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### **Modelling a Systemic Industrial Policy Ecosystem: A Case Analysis of Singapore**

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## Abstract

The central objective of industrial policy lies in its influence on a nation's industrialisation process and economic development. Because effective industrial policy is intended to enhance economic growth and eventually help countries attain developed nation status, most developing nations are particularly keen in adopting the "right approach" of industrial policy-making in the hope of transforming their economies. This article attempts to highlight key arguments, through a literature review of relevant issues, to offer new insights into the current debate on industrial policy. It first argues for the need to purposefully adopt a systemic view of industrial policy-making. Next, it turns to introduce the idea of an industrial policy ecosystem to explain the advocacy of the "selective interventionist model" centred on a strategic stance of industrial development. It then proposes an institutionalised approach of broad initiatives as an analytical framework to identify, appraise and critique industrial policies. It further provides perspectives of Singapore's industrial policies in the last four decades, based on the proposed analytical framework, to examine how a government's facilitation role has helped to build the country to its current state of economic development. Finally, it concludes with the new challenges of industrial policy-making.

### **Keywords:**

Industrial policy, industrialisation, industrial growth, industrial development, industrial policy ecosystem, industrial policy-making, economic development, economic growth, economic competitiveness and knowledge economy

## Introduction

### **The Endeavour of Industrial Policy-Making**

Industrial policy has been characterised by a primary emphasis on attaining the desired macro-economic environment for industrial development, and at the same time, achieving the intended long-term economic performance for a country (Goh, 2005; 2004a). In practice, an industrial policy may constitute a wide range of governmental actions designed to promote industrial growth with the basic objective of improving the competitiveness of a particular sector or sectors in an economy. Implemented, led or directed by the state, such governmental actions usually imply preferential treatment for specific industries or individual firms (Goh, 2004b; COM, 1994). As many bureaucrats generally believe, industrial markets are inefficient and may cause an entire economy to falter, if not managed prudently. For this reason, increased policy efforts are now placed on optimising industrial structures, expanding industrial bases and rejuvenating "sunset industries". Indeed, for more than four decades, the rapid phenomenal industrial growth of Asia's tigers: Hong Kong SAR, Singapore, South Korea and Taiwan had attracted much attention to the benefits of industrial policy. These economies were seen to be pursuing predominantly government-initiated industrial development, which resulted in rising optimism that industrial policy, if formulated and executed effectively, would make a significant contribution to industrial growth and economic progress (Goh, 2004b; Rodrik, 1995; Pack and Westphal, 1986; Trezise, 1983). Given the escalating pressure to enhance economic competitiveness, nations around the world are now urgently in need of identifying the "right approach" of industrial policy-making that would produce positive

economic results. With this sense of well-placed optimism, coupled with lessons derived from the developed world, many developing nations are hoping to accelerate economic growth through the endeavour of industrial policy-making.

