tr>
<td>Appraised twice</td>
<td>108</td>
<td>60</td>
</tr>
<tr>
<td>Appraised three times</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Total Appraisals</td>
<td>405</td>
<td>196</td>
</tr>
</tbody>
</table>

The impact of standardizing school work procedures and processes were also reflected in the National Examination Results.

Table 6: National Examination Results (1980 – 1989)

<table>
<thead>
<tr>
<th>Year</th>
<th>%PSLE Candidates Passed</th>
<th>% GCE ‘O’ Level Candidates</th>
<th>% GCE ‘A’ Level Candidates</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Obtaining 3 ‘O’ Level Passes</td>
<td>Obtaining 5 ‘O’ Level Passes</td>
</tr>
<tr>
<td>1980</td>
<td>83</td>
<td>69</td>
<td>40</td>
</tr>
<tr>
<td>1989</td>
<td>88</td>
<td>88</td>
<td>69</td>
</tr>
</tbody>
</table>
4.3.4 **Strategy 3: Certification through Part-time Training in Technical Education**

The increasing importance of technical education could be seen from the fact that the percentage of workers employed in the industrial sector had doubled to 28.3% between 1963 and 1973. The TED built a firm foundation for technical education by being under the Ministry of Education but it was not ideally placed to bring industry and labour together.

The formation of the Industrial Training Board (ITB) in 1973 as a statutory board was to centralize, coordinate and intensify industrial training (Chiang, 1998). The TED was still involved actively in technical education under the Ministry of Education. However, there was a need to respond rapidly to new, emerging needs of industries for technical manpower. As a statutory board, ITB had much greater autonomy and flexibility in its operations than government departments.

The ITB made a major change in 1973 by implementing the National Trade Certificate (NTC). Also introduced was the Public Trade Test System. This system enabled workers who did not go through formal courses, but picked up skills through on-the-job training and other means, to be certified through a standardized system of public examinations and be awarded National Trade Certificates. These certificates were awarded at three levels: semi-skilled, skilled, and master craftsman levels. With common standards set and understood nation-wide by employers, workers and students, the National Trade Certificates
quickly became recognized by employers. Thus the formation of ITB as a statutory board allowed it to implement the National Trade Certificate which otherwise could have been slowed down by bureaucracy.

The Vocational and Industrial Training Board (VITB) came into existence in 1979 through the amalgamation of the ITB and Adult Education Board (AEB). The Board had tripartite representation consisting of government, employers and industry, and businessmen or executives thus ensuring that the training was relevant and responsive to the demands of industries and employers. The AEB had been established to provide “second chance” academic education to adults who for various reasons did not have a secondary education up to the GCE ‘O’ or ‘A’ level. The VITB was set up to provide greater involvement of the industries and the government in order to meet the growing need of technical and skilled manpower needs of the nation. Thus it was only logical for the amalgation since adult workers seeking to upgrade themselves can now do it through VITB (Chiang, 1998).

Under the VITB, technical education was promoted across a broader front. The use of media helped put the limelight on technical education in the public. Through popular new training programmes aimed at mature workers with little education or technical training, the VITB was able to certify some 112,000 workers which constituted up to 9 percent of the existing Singapore workforce.
4.3.5 **Strategy 4: Foreign Company Participation in Institutes of Technology**

In 1979, the EDB moved into a new phase in its training efforts when the Japan-Singapore Training Centre (JSTC) was established. This was the beginning of government-to-government technical institutes. These “institutes of technology” were different from the local polytechnics as they were established with the financial and technical assistance of foreign governments under renewable five-year agreements. The intent was to provide efficient and effective training quickly.

These institutes were offering two-year full-time diploma courses as compared to the three year diploma courses offered by the polytechnics. This was more intensive and it also provided a unique transfer of learning. The EDB’s partnership with the Germany to set up the German-Singapore Institute was an example where locals could tap on the expertise and teaching systems and then adapt the learning to the local context. This gave rise to a new training concept that was uniquely Singaporean, the “Teaching Factory Concept.” This practice and application-oriented training approach became the hallmark of the EDB technical institutes (Chiang, 1998). Trainees learned in a realistic and relevant learning environment. Thus, manufacturing took place while learning was going on.
Once again, the EDB played the role to supplement and complement the local technical institutes and training centres in order to produce the skilled manpower needs for the industries.

