

**TOWARDS AN INNOVATION-
DRIVEN ECONOMY
THROUGH INDUSTRIAL POLICY-
MAKING:
AN EVOLUTIONARY ANALYSIS OF
SINGAPORE**

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Towards an Innovation-Driven Economy through Industrial Policy-Making: An Evolutionary Analysis of Singapore

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ABSTRACT

Industrialisation has always constituted a major objective of development strategy and government policy. Through industrialisation, developing nations aspire to achieve higher economic growth, and to eventually attain developed nation status. Yet, it remains doubtful whether the approach of industrial policy-making in developing countries has indeed been successful in transforming their economies. In support of private sector-led industrial development, this paper argues for a primary focus on innovation-driven industrial policy to foster skills upgrading, enhance industrial growth and produce world-class exports, with lessons drawn from the experience of developed countries. It explains why industrial policy-making must address the pursuit of innovation as a prime mover in economic development to put in perspective the importance of innovation-driven industry policy. To provide evolutionary perspectives of Singapore's industrialisation process since independence from 1960s to 1990s, it analyses the industrial policy thinking behind the different stages of industrialisation that has helped build the nation to its current state of economic development. It also describes the new wave of Singapore's industrialisation in support of innovation, as articulated in its Innovation Manifesto. Finally, it concludes with the new challenges of industry policy-making.

Keywords: Industrial policy, innovation, industrial growth, policy-making, innovation-driven economy, economic growth and economic competitiveness

Introduction

Industrial policy¹ 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 economic performance for a country. For more than four decades, the rapid growth of Asia's tigers: Hong Kong SAR, Singapore, South Korea and Taiwan, which pursued government-initiated industrial policy, gave rise to optimism that industrial policy-making, if executed correctly, could be a major contribution to economic growth (Pack and Westphal, 1986; Rodrik, 1995). Yet, governments demonstrated strong tendencies of refraining to play the role of a "central actor", but rather that of a "facilitator" – which stems from the view that industrial development basically originates from societal demands and should thus be derived from the society rather than the state (Hall, 1986).

While politicians, industrialists and businessmen share the opinion that industrial policy-making may bolster economic development, it is also recognised that industrial

policy, if implemented to “cut off” competition, may be counter-productive. The existence of government’s industrial policy instruments² – subsidies for failing businesses may be inefficient and it was felt that with government subsidies, comes state control, which is repeatedly found to be detrimental to the market efficiency of business transactions. Indeed, past solutions centred on fiscal incentives that help industries improve the costs of production and factors of efficiency in the creation of goods and services have also become less effective (Goh, 2003; Legge, 1993; Adler, 1989). As many would advocate, one of the virtues of a free-market economy is that it rewards businesses that are efficient in serving their markets and penalise those that are not.