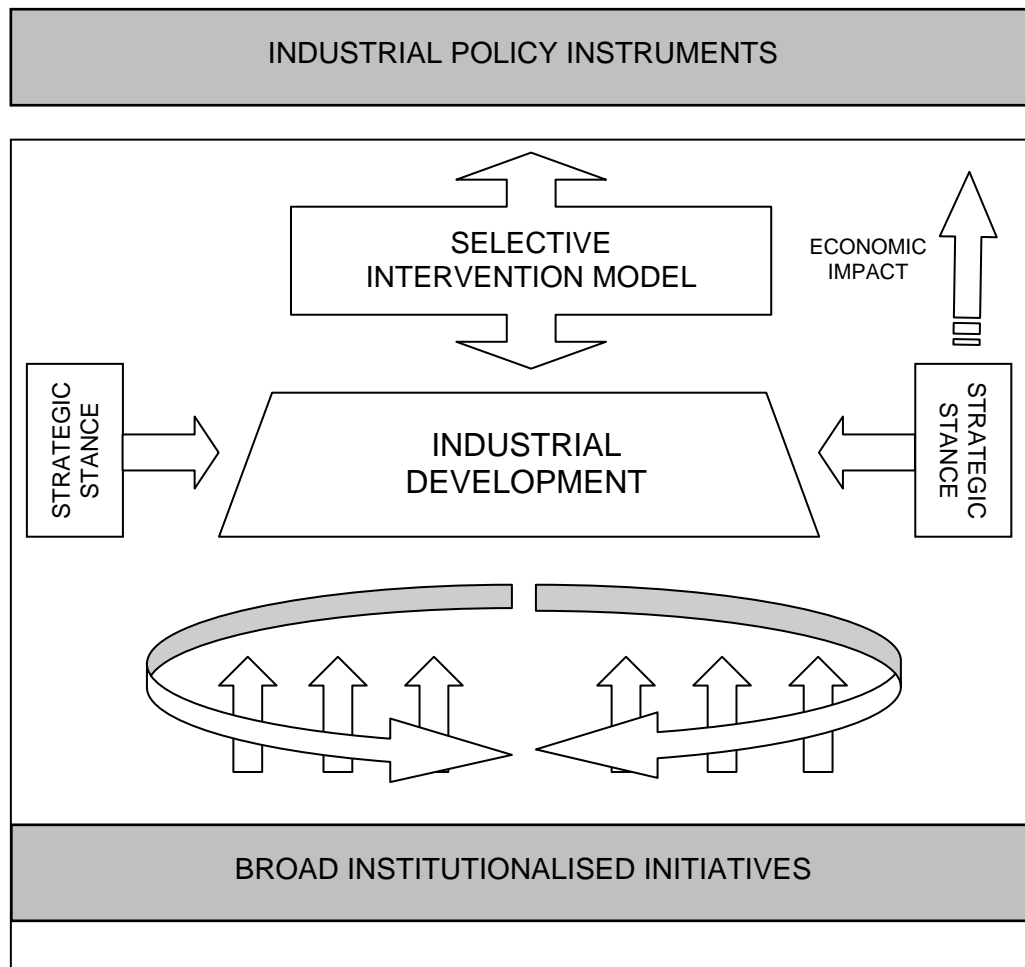
## Industrial Policy Instruments

Conventionally, industrial policy instruments include tax incentives and subsidies, financial support to research and development (R&D), education and infrastructure improvement programmes, favourable anti-trust regimes, export assistance, and foreign trade and investment incentives (Goh, 2004a; COM, 1994). While these instruments have enjoyed a significant degree of success, government's sponsorships or subsidies are still viewed with some suspicion by proponents of free market economies. This suspicion arose because industrial policy that intervenes by dispensing government incentives or subsidies is perceived as one of "picking winners", as it concerns decisions about which firms the government wishes to support (Goh, 2004a; 2004b; COM, 1994; Schultze, 1983). Nevertheless, the counter argument holds up that "picking winners" ahead of the market is the best result advocates of industrial policy could hope for; as the other alternatives may be propping up "losers" or worse still, a random distribution of recipients of taxpayers' money. Besides, it was felt that with these incentives or subsidies, comes state control, which are repeatedly found to be detrimental to market efficiency of businesses. Furthermore, the existence of government's industrial policy instruments – whether for failing or successful businesses, for example, are often seen to be inefficient, unproductive, and sometimes even poses a hindrance to industrial growth. Hence, it is crucially important to take into account the wider impact of these instruments and to do this, industrial policy-making should be considered with a systemic view rather than as piece-meal policy alternatives to catalyse industrial development.

## The Need for a Systemic View for Industrial Policy-Making

Seemingly, the current debate on efficient industrial policy continues to revolve around how the total factor productivity (TFP) of industries might be improved or how different structural changes in industries could be better implemented (Goh, 2004b; Rodrick, 1995; Grossman and Helpman, 1992). While politicians, industrialists and businessmen generally share the same opinion that industrial policy-making may bolster economic development, it is also recognised that industrial policy, if implemented solely to "cut off" competition, stands little chance of achieving efficiency gains or productivity increases. Past solutions of industrial development centred on government's fiscal incentives or subsidies alone to improve the costs of production and factors of efficiency in the creation of goods and services are seen to be less effective (Goh, 2005; Legge, 1993; Adler, 1989). Presently, as far as industrial development is concerned, all nations are undergoing a trying time due to new challenges of economic competition arising from changes such as labour productivity, industry structuring and international trade. It is also reported that while large government involvement has been present in some countries, it ended up without any positive impact on economic development. The supplementary objective of any industrial policy is thus to balance amongst various strategic concerns relating to "competitiveness issues" to ensure sustainable long-term industrial development. To evaluate whether an industrial policy may result in economic impact, it is proposed that a systemic view of an industrial policy ecosystem be adopted, as depicted in Figure 1. This underlying intention is to provide better insights into how policy alternatives could be considered with a strategic stance of industrial development based an institutionalised approach of broad initiatives.

**Figure 1:** A Systematic View of Industrial Policy-Making



## The Industrial Policy Ecosystem

### Economic Impact of Industrial Policy

Industry policy-makers now realise that industrial development models based on the old economy paradigm of efficient “resource accumulation” only will not suffice and may eventually fail. In fact, as globalisation speeds up and cross-border barriers are dismantled, future industrial development of an increasingly globally-interconnected world will depend lesser on tangible and physical assets. Instead, intangible assets like intellectual capital are far outstripping traditional assets such as land and labour as the dominant drivers of rapid industrialisation. Industrial policy thinking has inadvertently shifted to embrace issues relating to efficient “resource allocation” that must take place in industrialisation for a market-driven economy to be truly sustainable. However, to most bureaucrats, it seemed that the developing economies were not, in general, optimally efficient and that there was a crucial role for governments to play in effective industrial policy-making (Padmanabhan, 1993; Adler, 1989). Nevertheless, one has to be realistic with what industrial policy could achieve in terms of economic impact. To give some insights into this, empirical studies on the contribution of aggregate economic growth attributable to industrial

policy seem to put things in the right perspective. According to a World Bank Study on the manufacturing sectors of developing nations, the increase in GDP growth rates induced by industrial policy have reportedly reached 0.5 percent annually; and this was assessed to be "hardly trivial", but also not the "secret of success" for economic development (Stiglitz, 1996).