4.3 Economic Achievements

In the second reform, the economy grew at an average of 7.3 per cent. The measure of nominal value-added per manufacturing worker grew from S$18,400 in 1979 to S$27,000 in 1985.

In this second industrialization phase, the government had assumed a crucial role in raising workers’ skills to accelerate industrial restructuring. As a result of implementing part-time certification and foreign company participation in institutes of technology, the goal of producing skilled manpower for the industries was realized. Skilled manpower employed as a share of total employment doubled from 11% in 1979 to 22% in 1985.


5.1 Challenges faced by the State

When Singapore first began industrializing in the 1960s, developing countries were competitors. By the Seventies, the Asian Newly Industrialising Countries (NIC) became Singapore’s prime competitors. In addition, competition from developed countries especially in attracting MNCs became more intense. MNCs
seeking investment locations were comparing Singapore with Britain, Spain, and even some states in the US.

In 1985, the Singapore economy was hard-hit by global recession. The high average economic growth of the Seventies could no longer be expected. The impact of globalization and the volatile world economy were external factors over which it had no control.

As Singapore strived to meet these challenges, the need to find new niches and to sustain competitive advantage became increasingly important. In addition, the goal of achieving a developed country status required focusing on other aspects aside from per capita GNP and standard of living. The ‘intangibles’ such as an international mind-set, a strong work ethic, business creativity and national teamwork become even more important determinants of the quality of the work force and the development of the country (Lee and Gwee 1991). The quality of education took on a new significance in the 1990s as never before.

5.2 Economic Strategies

The Government took the lead in catalysing the development of technology. This was to deepen the technology base. In the process, $2 billion was invested from 1991 to 1995 under the National Technology Plan and another $4 billion under the National Science and Technology Plan from 1996 to 2000.
Industrial strategy was refined to leverage on synergies at the firm and industry levels. Mutually supporting industries were identified and developed to entrench entire cluster niche areas, e.g. electronics, petrochemical and engineering. By competing on the basis of clusters, Singapore could formulate cluster development plans with emphasis on core capabilities that were common to industries within the cluster.

Services were promoted as one of the twin pillars of the economy in order to diversify the sectoral and market dependency, reduce vulnerability, and promote a broader base for the economy. For this purpose, many incentives were offered for manufacturing investments, e.g. pioneer status, and investment allowances were also extended to investments in service sectors.

In the area of education, providing quality education through quality staff in order to educate the population to its fullest potential became very important. It was the only way to mobilize the talent available to the nation.

5.3  **Third Educational Reform**

According to the 1986 Report of the Economic Committee, Singapore was expected to be a developed country by the 1990s, with education as one of the fundamentals of economic growth. It further suggested that “the only way to mobilize the talent available to the nation and apply it to productive use” is for our
population to be educated and trained to its fullest potential (Economic Committee, 1986).

By coupling school management with the growing economy, the environment of school management was expected to be very dynamic. The School Principal would be expected to be an important contributor to economic growth. School leaders and staff were tasked to educate students holistically and to develop a creative, thinking and innovative Singapore society, complete with flexible skills (Wee and Chong, 1990).

The following recommendations were put forward by the Economic Committee Report:

i) Upgrading the median educational level of the Singapore workforce (60 per cent of which, in 1979, had only primary or no education, and only 3 per cent of which had tertiary level education);

ii) Providing continuous training and retraining for the workforce;

iii) Expanding and improving education at the post-secondary and tertiary levels; and

iv) Providing broad-based education aimed at the development of the “whole person”.
5.3.1 **Strategy 1: School Leadership Training and Development**

The Minister of Education in 1985 suggested that “the key factor which will determine the success of our educational system is the quality of our principals and teachers” (Tan, 1985). An in-service programme in educational administration for incumbent principals, vice-principals and professional officers in the Ministry headquarters was first implemented in 1982 with the assistance of the United Nations Development Programme (Jacobsen, 1983).