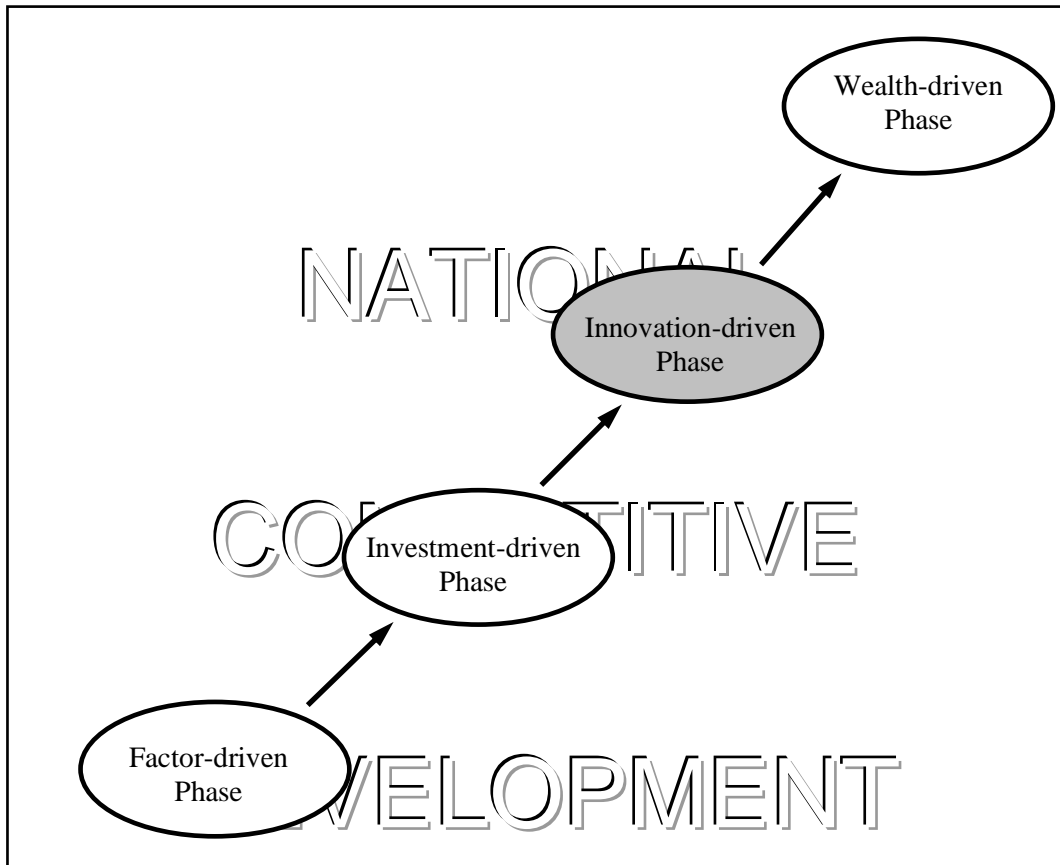
The debate on industrial policy-making continues to revolve around how the total factor productivity of industries may be improved rapidly; or how changes in the structure(s) of industries can be implemented efficiently. So, what constitutes an approach of effective industrial policy-making? One approach is that governments should concentrate on providing a functional framework for private sector industrial development and leave it to market forces. Advocates of pro-market forces for industrial policy seem to favour selective intervention³, as the most successful achievements of industrial policy have taken place in economies where selective intervention has been the most pronounced such as in South Korea and Taiwan. Due to growing trends towards enhancing global competitiveness through innovation with the private sector as a principal engine of industrial growth, a shift to private sector-led, innovation-driven industrial development appears to offer the answer. But to most bureaucrats, it seems that the market economies in developing nations were not, in general, optimally efficient and that there was a significant role for governments to play in effective industrial policy-making (Adler, 1989; Padmanabhan, 1993).

To shed light on the effectiveness of industrial policy-making, empirical studies on the contribution of aggregate economic growth attributable to industrial policy place things in perspective. According to a World Bank Study on the manufacturing sectors of developing nations, it was reported that the increase in GDP growth rates induced by industrial policy reached about 0.5 percent annually and was assessed to be “hardly trivial”, but also not the “secret of success” (Stiglitz, 1996). To provide insights on the benefits of an innovation-driven economy, one cannot do justice to the debate about effective industrial policy-making without mentioning Michael Porter’s works on “The Competitive Advantage of Nations”. According to Porter’s (1998) classification of economies by a four-phase model of national competitive development as depicted in figure 1, the overriding consensus is: if a country aspires to become a developed nation, it must transit to the innovation-driven category.

Yet, one ponders, with the ever-changing global economic landscape sweeping today’s world, what should the primary focus of industrial policy be, to aid the economic development in developing nations? Two aspects of industrial policy-making are important. One, the objectives of industrial policy in developing countries should aim to achieve an accelerated pace of competitive and sustainable industrial growth within an efficient framework of increased market orientation and private sector-led development. Two, these objectives would be inevitably met if a country seeks to transform its economy to the innovation-driven category by purposively planning its industrial policy to have a primary focus predominantly rooted in innovation imperatives. These two

aspects of industrial policy-making must go in parallel if the intended economic outcomes in developing countries are to be fulfilled. With the backdrop of innovations now being accountable for the world's highest growth areas (information and communication, and biomedical technologies, for example) in the most competitive global markets (such as the United States and Japan), three groups of individuals seemed to offer viewpoints that appear ostensibly convergent.

Figure 1: Porter's Four-Phase Model of National Competitive Development



Firstly, policy critics have constantly championed that a pro-innovation theme should dominate the industrial policy ecosystem. Despite prompting a rethink of industrial policy-making, public policy researchers are also in support of innovation-driven industrial policy (Goh, 2002; Porter, 1998; Grossman and Helpman, 1992).

Secondly, industrial macro-economists have consistently backed opinions that the economic growth of developing nations should increasingly depend on the ability to innovate and the focus of any industrial policy in a developing economy should strive for a conducive climate that enables innovations to flourish (Giget, 1997; Branscomb, 1992).