## Selective Interventionist Model

To extract the full benefits of any industrial policy, one must recognise that governments should only facilitate and not be directly involved in all aspects of the industrialisation process. In many instances, the best form of governmental facilitation is to dismantle and minimise barriers and obstacles in industrial development. From the experience of the developed nations, it appears that governments have demonstrated tendencies of refraining to play the role of a "central actor", but instead that of a "facilitator" in industrial development (Hall, 1986). Fundamentally, this stems from the viewpoint that any form of industrial development, which involves complex activities associated with efficient resource allocation, basically originates from societal demands and should therefore rightly be derived from society rather than the state. Even if governments possess a highly efficient bureaucracy to implement policy alternatives effectively, the role of industrial policy is pre-emptive in nature - what really works may not be so explicitly known to the policy-maker at the outset and the industry players themselves know best. Thus, a more "neutral" approach to state intervention is generally favoured as many would advocate, one of the virtues of the free-market economy is that it rewards industrial developments that are efficient in serving markets and penalises those that are not (OECD, 1990; Bubb, 1986). While acknowledging that more state intervention should ultimately lead to lesser government involvement, advocates of pro-market forces strongly support the "selective interventionist model" for industrial policy-making, as the most successful achievements in industrialisation have taken place in economies where selective intervention by government has been the most pronounced [1]. For instance, governments may wish to intervene by slowing down the contraction of declining industries or speeding up the growth of new emerging industries, especially if there are strong compelling national reasons to do so. Even then, the rationale for selective interventionist industrial policy should be as transparent as possible.

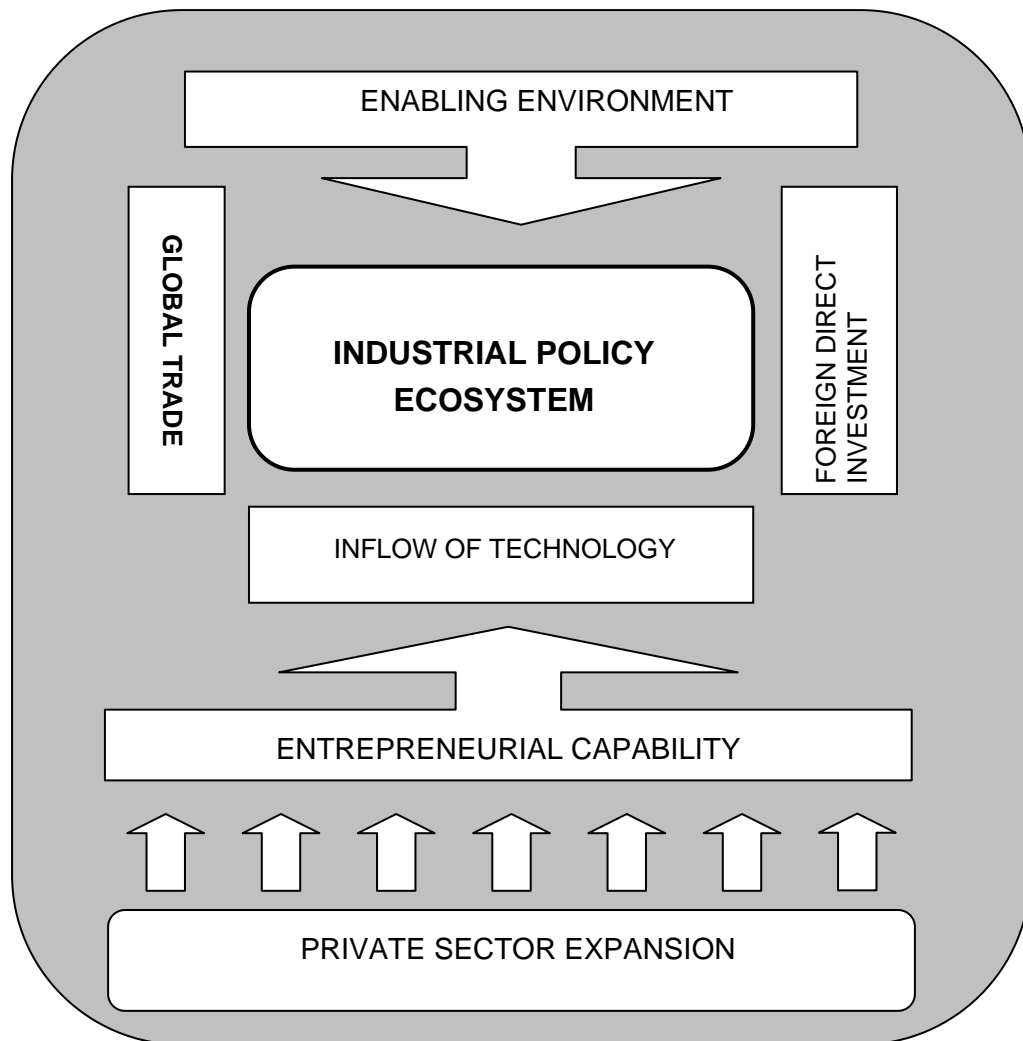
## Strategic Stance of Industrial Development

While what constitutes effective industrial policy-making is still subject to continuous debate, it seems that industrial development should avoid merely addressing resource accumulation concerns or factors of market efficiency or governmental direct involvement in industrialisation projects (Goh, 2004b; COM, 1994). Rather, one of the important outcomes of industrial policy is to empower industries and private firms to deliver industrialisation projects efficiently on their own – whose economic objectives are aligned to that of the state and the wider global economic community. If an industrial policy favours a particular industry sector or firm, besides being construed as unfair, there often exists a gap between the "market's way" of "picking winners" and that envisaged by the state. In fact, history has shown that industrial policy that overly supports government's participation in the "bolts and nuts" of industrialisation projects often leads to failure or results in industrial developments that are not commercially viable without state funding or in other words, uncompetitive (Bubb, 1986; Trezise, 1983; Schultze, 1983). To cite an example - although US government's US\$1 billion involvement to help defence contractors

develop high-speed integrated circuits (ICs) for military use was seen to be important in the pre-competitive phase of the project, it was found out later that Intel got there first on their own without any federal funding. What seems ostensibly clear is that the stance of industrial development should at least avoid “past mistakes”, where governmental actions are neither efficient nor needful. Three strategic aspects have been identified. First, it should depend less on policy alternatives centred on resource accumulation. Second, it should not rely overly on state involvement or participation in industrialisation projects. Third, it should neither diminish competition nor distort the influence of market forces in industrial development.