The Institute of Education, in collaboration with the Ministry of Education for the first time, conducted a one-year full-time course in 1984 for potential school principals, leading to the award of the Diploma in Educational Administration (DEA). In this programme, participants learnt the theories and practices of school management. They also learnt the technique of action research, which resulted in their applying this technique in solving a real problem in a school together with the school principal.

In 1983, a pilot project to prepare prospective heads of departments in the schools was also implemented with the aim of developing a competent administrative and professional team in schools. Initially, heads of departments went through a part-time training course. This was replaced by a one-year full-time training programme. The pilot project was successful and was incorporated as a milestone programme for heads of department. The programme was later
shortened to a nine-month full-time programme. All schools were targeted to complete organizational restructuring to introduce heads of department positions by 1994, thus giving principals a trained and competent management team to help in managing the school (Wee and Chong, 1990).

5.3.2 **Strategy 2: Excellence in Education through Quality Schools**

In pursuit of this goal of excellence, a pilot project involving nine primary and secondary schools that had double-session was converted into single session schools. Schools that have double sessions faced issues with time-tableing and usage of faculties. The purpose of converting schools into single session was to allow greater flexibility in time-tableing and programme organization. A greater variety of programmes could be organized in order to provide more opportunities for students and to meet their needs and interests.

The pilot project yielded positive reception from principals, staff, students and parents. On the basis of the reported success, the Minister of Education announced that by 1994, all secondary schools would be converted into single-session schools. This strategy required the building of an additional 50 schools over and above the 25 schools already planned under the Ministry’s existing school building programme.

To realize the goal of excellence in education, some of the well-established schools were allowed to become independent. In 1988, three schools became
independent and by 1997, ten schools were granted independent status. From 1988 to 1997, these independent schools had performed well and introduced several innovations in their curriculum and provided their pupils with a wider range of co-curricular, enrichment and enhancement programmes.

Learning from the experience of the Independent Schools, the Ministry had also set up eighteen Autonomous Schools which were given funds to buy enrichment and support services at their discretion. School Clusters\textsuperscript{11} were set up to give schools greater autonomy with regard to the use of funds and resources to innovate and implement programmes. Through these means, MOE encouraged all schools to introduce strategies and programmes tailored to the needs of their pupils (Wee and Chong, 1990).

5.3.3 **Strategy 3: Setting up Institutes of Technical Education**

Both the ITB and VITB played important roles in meeting the manpower needs of the fast-paced first and second industrialization phases. In 1992, it was clear that trainees with only primary education were not very successful as trainees. The need to have secondary education became paramount in view of the need to move into higher value-added skills of the third industrialization phase.

The education authorities decided the solution lay in giving every student in Singapore at least ten years of general education. Those who were more

\textsuperscript{11} Schools are grouped into clusters and each cluster is facilitated by a Cluster Superintendent. The Cluster Superintendents develop, guide and supervise the school leadership teams to ensure that schools are effectively run.
technically inclined were channeled into a new Normal (Technical) stream in secondary schools. There, they were prepared for entry into post-secondary technical institutes. This means the VITB would have to be upgraded and converted into a post-secondary institution awarding its graduates with at least a semi-skilled certificate. Thus the VITB was changed to become the Institute of Technical Education (ITE).

Between 1992 and 1998, ten ITEs were built or upgraded from the previous technical institutes all over Singapore. These ITEs introduced the New Apprenticeship Scheme through partnership with industries. This scheme required the employers in providing on-the-job training to the apprentice. The ITE on its part tested and certified the apprentices and made available some 90 part-time courses to give them a strong theoretical foundation. These courses were conducted at ITE campuses or at company training centres which had “Approved Training Centre\(^{12}\)” (ATC) status. By 1996, some 60 major companies and industrial organizations had been recognized as ATCs and were offering some 70 apprenticeship courses (Chiang, 1998).