Thirdly, technocrats deem that a relentless pursuit of innovation is central to economic competitiveness and constitutes a principal determinant of industry growth for

both the manufacturing and services sectors, which form the two largest engines of economic growth in most developing economies (Goh, 2003; 2004; Tidd, 1997).

Innovation-Driven Industrial Policy

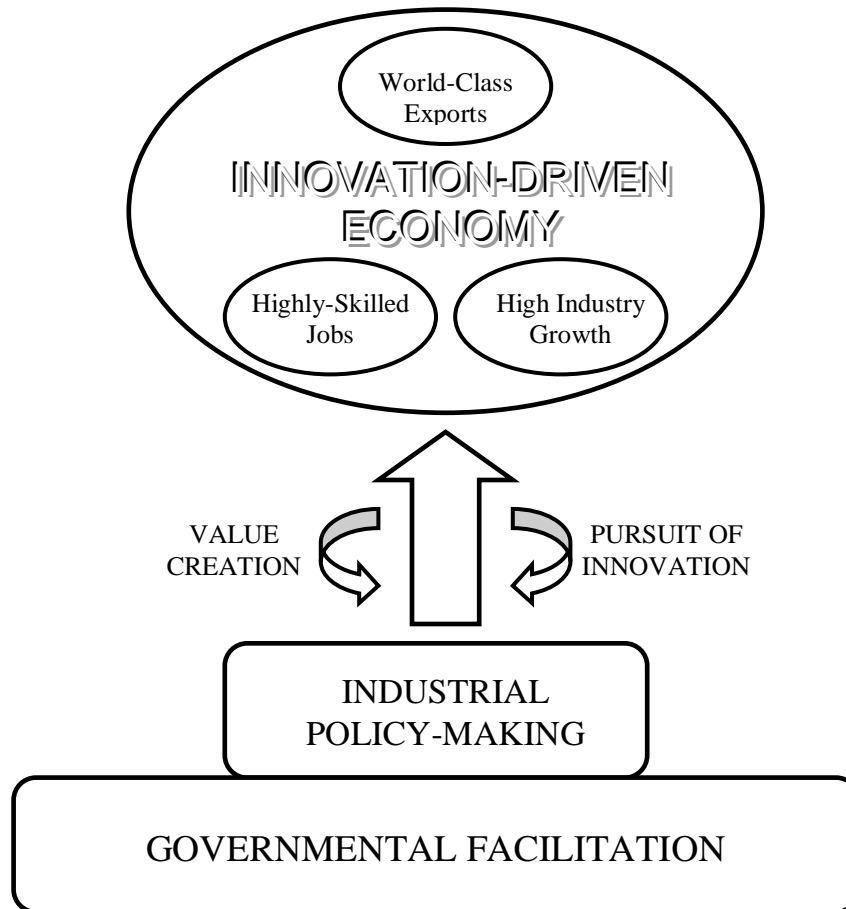
Industry policy-makers must realise that the solutions of past decades based on the old economy paradigm of efficient resource accumulation only will not suffice and may even fail. Instead, intangible assets like human resources and intellectual capital are outstripping traditional assets such as land and labour as the dominant drivers of industrial growth. On the one hand, innovation, which impacts industrial growth, is concerned with the efficient utilisation of scientific, technical, organisational and managerial assets. On the other hand, industrial policy facilitated by government not only must address firms' concerns about efficiency gains and productivity increases, but must also enable firms to maximise entrepreneurial opportunities through the pursuit of innovation. Both are key to economic development and important to developing an innovation-driven economy. It is therefore understandable why industrial policies of developed countries tend to leverage on the strategic role of innovation as a means of generating new business ideas that in turn lead to greater successes in industrial development (Arora and Gambardella, 1994; Jameson and Soule, 1991; Pavitt, 1991).

Furthermore, in today's economic environment, value creation of most products and services has migrated towards innovation, since the latter promotes a climate of embracing continuous change as a motivating force that drives economic development (Goh, 2002; Buckler, 1997; Giget, 1997). Once innovation becomes the lifeblood of firms and mainstay of firms' activities, economic upgrading can be sustained continuously by: creating highly-skilled jobs, producing world-class exports and fuelling high industry growth – which are all the outcomes of an innovation-driven economy as shown in figure 2. In addition, studies have also found that the underlying theme of most industrial policies across the world's developed nations seek to nurture innovation-driven industries. Developing nations can ill-afford to neglect this underpinning of industrial policy thinking in economic management (Goh, 2003; Padmanabhan, 1993; Rothwell, 1992; Peters, 1991). Three supporting reasons are cited.