## **Institutionalised Approach of Broad Initiatives**

Thus, to holistically consider the issues surrounding effective industrial policy, it is more appropriate to accommodate a set of industrial system ideas based on the reality of practical development-related concerns rather than blindly adopting tenets of industrial policy pronouncements. Clearly, there exists a plethora of perspectives concerning which industrial policies are more suited to the industrial developmental conditions of an economy. One thing for sure is that no policy-makers can be fully aware of a rigid “set of criteria” for industrial policy that gives a national economy pre-eminence in a particular line of business or sector of industry. At best, an industrial policy can encompass elements of both “protecting the losers” and “favouring the winners” to bear some semblance of impartiality in industrial competition. Given the ever-changing economic landscape sweeping today's world, one ponders which industrial policy initiatives should be considered for implementation. For instance, what kind of government-run financial support systems or taxation credits should be provided by the state for industrialisation projects? How should industrial development place emphasis on multi-lateral cooperation amongst banks, private enterprises and employees? Does the government need to lead or actively coordinate efforts to develop new technologies or industries? To make headway along this line of thinking, an industrial policy ecosystem grounded on an institutionalised approach of broad initiatives could be used to analyse whether issues relating to effective policy-making are adequately addressed. Through a comprehensive overview of industrial policy literature, six broad initiatives are conceptualised into an analytical framework, as shown in Figure 2, for an industrial policy ecosystem, which should be tailored to its unique context (Goh, 2004a; 2004b; UNCTAD, 1995; Mejstrik, 1991; OECD, 1990; Cook and Kirkpatrick, 1988)

**Figure 2:** Industrial Policy Ecosystem

### Creating an Enabling Environment

In most developing nations, there exist market constraints due to one reason or another - which can extend from the national economy as a whole to institutional support systems or even to the enterprise level that constantly need to be facilitated by the state or government. Evidently, even in the best of socio-economic circumstances, industrial policy-making is fundamentally one of enabling the environment for businesses to thrive – which is essentially to create an ideal economic milieu for industrial development. An industrialisation-friendly environment should enable economic agencies, statutory bodies and public sector organisations to embrace and champion rules, regulations and legislation with the objective of moving towards freer, more flexible and market-driven industrial developments. It is thus crucial that an enabling environment be created with certain prerequisites under which industrial developments favourable to businesses can flourish. These include, inter alia, stable socio-political conditions; availability of basic physical infrastructure like public utilities, transportation and telecommunications; institutional infrastructure and mechanisms for mobilising “investible resources”.

## Fostering Private Sector Expansion

The impact of private sector contribution, amongst the developed economies, on the success of a nation's industrial development that leads to higher levels of production, employment, and productivity, has been significant. Private sector participation in industrialisation not only strengthens the domestic capital market but also increases the financial resources available for economic upgrading. A strong private sector-led industrial development is critical since the private sector should constitute the principal engine of economic growth in any market economy. Moreover, the private sector is also in the best position to determine which industrialisation projects are commercially feasible and to decide which to embark on based on profit-driven motives. It is thus vital to foster private sector expansion for industrial development to flourish under free market forces, with the exception that governmental involvement be stepped up only in specific priority areas where private sector participation is absent, inappropriate or simply lacking. In these instances, the criteria for initiating public sector industrialisation projects should be transparent and be able to withstand public scrutiny.

## Developing Entrepreneurial Capability

An important objective of a country's industrial policy is to sustain economic growth by maximising the entrepreneurial capability of its workforce to meet the needs of the global marketplace. To achieve sustainable economic growth, developing nations need to adapt their industrial structures and production, and marketing mechanisms to fully participate in entrepreneurial activities of international trade and investment. As the industrialisation process is fundamentally concerned with the efficient utilisation of scientific, technical, industrial, organisational and managerial assets to enhance economic competitiveness, developmental efforts have to be managed and guided with strong entrepreneurial capabilities. To be internationally competitive, industrial policy should thus aim to raise the level of workforce entrepreneurial capability to global standards. Governments must therefore ensure the development of a strong institutional base of support systems and provide efficient channels and networks for industries to exploit all opportunities of developing entrepreneurial capability.

## Facilitating Inflow of Technology

With the need to keep up with global technological advancements, industrial policy must also facilitate an inflow of technology since the government has a role to play in supporting strategic research programmes (e.g. technology acquisition programmes essential for new emerging industries) to accelerate industrial development. One example is to promote technology transfer agreements - which advance technological inflows through licensing of technology. Another example is to encourage capital investments accompanied by proprietary technology and technical know-how. It is also important for governments to invest in state-of-the-art scientific or technological programmes so as to enhance the prospect of becoming a technology leader in niche areas (e.g. projects on the Internet or DNA sequencing). Take for instance, the US Advanced Technology Program (ATP), which began in 1990, has been instrumental in advancing new promising and high-risk technologies for the country as a technology leader. However, it is noted that industrial policy should not set sights on an overly "narrow theme" of technology inflow but should rather be sufficiently broad-based to support acquisition of prospective technologies that possess good commercial potential.