\(^{12}\) To participate in the scheme, the organisation needs:
- A valid and structured training programme endorsed by ITE as meeting national certification standard;
- Adequate training facilities and equipment to conduct training and testing for the proposed ITE course; and
- Professionally and pedagogically qualified trainers to conduct training and testing in the proposed ITE course.
5.3.4 **Strategy 4: Total Training Concept in ITE**

To succeed in the modern workplace a worker needed more than just technical knowledge and skills. This was even more crucial because Singapore products were competing in the international market. Recognizing this, the ITE complements technical training with the inculcation of positive work values, social responsibility and leadership qualities. This ITE training philosophy was called the Total Training Concept.

The establishment of the ITE brought about one of the most significant developments in technical education in Singapore. Previously, primary school-leavers formed a significant proportion of the VITB’s students and these institutions were viewed as dead-ends. Their graduates could not go further up the educational ladder. After the ITE was upgraded to a post-secondary institution, progression paths were provided for students who do well in ITE. These students could go on to polytechnics and if they continue to do well, may proceed to university. In 1995, some 1,300 or about a third of those who graduated from the ITEs progressed to full-time and part-time polytechnic courses. What has astounded educators was that a fifth of such students graduated from polytechnics with Certificates of Merit, and some have won prizes as outstanding graduates.
5.4 **Educational Achievements**

Through the implementation of the above strategies the student intake enrolment increased significantly. Table 7 and 8 below provide comparisons of the intake of ITE students for 1997 and 2000.

<table>
<thead>
<tr>
<th>Courses</th>
<th>Intake Total</th>
<th>Intake Female</th>
<th>Enrolment Total</th>
<th>Enrolment Female</th>
<th>Output Total</th>
<th>Output Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering</td>
<td>1402</td>
<td>143</td>
<td>2350</td>
<td>252</td>
<td>915</td>
<td>100</td>
</tr>
<tr>
<td>Business &amp; Service</td>
<td>1419</td>
<td>1094</td>
<td>2010</td>
<td>1566</td>
<td>1413</td>
<td>1140</td>
</tr>
<tr>
<td>Technical Skills</td>
<td>2483</td>
<td>245</td>
<td>3963</td>
<td>301</td>
<td>1745</td>
<td>78</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>5304</strong></td>
<td><strong>1482</strong></td>
<td><strong>8323</strong></td>
<td><strong>2119</strong></td>
<td><strong>4073</strong></td>
<td><strong>1318</strong></td>
</tr>
<tr>
<td>Courses</td>
<td>Intake Total</td>
<td>Intake Female</td>
<td>Enrolment Total</td>
<td>Enrolment Female</td>
<td>Output Total</td>
<td>Output Female</td>
</tr>
<tr>
<td>-----------------------</td>
<td>--------------</td>
<td>---------------</td>
<td>-----------------</td>
<td>-----------------</td>
<td>--------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Engineering</td>
<td>1938</td>
<td>378</td>
<td>2904</td>
<td>465</td>
<td>1349</td>
<td>197</td>
</tr>
<tr>
<td>Business &amp; Service</td>
<td>2395</td>
<td>2004</td>
<td>3073</td>
<td>2530</td>
<td>2091</td>
<td>1752</td>
</tr>
<tr>
<td>Technical Skills</td>
<td>5439</td>
<td>866</td>
<td>9997</td>
<td>1348</td>
<td>4210</td>
<td>480</td>
</tr>
<tr>
<td>Total</td>
<td>9772</td>
<td>3248</td>
<td>15974</td>
<td>4343</td>
<td>7650</td>
<td>2429</td>
</tr>
</tbody>
</table>