One, to compete with established incumbents in the global marketplace, innovation provides a strong impetus for firms to introduce new products and services as a means of consolidating their foothold in international competition; and for start-ups to strengthen their relative competitive positions. A pro-innovation stance motivates firms to move beyond mere production and manufacturing that just reproduce what others create, into the realm of being the “creator” of new products and services.

Two, innovation creates new opportunities for industrial growth by constantly improving existing products and services. From the perspective of “competitiveness” considerations, innovations not only invigorate the potential of traditional industries but also rewrite the “rules of the games” in industrial competition. An innovation-focused industrial development fuels the vibrancy of a business enterprise ecosystem to help build competitive industries.

Figure 2: Developing an Innovation-Driven Economy



Three, an industrial environment oriented towards innovation enriches cross-fertilisation, inter-firm collaboration and sharing of ideas, which enhance the overall quality of entrepreneurship. The pursuit of innovation breeds an environment favourable for mobilising intellectual capital to foster enterprise development, and to continually upgrade enterprises through reinvigoration, adaptation and transformation.

Even as developing nations aim to become more proactive, responsive and adaptive in industrial policy-making, much can be learnt from the developed world – which for decades have supported innovation-driven industrial policy. For instance, at the Lisbon Summit in 2000, the European Union (EU) has unanimously placed innovation-driven policy as the top macro-economic strategy for industrial development. As a matter of fact, the United States (US), the United Kingdom (UK), Japan, France, Germany, the Netherlands, Canada, and Sweden are identified as amongst the first developed nations that consistently enacted industrial policies that took into consideration firms' concerns in innovation pursuits to replace the more general industrial policies of earlier years after the second world war.

Of these eight countries, however, some differences in industrial policy thinking

were noted. First, the UK predominantly adopted industrial policies and legislation directed toward the institution of taxes and financial measures. Second, in comparison, about half of the measures enacted by the US related in some manner to the regulation of innovation activities or were laws enacted to establish the legal limits of these activities. Third, in contrast, the industrial policies of Japan, the Netherlands, Canada, and Sweden were more concerned with the impact of innovation pursuits on national interests; and as a result, industrial policies were more oriented toward addressing innovation inputs. Fourth, France and Japan viewed state involvement in large-scale innovation programmes undertaken by the private sector as essential to producing effective results aligned to national economic plans. Fifth, the US, the UK and Germany treated industrial policy concerning innovation as subordinate to general economic policy, and as a result, sought to create a positive climate for innovation through a series of relatively flexible industrial policies as ancillary economic measures. Though the successes of industrial policies amongst developed nations in transforming to an innovation-driven economy are commendable, imitating blindly their much-credited industrial policies would be foolhardy. Each developing country would need to formulate their own industrial policy tailored to its unique political and socio-economic conditions.

Role of Governmental Facilitation

On the debate relating to the effectiveness of industrial policy-making, no topic engenders more arguments, especially in the context of developing an innovation-driven economy, than the role of government facilitation. On the one hand, any industrial policy that intervenes by dispensing government subsidies to businesses is automatically a policy of picking “winners” amongst industry players, as it concerns the decision about which firms the government wishes to support, nurture and develop. Yet, picking “winners” – in the sense of spotting them ahead of the market – is the best result advocates of industrial policy could hope for; as the other alternatives for any subsidy programme are propping up “losers” or worse still, a random distribution of state subsidies. What constitute the traits of a “winner” in innovation is not always obvious. Very often, there exists a gap between market’s method of picking “winners” and that envisioned by the subsidy-granting agency. The celebrated 3M’s “Post-It Notes” is one case in point. It was neither identified as a “winner” nor really sought after by users but later became one of the world’s most popular innovations.