## Enhancing Global Trade

Industrial policy should also promote economic activities that enhance global competitiveness by generating more investment opportunities. Thus, a prominent feature of industrial policy in most developing countries is centred on ways of enhancing global trade and exports. For instance, one is the liberalisation of foreign trade and another concerns the development of export capability. An increased liberalisation of foreign trade improves market efficiency and gives rise to greater competition for local exports in international markets – which enhances the nation's economic competitiveness in the production of goods and services. An improved export capability enables indigenous goods and services to penetrate overseas markets. Such a policy initiative requires not only institutional support systems for trading activities, but also a comprehensive set of economic measures for promoting global trading and exports.

## Encouraging Foreign Direct Investment (FDI)

Industrial policy should result in attracting foreign direct investment (FDI) whose objective is to bridge gaps in investment requirements, and to facilitate inflows of capital for industrial development. To increase FDI inflow, governments must promote initiatives to attract foreign partners in the participation of new business ventures. Besides, it must be acknowledged that at times, in the absence of private sector-led involvement in industrialisation projects, the role of FDI would have to assume dominant importance. Given the intense competition for such investments from new emerging economies, governments would need to put in place initiatives such as investment regulations with fewer ownership restrictions, or to simply impose less restrictive measures. Laws relating to industrial investments, especially with respect to FDI should also provide ample protection and guarantees for foreign investors. However, in the event of “market abnormalities” such as monopolies, government controls would need to be retained to safeguard national interests.

## The Singapore Experience

Singapore, which attained independence from the United Kingdom on 9 August 1965, only started industrialisation around the mid-sixties. Due to the absence of a sizeable domestic market, the country focused on an economic strategy of export substitution to boost up productive outputs beyond domestic demand, and hopefully, accelerate economic growth. However, without indigenous firms capable of producing exports, Singapore faced enormous pressure to import productive capacity (Goh, 2004a; Chew and Goh, 1993; Choy, 1983). As a small nation without a hinterland, Singapore could only achieve this economic strategy by positioning itself as an off-shore manufacturing hub for multinational corporations (Bloch and Tang, 2000; Rosenberg and Birzell, 1986; Rugman, 1983). The government hence concentrated largely on the manufacturing sector and the development of international services as part of its overall industrialisation efforts. Right until the late 1990s, Singapore's economic performance has been widely hailed as “remarkable” by the international community, achieving an average annual economic growth rate of about 8 percent over a four-decade period. This was largely attributed to effective industrial policy-making, on the part of government, which continually upgraded industrial development that transformed the nation from an entrepôt into a diversified economy. Table I provides a glimpse of Singapore's current state of economy as summarised by macro-economic indicators.

**Table 1:** Macro-Economic Indicators of Singapore

INDICATOR	IN US\$
Gross Domestic Producta (GDP)	84.9 billion
GDP Per Capita	21,814
Real GDP Growth <sup>b</sup>	5.35%
Real Growth in Industrial Production <sup>c</sup>	8.8%
Export of Goods	114.6 billion
Growth in Export of Goods <sup>d</sup>	4.28%
Direct Investment Flows Inward	7.22 billion
Overall Productivity Growth	4.448%
R&D Expenditure Per Capita	384.8

a: The figure is estimated at prices and exchange rates in 2000.

b: The percentage change is computed on a local currency at constant price basis.

c: The figure is estimated based on average annual percentage rate of growth from 1990 to 2000.

d: The figure is computed based on percentage change of export values in US\$.

(Source: Adapted from The World Competitiveness Year Book)

In summary, as shown in the figures of Table II, for the decade between 1960 and 1970, Singapore's per capita income doubled and then more than trebled for the decade from 1970 to 1980. Subsequently, in the following decade from 1980 to 1990, the country's per capita income went on to increase by four-fold to almost US\$25,000. In fact, by the late 1990s, Singapore's real per capita income level has already matched that of most EU countries. Also, it is widely reported that Singapore hopes, in 30 to 40 years' time, to be a first league developed country. Moreover, based on current growth projection and economic estimates, Singapore's GNP per capita would match the Netherlands by 2020 and the United States by 2030. While it may be far from certain whether the country would be able to tackle all the new challenges of industrial development in future to attain its economic goals, it is clear that Singapore's earlier efforts and achievements are of relevance to developing countries.

**Table 2:** Economic Growth In Singapore 1960 to 2000

	1960-1970	1970-1980	1980-1990	1990-2000
GDP Average Annual Real Growth (%)	8.7	9.4	7.5	8.4
	1960	1970	1980	1990
GNP Per Capita (current prices in S\$)	1,330	2,825	9,941	42,212

(Source: Yearbook of Statistics Singapore)

On the whole, policy researchers and industry analysts are of the opinion that Singapore has managed, over the past four decades, to weather tough economic challenges through relatively sound industrial policies (Goh, 2000b; Huff, 1995; Lee, 1992). To draw insights from Singapore's case of industrial policy-making whose support for reforms has been significant, the thinking behind its enacted industrial policies is highlighted vis-à-vis the earlier-mentioned analytical framework. To establish a strong foundation for the industrial policy debate, the institutionalised

initiative-based approach to an industrial policy ecosystem is employed for discussion to illustrate how the Singapore's government has acted with pragmatism in an attempt to achieve effective and yet workable industrial policies. In addition, the socio-economic circumstances, under which the government's policy initiatives were shaped, in terms of the country's endeavour in industrial policy-making, are discussed in turn.