The educational achievement in terms of ‘O’ level passes also saw a significant increase from 1991 to 2004. These achievements were further strengthened when Singapore achieved international recognition in the TIMMS.
<table>
<thead>
<tr>
<th>Year</th>
<th>Malay No.</th>
<th>Malay % Passed</th>
<th>Chinese No.</th>
<th>Chinese % Passed</th>
<th>Indian No.</th>
<th>Indian % Passed</th>
<th>Others No.</th>
<th>Others % Passed</th>
<th>Overall No.</th>
<th>Overall % Passed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991</td>
<td>3207</td>
<td>45.0</td>
<td>29772</td>
<td>74.0</td>
<td>1866</td>
<td>55.0</td>
<td>299</td>
<td>58.0</td>
<td>35144</td>
<td>70.0</td>
</tr>
<tr>
<td>1992</td>
<td>3018</td>
<td>43.8</td>
<td>30251</td>
<td>73.4</td>
<td>1838</td>
<td>56.9</td>
<td>305</td>
<td>66.6</td>
<td>35412</td>
<td>70.0</td>
</tr>
<tr>
<td>1993</td>
<td>2940</td>
<td>45.9</td>
<td>29345</td>
<td>74.3</td>
<td>1771</td>
<td>58.6</td>
<td>296</td>
<td>64.5</td>
<td>34352</td>
<td>70.9</td>
</tr>
<tr>
<td>1994</td>
<td>3045</td>
<td>42.5</td>
<td>28254</td>
<td>73.9</td>
<td>1722</td>
<td>58.7</td>
<td>283</td>
<td>64.0</td>
<td>33304</td>
<td>70.2</td>
</tr>
<tr>
<td>1995</td>
<td>2865</td>
<td>46.0</td>
<td>28172</td>
<td>76.7</td>
<td>1747</td>
<td>61.1</td>
<td>291</td>
<td>63.2</td>
<td>33075</td>
<td>73.1</td>
</tr>
<tr>
<td>1996</td>
<td>3321</td>
<td>47.9</td>
<td>28648</td>
<td>77.0</td>
<td>1907</td>
<td>62.1</td>
<td>318</td>
<td>69.2</td>
<td>34194</td>
<td>73.2</td>
</tr>
<tr>
<td>1997</td>
<td>4344</td>
<td>46.0</td>
<td>30114</td>
<td>77.7</td>
<td>2284</td>
<td>59.1</td>
<td>399</td>
<td>63.2</td>
<td>37141</td>
<td>72.7</td>
</tr>
<tr>
<td>1998</td>
<td>4238</td>
<td>46.0</td>
<td>29323</td>
<td>79.2</td>
<td>2271</td>
<td>59.8</td>
<td>370</td>
<td>70.0</td>
<td>36202</td>
<td>74.0</td>
</tr>
<tr>
<td>1999</td>
<td>3934</td>
<td>49.0</td>
<td>26555</td>
<td>81.2</td>
<td>2151</td>
<td>65.5</td>
<td>416</td>
<td>72.4</td>
<td>33056</td>
<td>76.3</td>
</tr>
<tr>
<td>2000</td>
<td>4017</td>
<td>52.8</td>
<td>26089</td>
<td>82.6</td>
<td>2136</td>
<td>66.2</td>
<td>430</td>
<td>75.8</td>
<td>32672</td>
<td>77.8</td>
</tr>
<tr>
<td>2001</td>
<td>3990</td>
<td>56.5</td>
<td>26943</td>
<td>84.3</td>
<td>2133</td>
<td>70.3</td>
<td>466</td>
<td>74.7</td>
<td>33512</td>
<td>80.0</td>
</tr>
<tr>
<td>2002</td>
<td>4081</td>
<td>58.0</td>
<td>24155</td>
<td>84.6</td>
<td>2266</td>
<td>71.3</td>
<td>471</td>
<td>76.6</td>
<td>30973</td>
<td>80.0</td>
</tr>
<tr>
<td>2003</td>
<td>4083</td>
<td>59</td>
<td>26351</td>
<td>85.9</td>
<td>2376</td>
<td>73.5</td>
<td>523</td>
<td>80.9</td>
<td>33333</td>
<td>81.6</td>
</tr>
<tr>
<td>2004</td>
<td>4313</td>
<td>59.3</td>
<td>32620</td>
<td>86.5</td>
<td>2507</td>
<td>73.7</td>
<td>569</td>
<td>77.2</td>
<td>40009</td>
<td>82.7</td>
</tr>
</tbody>
</table>
5.5 **Economic Achievements**

In the third industrialization phase, the GDP grew at an average of 8.6 % per annum. This was remarkable considering the fact that many developed nations were growing incrementally at a much lower rate.