It seems that, while governments should not be directly involved in the implementation activities relating to innovation pursuits, they should facilitate by an institutional approach of broad initiatives. This they should do, firstly, to create the right business environment suitable for a transition to an innovation-driven economy; and secondly, to enable firms to move to higher levels of innovation performance. To extract the full benefits of any industrial policy by governmental facilitation, one must recognise that governments cannot create innovations; ultimately only firms can, and should. Hence, in many instances, the best form of governmental facilitation in any industrial developmental effort is to dismantle, reduce and minimise potential barriers, obstacles and restrictions. At the very least, the government has a public obligation to remove impediments which firms encounter, and to address firms’ concerns in the pursuit of

innovation as stated below (Goh, 2002):

“Governmental institutions must play a catalytic function to develop an innovation-driven economy. The experience of developed countries has evidently demonstrated that a shift of government's industrial policy-making towards an innovation-driven economic strategy is absolutely critical. Allegedly successful industrial policy performs an important function in fostering firms to inculcate a culture-based spirit of innovation and addresses firms' concerns in the realm of innovation pursuits.”

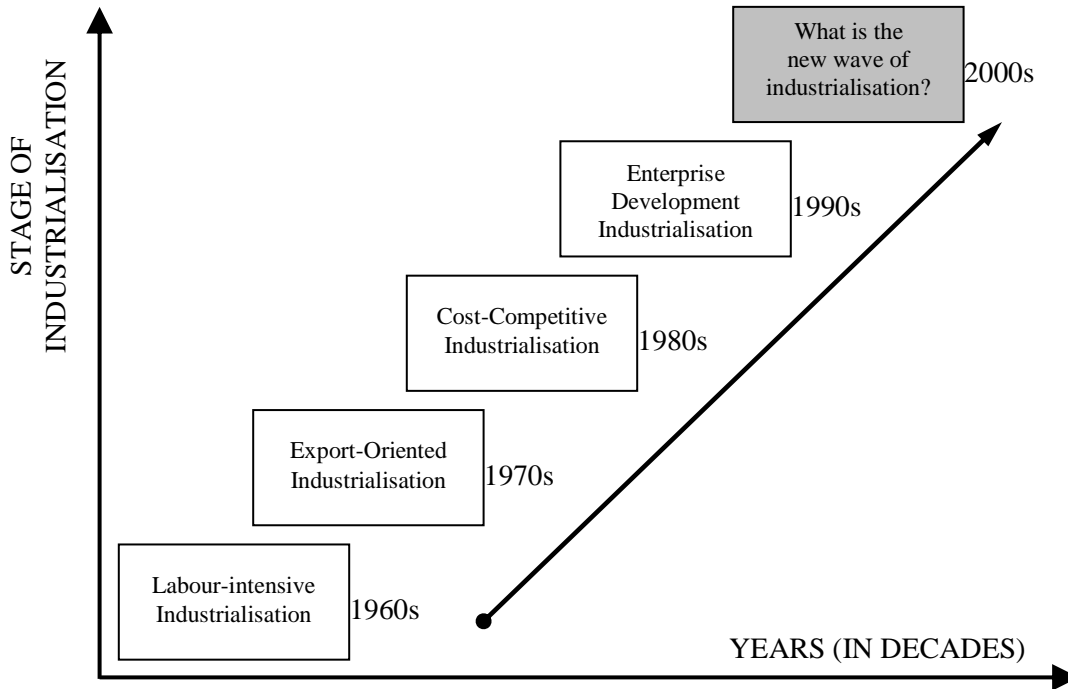
Nevertheless, even if governments possess a highly efficient bureaucracy to formulate effective industrial policies, policy-making is basically pre-emptive in nature. What really works may not be so explicitly known to the policy-maker at the outset. It is more essential that governments adopt a stance of industrial policy pronouncements that support and enable innovation-centred value creation to flourish, whose success depends ultimately on free and open competition. Hence, the role of governmental facilitation towards implementing an innovation-driven economic strategy should only give special attention to specific priority areas where private sector involvement is absent, inappropriate or simply lacking. In these instances, it is important that the criteria for initiating public innovation projects to aid economic development must be transparent and be able to withstand public scrutiny.

An Evolutionary Analysis Of Singapore's Industrialisation

It is difficult to understand the prescriptions of industrial policy developed in any country in the absence of a specific context. Take the case of Singapore, which attained independence from the British on 9 August 1965, only started industrialisation in the mid-sixties. To provide an evolutionary analysis of Singapore's industrial policy-making in relation to how it has helped build the nation to its current state of economic development, its industrialisation process in the last four decades can be classified into stages as illustrated in figure 3:

- (1) labour-intensive industrialisation of the 1960s,
- (2) export-oriented industrialisation of the 1970s,
- (3) cost-competitive industrialisation of the 1980s,
- (4) enterprise development industrialisation of the 1990, and
- (5) what is the new wave of industrialisation?