## **Creating a Haven for Industrial Development**

Upon attaining independence, as Singapore had to survive both politically and economically, it urgently needed an enabling environment to embark on industrialisation immediately. However, unlike countries such as Indonesia, Malaysia, Thailand and the Philippines, Singapore was, and still is devoid of significant minerals or agricultural resources. Being dependent on entrepôt trade, whose trading activities were unable to create sufficient jobs, it was critical then that industrial policy supporting economic development must lead to employment opportunities for its populace. Industrial policies were thus aimed at creating a haven for industrial development as a pragmatic means of job creation (Goh, 2002; Liao and Chew, 2000; Tan, 1995; Wong, 1995). Policy objectives were targeted at making Singapore a choice business location, compared to neighbouring countries, for multinational corporations (MNCs). The island republic thus deliberately positioned itself as an ideal business venue for MNCs by virtue of its strategic trading location in the middle of the Malay Archipelago, large deep water seaport, harmonious industrial relations climate, well-equipped physical infrastructure and a relatively skilled workforce coupled with political stability [2]. With MNCs supporting the nation's industrialisation efforts, the country enjoyed robust economic growth and a vibrant manufacturing sector was quickly formed. But increasingly, with neighbouring countries able to offer lower operating costs, abundant manpower, industrial land and natural resources, and immense potential for market expansion, Singapore's industrial policy is now targeted at differentiating itself in terms of total value-added industrial output for goods and services (Goh, 2004b; Tan, 1995; Lee, 1992). Furthermore, the country now prides itself with efficient communications and information infrastructures, a cosmopolitan city of highly-quality human capital and well-trained bureaucracy to provide a conducive industrial environment that encourages technology-based knowledge transfer to add value to all business activities (Goh, 2004a; Hamilton-Hart, 2000; Young, 1992).

## **Promoting Private Sector-led Industrialisation**

Since the 1970s, Singapore's industrial policy consistently intensified private sector participation in the industrialisation process by promoting spending for industrial developments through generous fiscal incentives. In addition, the government also focused on the privatisation of industries and provided a strong functional framework for private sector-led industrial development. In spite of fierce competition both regionally and globally, the country's private sector expansion gave rise to efficient industrial development in sectors such as shipbuilding and petroleum refinery (Huff, 1995; Kim and Lau, 1994). By early 2000s, in the midst of ever-increasing private sector expansion, Singapore became one of the world's largest manufacturers of disk drives, refrigerator compressors and computer peripherals with about 6000 MNCs. These MNCs are now responsible for about 75 percent of Singapore's manufacturing output and 80 percent of the country's exports (Goh, 2005; Tan, 1995; Huff, 1994). With branches and subsidiaries in Singapore, the MNCs had also expanded their scope of business over the years beyond mere off-shore manufacturing to other areas like merchandising, logistics management, customer support services, financial

management and regional procurement. To foster new economic activities through greater private sector expansion, the government outlined the Industry 21 vision to supplement the country's present role as a manufacturing base for MNCs and a services hub for regional economies [3]. Hence, indigenous firms were encouraged to participate in large-scale industrialisation projects in an attempt to help nurture them to be global MNCs. The government realised that for Singapore's future economy to be sustainable over the long-term, indigenous firms must be more actively involved in industrial investments and should also own a major proportion of the private sector's wealth. With Singapore's GDP reaching US\$93 billion in 2003, the country's sizeable economy is now ready to embark on high value-added industrial development for the manufacturing sector and to further diversify private sector expansion into other knowledge-based sectors.

### **Enhancing Enterprise-Development Capability**

Due to growing global competition, Singapore's government decided to promote efforts in developing entrepreneurial capability. For instance, various industrial policies were introduced to change the mindset of the population with themes like "educate for entrepreneurship" or "be an entrepreneur". Industry-wide initiatives such as the Technopreneurship 21 Plan were implemented to support the goal of building a culture of entrepreneurship centred on technological innovations [4]. With a strong governmental commitment to enhance entrepreneurial opportunities for industries such as data storage, healthcare, logistics, multimedia, microelectronics, wireless communications and manufacturing technologies, the country mounted ambitious programmes to raise competence levels of entrepreneurship, in technology-based industry sectors, to international standards (Liao and Chew, 2000; Young, 1995; Chew and Goh, 1993; Krause, 1987). Because the domestic market was also too small and over-saturated to sustain long-term economic growth, the government also embarked on a regionalisation drive to develop an "external economy" by encouraging Singaporean firms to hone their entrepreneurial capabilities abroad (Tan, 1995; Lee, 1992). Notably, it was widely acknowledged that indigenous entrepreneurs possessed limited capability in gaining access to foreign markets since they knew little about foreign preferences and business environments, distribution systems and regulatory frameworks. To kick-start the regionalisation efforts, the government also jointly developed Singapore-modelled industrial parks with countries like China, India, Indonesia and Vietnam. Learning from the experience of MNCs, Singaporean firms increasingly began to operate their businesses in these countries to enjoy economic factors of production and to explore new markets. One case in point was Singapore's involvement in the co-operative partnership to develop new economic zones such as the Growth Triangle [5]. These industrial policy initiatives are also very timely as almost all Asian economies around the region are beginning to adopt more open-door industrial policies to accelerate the industrialisation in aid of economic development.