The share of financial and business services sectors in total GDP grew from 21% in 1986 to 26% in 1997 signifying the success of stimulating the service component as the second pillar of economic growth.

The number of research scientists and engineers grew from 3,361 in 1987 to reach 11,302 in 1997, thus ushering Singapore into higher value added research and development of products.

6. **Current Industrialization Phase and School Reform (1998 onwards)**

6.1 **Challenges faced by the State**

The Singapore economy was hit by the regional crisis that started with the devaluation of the Thai Baht in July 1997. Although Singapore’s financial and economic fundamentals were sound, the rapidly deteriorating external environment adversely affected Singapore due to its close linkages with the regional economies.
The Singapore economy contracted 1.4 % in 1998, after achieving 8.3 % growth in 1997. After picking up in 1999-2000, Singapore was hit by another recession in 2001. The synchronized downturns in the major developed economies as well as the global electronics industry led to a sharp deceleration in global growth. The terrorist attacks on 11 September further aggravated the slowdown. As a result, the Singapore economy fell by 2.3 %, down from 10 % growth in 2000.

The rise of large new players like China and India brings both challenges and opportunities. In addition, regional countries began to aggressively attract foreign direct investment.

6.2 Economic Strategies

Singapore aims to become a globalised, entrepreneurial and diversified economy, with economic growth of 3-5 % p.a. over the medium term.

The key strategies are:

Expanding external ties - embracing globalisation through the multilateral trading framework of the WTO, regional co-operation as well as bilateral Free Trade Agreements.

Maintaining competitiveness and flexibility - keeping the burden of taxes and the Central Provident Fund on the economy as low as possible, reviewing the labour
market and wage system to make them more flexible, and pricing factors of production competitively.

Promoting entrepreneurship and domestic companies - encouraging people to be innovative and improving the ability of firms to develop new ideas and businesses, tap new export markets and broaden the economic base.

Growing manufacturing and services - upgrading these sectors by improving cost competitiveness, equipping the labour force with relevant skills, and developing new capabilities and industries.

Developing human capital - investing in education, helping workers train and upgrade, and welcoming global talent to augment the indigenous talent pool.

Table 10 shows the seriousness of the government in developing human capital through investing in education from 1997 to 2003. Despite the economy contracting by 2.2% in 2001, which was the largest decline in Singapore’s post-independence history, budget allocation for education saw an increase in funding in 2002 and 2003.
Table 10: Singapore Budget Allocation

<table>
<thead>
<tr>
<th>Year</th>
<th>Budget (S$ billion)</th>
<th>Percent to education</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>23.90</td>
<td>19.7</td>
</tr>
<tr>
<td>1998</td>
<td>27.20</td>
<td>21.0</td>
</tr>
<tr>
<td>1999</td>
<td>29.20</td>
<td>19.5</td>
</tr>
<tr>
<td>2000</td>
<td>29.00</td>
<td>20.7</td>
</tr>
<tr>
<td>2001</td>
<td>28.05</td>
<td>22.4</td>
</tr>
<tr>
<td>2002</td>
<td>28.33</td>
<td>24.0</td>
</tr>
<tr>
<td>2003</td>
<td>29.92</td>
<td>21.9</td>
</tr>
</tbody>
</table>

Source: Ministry of Finance

6.3 **Educational Reform**

Singapore’s survival as a nation depends on its ability to remain competitive and to anticipate change. In 1997, the Ministry of Education introduced a new reform called, “Thinking Schools, Learning Nation.” This concept is a step towards nurturing a creative and enquiring spirit, and igniting a passion for life-long learning.

The characteristics of “Thinking Schools, Learning Nation” are as follows:

- Teacher’s role

The teacher’s role as facilitator, a guide on the side, is central to initiatives like Project Work. Working on projects makes classroom learning applicable to life. The students draw the various strands of a topic together, obtaining a holistic view of the knowledge gained. The teacher encourages students to work in teams, and emphasizes the importance of each member pulling his weight. The
teacher also prompts students to be resourceful in gathering and processing information, and in displaying the knowledge they have acquired.