Figure 3: Evolutionary Analysis of Singapore's Industrialisation



Labour-Intensive Industrialisation of the 1960s

Unlike economies such as Brunei Darussalam, Indonesia, Malaysia, Thailand and the Philippines, which are all naturally endowed with rich and abundant resources, Singapore is devoid of natural resources. Being dependent economically on entrepôt trade, industrialisation began only after the British left. The unemployment rate was high because trading activities alone could not create sufficient jobs for the populace. Due to massive unemployment, it was critical then that industrial policies supporting economic development must lead to more job opportunities. The government thus embarked on industrialisation programmes to build labour-intensive industries as a pragmatic means of solving the severe unemployment problems plaguing the country. The government's immediate task then was to maximise employment creation to prevent social unrest and political upheaval (Tan, 1995; Wong, 1995).

Little priority was given to foster an innovative culture in the workforce, even for industries that are capital-driven and equipment-intensive. National innovation programmes were met with scepticism by trade unionists because large-scale innovation projects were viewed as industrial initiatives that would lead to eventual job losses. Industrial policies were thus explicitly focused on job creation for Singapore to survive economically and politically as a newly-born nation. With an open-door policy of welcoming foreign investors to set up factories and hence provide more jobs, industrial policy-making dealt extensively with labour-related issues to protect employment concerns. By refraining from creating a socialist welfare state, the government's industrial policies supported a labour-intensive industrialisation strategy. Built upon this

sense of purpose, Singapore prided itself as one of the first developing countries in the world to enact labour laws that granted workers compensation rights to further the cause of labour-intensive industrialisation. The country's subsequent success in industrial harmony, peace and discipline was in fact attributed to a system of collective bargaining, conciliation, arbitration and the tripartite co-operation among trade unions, employers and the government (Wong, 1992; Chew and Goh, 1993; Tan, 1995).

Export-Oriented Industrialisation of the 1970s

In the 1970s, without indigenous firms capable of producing exports, Singapore faced enormous pressure to import productive capacity. Industrial policies were thus aimed at attracting an inflow of foreign direct investments (FDIs) from developed countries to Singapore to increase productive capacity (Choy, 1983; Chew and Goh, 1993). This was essential because, as a small nation, Singapore could attain rapid economic growth by exporting overseas to increase productive outputs beyond domestic demand. It needed foreign MNCs to achieve trade surpluses by an export-oriented industrialisation policy (Rugman, 1983; Rosenberg and Birzell, 1986; Goh, 2002).

To attract MNCs to the country, the dominant industrial policy focus was to make Singapore a choice location compared to neighbouring countries. As the island republic was an ideal business haven by virtue of its strategic trading location, harmonious industrial relations climate, well-equipped physical infrastructure and a relatively skilled workforce, coupled with political stability⁴, MNCs were lured to locate their business activities in Singapore. With MNCs supporting the government's industrialisation efforts, the country enjoyed double-digit economic growth rates almost every year in the seventies and a vibrant manufacturing sector was created. The country's industry structure was also expanded to include new sectors that were more technology-based and higher in value-added output.

By seizing opportunities arising from the influx of MNCs, the government mounted major economic programmes to deepen the industrialisation process. It implemented industrial policies to increase capital-driven investments since these investments provided the added potential for capability development, technology acquisition and renewal of international business practices for Singapore's industries. Notwithstanding the advantageous costs of production and factors of efficiency that constituted the overall pull factor to Singapore, the government's primary economic objective was to root MNCs in the country to advance the industrialisation process in tandem with its long-term economic progress. It hence adopted a selectively interventionist approach of industrial policy-making, with MNCs playing a key role, to develop a competitive export-oriented climate.

Cost-Competitive Industrialisation of the 1980s

By the 1980s, industrialisation was firmly established in several sectors of industry such as electronic parts manufacturing, construction and building engineering, logistics, and banking and finance. Unemployment was no longer a pressing social concern of the state. Despite its small size with a population of less than three million, Singapore enjoyed an average gross domestic product (GDP) growth of 8.5% every year

in the early 1980s. But in 1985, the country went through a period of economic recession with a negative gross domestic product (GDP) growth of 1.6%. It came as a rude shock to the political leaders and industrial policy-makers alike; and was attributed to the erosion of the country's cost competitiveness that forced many foreign firms to move their business operations to other surrounding low-cost locations. The government led a high-level Economic Committee to review and chart new directions for the economy to stay competitive. Through a whole host of cost-cutting measures, by the end of 1986, the nation emerged from the economic recession with a growth rate of 1.8%. Despite being modest compared to the double-digit economic growth rates in the seventies, investors' confidence was gradually restored. The government learnt an important lesson from the economic recession: that it is crucial to be cost competitive, coupled with other economic factors of production (such as strong productivity growth) and most importantly, enable firms to implement new cost structures to maintain business competitiveness (Giget, 1997; Tan, 1995; Grossman and Helpman, 1992).