### **Building Technology-Based Industries**

With the country's industry structure continuing to diversify into sectors that are more technology-intensive, knowledge-based and higher in value-added output, the government began in the late 1990s to focus on developing high-tech industries (e.g. wafer fabrication plants and pharmaceutical plants). Realising that technological progress is crucial for industrial growth, there was a concern amongst the bureaucrats and academics that Singapore's economic growth based heavily on factor accumulation would not be sustainable (Bloch and Tang, 2000; Kim and Lau, 1994). Instead, there is growing demand for developing industries with a high

knowledge and technological content. Since the early 1990s, the government has been making continuous efforts to transform the entire economy into a knowledge economy [6]. As the MNCs have already provided a strong inflow of technology to Singapore, a key objective of its industrial policies was thus to root them in the country to deepen the industrialisation process in tandem with its long-term economic and technological advancement. However, in recent years, Singapore's government has started to invest heavily on indigenous technology development. Industrial policies are thus implemented to build a network of industrial assets and capital-intensive investments to provide the potential for technology acquisition, transfer and development. To increase industrial growth through the creation of new technological innovations as what the Americans, Europeans and Japanese have succeeded in doing for several decades now, an Innovation Development Programme [7] was launched to support Singapore's vision of becoming an innovation-driven knowledge economy. Incentives such as tax exemptions for workers' training are used to upgrade the country into an economy that builds its own indigenous innovations rather than on imports of ready-made technologies through the foreign MNCs based in Singapore. The government also understood that industrial development would increasingly depend on its ability to transmit, adapt and commercialise scientific and technological knowledge than on factor accumulation (Young, 1995; Huff, 1994; Kim and Lau, 1994). Hence, to further accelerate technology inflows, the Singapore's government adopted industrial policies that favoured liberalisation, for example, in the telecommunications sector (e.g. cellular phone and radio-paging services). Other policies urged the information and communication technology sector to engage in licensing of foreign technologies and the use of advanced process technologies and process management capabilities (Wong, 2002). These policies helped the economy to leverage technology-based capital investments and technology transfer arrangements to secure further industrial growth.

### Attracting Overseas Investments

For four decades, Singapore had relied on an open-door industrial policy of welcoming foreign investors to set up new businesses in the country for export substitution. In the initial years, the importance of foreign direct investment (FDI) to Singapore's economy was starkly obvious. One advantage that accompanied FDI inflow was the fact that its impact on economic growth and employment was rapid since foreign firms were more established and hence brought about considerable increases in production and besides, they were well-connected to world markets (Te Velde, 2001; Lall, 2000; Krause, 1987). It was generally felt that Singapore's continued reliance on FDI was laudable, since it also provided a good indicator of keeping in check the effectiveness of the country's industrial policy. The thinking was that should there be any bad industrial policy resulting in a deterioration of business climate vis-à-vis regional economies, the international companies, especially the MNCs would immediately "punish" Singapore through a lowering of FDI. So, the FDI-centred strategy allows less room for policy mistakes and in a way, demands strict discipline from the policy-makers to act responsively to changing conditions and opportunities or stands to lose foreign investments and export revenue. The government thus aggressively mounted efforts to attract foreign direct investments (FDI) into Singapore, especially from the developed world through a host of liberal investment incentives (Goh, 2004b; Te Velde, 2001). As far as the inflow of foreign direct investments (FDI) was concerned, Singapore has indeed performed relatively well in comparison with regional economies. Based on the FDI Performance Index of 140 economies, which ranked countries by foreign direct investments (FDI) received relative to economic size as a ratio of the country's share of global FDI inflow to its share in global gross domestic product (GDP), Singapore was ranked sixth or better

since early 2000s. The ranking placed Singapore ahead of even some OECD countries that were traditionally hailed as leading FDI performers. But increasingly, countries like Singapore are now facing intense competition from Northeast Asia (China and India, in particular) for FDI from world's major investors. For this reason, huge spending on FDI promotion has to continue and Singapore's industrial policy needs to further differentiate the country as a "premier FDI location" through efficient infrastructures, minimum ownership restrictions and high value-added business services.

## **Fostering International Trade**

In the 1990s, as Singapore's economic development became increasingly dependent on globalisation, the government began to place greater emphasis on the importance of international trade (Hamilton-Hart, 2000; Kim and Lau, 1994). Industrial policies were thus aligned with the objective of enhancing global trade to speed up the country's industrialisation process and as a result, transit into a globalised economy. With new opportunities offered by freer global trade, the government embarked on programmes to encourage Singapore's firms to trade overseas. One good example is the "internationalisation drive" to export Singapore's products and services to other parts of Asia. To address the new challenges (e.g. protection of intellectual property rights) facing industrialisation efforts in anticipation of increased global trade, the Singapore government also concluded Free Trade Agreements (FTAs) with the United States, Japan, Australia, New Zealand and the European Free Trade Association (Goh, 2004b). With Singapore's increasing FTA portfolio keeping its trading activity buzzing, Singapore's direct investments overseas rose from US\$13 billion in 1992 to US\$86 billion in just one decade; and these investments now accounted for more than 27 percent of Singapore's domestic trade (Soh, 2004). This policy of open regionalism continued to benefit Singapore as it presses for further rounds of talks at the World Trade Organisation (WTO) while simultaneously pursuing bilateral and regional initiatives with other countries and blocs. As more FTAs are established, industries not only derive cost savings from lower tariffs, but also stand to gain from better market accessibility, enhanced investment opportunities and knowledge-intensive commercial activities. In fact, the government has also acknowledged that a significant amount of its wealth created in Singapore came from international markets; and this strong international dependence had perhaps been the guarantee for the country's success in implementing high growth industrial policies over the years. Besides, being strongly interconnected and closely linked to international markets is probably the best way to benchmark the country's competitiveness against the world's high performing rivals.