- Character and Leadership Development

Education goes beyond textbook learning. Aside from instilling national values, teachers also play a role in character and leadership development. Character development takes place during the formal and informal curriculum – during civics and moral education lessons, the pastoral care and career guidance programme and Co-Curricular Activities (CCA). Through participation in CCA, students are exposed to a wide range of activities in uniformed groups, clubs, societies and sports. They participate in programmes to develop leadership skills and to acquire confidence and self-awareness. By engaging students in a meaningful way, teachers promote the acquisition and application of social and cooperative skills, and instill in them a sense of social responsibility and commitment. The Community Involvement Programme exposes students to a world that is different from theirs, and helps them empathize with people from all walks of life.

This new educational reform gives more autonomy to school principals to lead and manage schools. There are fewer prescriptions of programmes. Instead, school leaders and staff are encouraged to emphasize on innovation and to instill greater professionalism in the management of schools.
6.3.1 **Strategy 1: The School Excellence Model**

In order to fulfill the purpose of ‘Thinking Schools, Learning Nation’ schools must provide an excellent teaching and learning environment. One of the ways to create such an environment is for schools to have an excellent self-appraisal system in order to continuously improve.

The School Excellence Model (SEM) was introduced in 2000 to guide schools in their self-assessment. The SEM provides schools with a systematic and holistic framework for self-assessment. By measuring both outcomes and processes, schools were required to examine their practices as parts contributing to a whole, in doing self-assessment every school must continuously question its current practices and established norms, and think of more creative and effective ways of delivering the desired outcomes of education.

From Jan 2001, schools could apply to MOE for external validation using the same model. A total of 53 schools, comprising 23 primary schools, 29 secondary schools and 1 junior college, applied and were externally validated. Of these, five schools received the inaugural Best Practice Awards – Anglo Chinese School (Independent), Paya Lebar Methodist Girls' School, Raffles Institution, River Valley High School and Xinmin Secondary School.
6.3.2 **Strategy 2: Singapore Quality Class (SQC) Award**

In ensuring greater professionalism in the management of schools, schools are encouraged to participate in the Singapore Quality Class Award (SQC). This Award was established to provide organisations a framework for achieving business excellence. In order to qualify for the award, organisations must score well in seven dimensions - Leadership, Planning, Information, People, Processes, Customers and Results.

For the first time since the SQC was instituted to encourage organisations to work towards excellence, five schools attained the award, which traditionally has been given to business organisations. They were Raffles Institution, Anglo-Chinese School (Independent), Xinmin Secondary School, River Valley High School and Dunman Secondary School. The Ministry, too, was awarded SQC status.

6.3.3 **Strategy 3: ITE Breakthrough Plan**

A new strategic plan - ITE Breakthrough - was formulated in 2000 to position ITE for the knowledge-based economy. The Plan focuses on ensuring relevance and responsiveness of the ITE training system; strengthening its Continuing Education and Training (CET) system to support national efforts in lifelong learning; developing a learning organisation to enhance organisational capability; and further improving the image and profile of ITE in technical training. ITE’s
vision is to be a world-class technical education institution for a knowledge-based economy.

6.4 Measures of Success:

6.4.1 Technical Education

The improved image of ITE and favourable publicity on its successful graduates had generated greater interest in ITE training among secondary school leavers. In 2001, ITE’s total intake was 11,342, surpassing the national intake target of 25 per cent of the annual school cohort for technical education. Enrolment reached a high of 18,535, an increase of 3 percent over the 2000 enrolment.

Likewise, the Continuing Education and Training (CET) programmes for adult learners also saw positive growth. In 2001, a total of 58,989 training places were conducted by ITE, and 131,401 training places were conducted by industry training partners under various ITE training schemes. The total training places taken up for ITE-conducted CET programmes were 7 percent higher than the achievement in 2000 and 9 percent higher than the FY 2001 target.

6.4.2 Educational Achievements

In the 2001 International Physics, Mathematical, Chemistry, Biology and Informatics Olympiads Singapore achieved the following rankings: It was placed 10th out of 65 participating countries in the Physics International Olympiad; 29th out of 83 participating countries in the Mathematical International Olympiad; 9th
out of 54 participating countries in the Chemistry Olympiad; 3rd place out of 39 participating countries in the Biology Olympiad; and joint first with Slovakia out of 74 participating countries in the Informatics International Olympiad.

In 2003, Performance at International Biology, Chemistry and Mathematics Olympiads

Singapore students performed well at the following international competitions:

- International Biology Olympiad: one gold medallist and three silver medallists, with the team placed 5th out of 41 countries.
- International Chemistry Olympiad: one gold medallist, two silver medallists and one bronze medallist, with the team placed 10th out of 59 countries.
- International Mathematics Olympiad: two bronze medallists and three honourable mentions, with the team placed 36th out of 82 countries.

7. Conclusion

As Singapore moves ahead in its economic and educational reform, the focus on human resource development will continue to take precedence. The move into higher-value manufacturing and industries such as the life sciences, nanotechnology, precision engineering, the desired national skills profile will need to be enhanced. Table 11 below provides a comparison of the desired national skills needed for the new economy and the actual situation. The desired profile consists of 65% in the skilled category, comprising 25% with degrees, 20% with diplomas and 20% with post secondary certification.
Table 11: National Skills Profile

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Skilled (post-secondary education)</td>
<td>19</td>
<td>34</td>
<td>65</td>
</tr>
<tr>
<td>Semi-skilled (secondary education)</td>
<td>31</td>
<td>28</td>
<td>20</td>
</tr>
<tr>
<td>Unskilled (less than secondary education)</td>
<td>50</td>
<td>38</td>
<td>15</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>


In attempting to address the demands of the new world economy, Singapore’s education landscape is being quite fundamentally overhauled to provide a broader based intellectual foundation, critical thinking skills and creativity that the economy demands. An ability-driven education, allowing students’ aspirations and interests to be better met has evolved. This has broken the mould of a highly structured education system that characterized much of the first three educational reforms. This new phase emphasises a system that values innovation, nurtures diversity, and encourages individuals with different strengths.
As with previous efforts at redefining the educational landscape in Singapore, the educational reforms continue to reflect Singapore’s holistic approach. The 1960s and 1970s saw changes permeating schools and universities complemented by the work of vocational institutes, polytechnics and joint technical training centres with MNCs. Today, the reforms at secondary schools and junior colleges are in step with changes at the universities, research institutes and industry. The continuing emphasis on science and technology education remains for pragmatic reasons. However, the influence of the humanities is increasingly given importance because of the need to provide a broad-based and multidisciplinary education. Singapore is moving towards achieving a better equilibrium between developing an individual holistically and the country’s need to stay economically competitive.

The following provides a summary of four major lessons learned from the strategic management of educational reform in Singapore:

1. Align educational reforms with economic reforms through a consultative and collaborative working relationship among various government ministries and agencies. Inter-ministerial committees are important to provide greater coherence in the development of manpower needs for the nation.

2. Strategic educational reforms should be prioritized based on the capacity and ability of school staff. Putting in place excellent structures and processes and simultaneously developing the ability and capacity of
school leaders and teachers are crucial before moving into greater
decentralization. Thus a gradual move from centralization to
decentralization is essential. Empowerment could only be appropriated
when school staff have the ability and capacity to provide quality
education through sound processes.

3. Employ a multi-prong approach to meet current and future manpower
needs. Upgrading of skills and knowledge requires both a strong
foundation of basic technical education and on-the-job training.
Partnerships with business organizations both locally and overseas
provide short term measures to improve technical expertise while
secondary and technical education institutions provide the future
manpower needs.

4. Strategic planning for industrialization and educational reforms is
characterized by flexibility in initiating required changes and in responding
to new challenges. The process of decision-making is distinguished by
efficiency, pragmatism and the ‘top-down’ approach.
References