## **New Challenges of Industrial Policy-Making**

While studies have been undertaken to better understand the impact of industrial policy, most of the literature continues to offer limited guidance to effective industrial policy-making. With the success of the developed world, policy makers and central planners have strongly supported a greater role for interventionist industrial policies as models of industrial development for developing nations. Although an "interventionist model" of industrial development is the policy of most countries of the world, including countries such as the United States which prides itself as a "free-trading" nation, the real nature of state intervention is still being disputed. For instance, some critics oppose industrial policy intervention in the domain of the private sector and strongly discredit its relevance because it is viewed as unnecessary and fruitless, since industries are already initiating industrialisation

projects on their own and are in the best position than the state to do so. This article has thus undertaken two steps to bridge the knowledge gap. One, it took a closer scrutiny at how issues should be addressed by contemplating an industrial policy ecosystem based on an institutionalised initiative-based approach as an analytical framework to identify, appraise and critique policy alternatives. Two, it has argued in support of a “selective interventionist model” by adopting a strategic stance of industrial development based on refraining from resource accumulation, state involvement or direct participation, and diminished competition or distorted influence of market forces. The proposed framework was employed to examine the case of Singapore whose adopted industrial policies were based on relatively sound initiatives. However, as to how the country would perform in the next decade of industrialisation remains to be seen; and should be best left to industrialists, academic researchers and businessmen to judge for themselves what the country would accomplish within the wider context of the current industrial policy debate. Notwithstanding the rising economic uncertainty caused by natural disasters, terrorist threats and communal health crises, it was also recognised that the most effective form of industrial policy should be flexible, responsive and adaptable to changing conditions and opportunities. New strategic issues, as they surface, could then be raised to further extend understanding on effective industrial policy, in particular, on how government’s role could be better facilitated.

In conclusion, for future exploration, three challenges facing industrial policy-makers which merit attention are identified. Firstly, for the benefits of effective industrial policy-making to be felt, it is noted that policy execution is key. The first challenge lies in forming a capable bureaucracy proficient in responding to fast, uncertain and ever-changing demands of industrial development to allow for industries to participate more fully in the international arena of trade and investment. Secondly, as the industrialisation process involves the utilisation of various types of technologies, processes, techniques, organisational, social and different forms of codified knowledge, it requires the joint and concerted efforts of individuals at all levels. The second challenge lies in ensuring that the policy imperatives of industrialisation permeate all layers of society and organisation. Thirdly, although the main purpose of industrial policy-making is to aid economic development, one should refrain from perceiving it as the “magic cure” for ailing economies. The fewer industrial policies a national economy requires, is also a reflection that its country’s economic policies have taken care of the country’s industrial policy imperatives. The third challenge posed to the government thus involves one of balancing between the two extreme approaches of “hands-off inaction” and “weighty interference”, but instead one based on well-reasoned selective intervention.

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## Endnotes

The approach of selective intervention strives for a “middle way” stance to industrial policy-making – which is neither a completely “hands-off” industrial policy nor an industrial policy of *laissez faire*, but one which intervenes “selectively” (Goh, 2004b).

Political stability and good governance were important structural factors responsible for Singapore's success. For more than four decades, from 1959 till now, the People's Action Party (PAP) was the dominant ruling party under the leadership of Mr Lee Kuan Yew (till 1990) and current Prime Minister Goh Chok Tong (from 1990 till 2004). Since 12 August 2004, the Prime Minister of Singapore is Mr Lee Hsien Loong.

Launched as the blueprint to take Singapore into the 21<sup>st</sup> century, the Industry 21 Plan calls for a stronger emphasis on innovation and to transform Singapore into a knowledge-based economy. The objective is to sustain the manufacturing sector's contribution to the gross domestic product (GDP) at not less than 25% and employment share at more than 20% in the medium to long term. Under this plan, Singapore will attract multinational corporations (MNCs) to anchor their key knowledge-driven industries in the country. Local companies will also be encouraged to engage in more knowledge-intensive activities to become world-class players.

The Technopreneurship 21 Plan is a national initiative to develop a critical mass of successful technology start-up companies to support an entrepreneurial culture and to create a conducive environment for innovation. It focuses on attracting technopreneurs, venture capitalists and investment houses to base their activities in Singapore.

The Growth Triangle was based on a concept of tripartite economic co-operation to promote the joint development of Singapore, Johore in Malaysia and the Riau islands in Indonesia. The choice of location was one based on close proximity to natural resources and labour, almost identically similar in concept as how the established foreign MNCs regard Singapore in the 1970s.

The OECD (1996) defines a knowledge economy as one in which the production, distribution and use of knowledge are the main drivers of growth, wealth creation and employment for all industries.

The key thrusts of the Innovation Development Programme are: (i) to identify and promote innovation projects by industry cluster; (ii) to introduce innovation systems and practices in companies; and (iii) to expand the innovation infrastructure and to intensify innovation awareness. The objective is to encourage companies to develop innovation competencies in products, processes, applications and services.