It became clear to policy-makers, though not publicly acknowledged that the underlying reason for the economic recession in 1985 was the nation's reliance, perhaps overly so, on MNCs for foreign capital, investments and trade. As global competition intensified, Singapore had to move a step ahead of its competitors and build upon the foundation already established through strategic partnerships with MNCs. The government believed that for economic growth to be sustainable, while business costs continue to rise, it was crucial to ensure that the overall growth rate resulting from economic factors of industrial production exceeds business cost increases. Thriving on the success of recovering Singapore from the economic recession, industrial policies were subsequently refined to enhance its overall competitiveness vis-à-vis regional economies. Economic measures were thus implemented to support the pursuance of a cost-competitive industrial policy throughout the eighties.

Enterprise Development Industrialisation of the 1990s

In the 1990s, the economic growth of Singapore was modelled after that of the East Asian Economic model characterised by strong government dominance. It was recognised that industrial policies bent on maintaining trade surpluses with heavy reliance on exports make countries economically dependent, vulnerable and susceptible to the rise and fall of demand for export markets. Such industrial policies do not work effectively, at least not anymore, in a world of intense global competition. It is evident that as Singapore became more developed economically, its cost-competitive advantage has diminished comparatively. Countries such as China, India, Indonesia, Malaysia, Philippines, Thailand and Vietnam are able to offer a business haven of lower operating costs with abundant manpower, industrial land and natural resources, with huge market potential for business expansion.

To refrain from attracting foreign investments on the basis of cost advantage alone, new industrial policies were introduced to differentiate Singapore in terms of total value-added output of business activities and services. The shift in industrial policy was thus to maximise potential for economic growth through enterprise development. To support entrepreneurship, the government intensified its investments in the public sector, while at the same time, promoted spending in the private sector through incentives. On the international front, Singapore's firms were encouraged to be more entrepreneurial in

the global economy. The strategic intent was to raise the level of indigenous expertise of Singapore's workforce in selective industry sectors to international standards, so that the country could compete in the world stage. As the Singapore domestic market was too small and over-saturated to sustain any further economic growth, the government embarked on programmes to develop an "external economy" by encouraging Singapore's firms to venture abroad.

Government agencies mounted an aggressive regionalisation drive to export the products and services of Singapore's firms to other parts of Asia. To champion the regionalisation drive, the government also jointly developed Singapore-modelled industrial parks with local authorities in parts of China, India, Indonesia and Vietnam. Learning from the experience of MNCs, Singaporean firms were located 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 Triangle⁵. These efforts were timely, as regional economies had begun to adopt open-door economic policies.

With the global opportunities offered by freer trade since early 1990s, the challenge facing Singapore's firms was to develop highly productive and capital-intensive industries (wafer fabrication plants and pharmaceutical manufacturing plants, for example). Thus, through enterprise development industrialisation, it was hoped that new opportunities could be created for Singapore's firms to increase their industrial growth potential and to build an international network of industrial assets; and by the late 1990s, Singapore's real per capita income level matched that of most EU countries.

In the last few years, Singapore has begun to transform itself into a knowledge economy⁶ that builds upon own innovations rather than on the import of ready-made innovations from MNCs. Increasingly, this is now occupying the minds of industrial policy-makers in most developing countries.

New Wave of Industrialisation

Singapore's economic development since independence in 1965 has been widely hailed as "remarkable", with an average annual economic growth rate of about 8 percent in the last four decades as shown in figure 4. This was made possible due to effective industrial policy-making that upgraded industrial development to increasingly high value-added production. For the decade between 1960 and 1970, per capita income doubled, and more than trebled during the decade of 1970 to 1980. Per capita income again rose four-fold from 1980 to 1990.

By the early 2000s, Singapore was already one of the world's largest manufacturers of disk drives, tape drives, refrigerator compressors and proprietary pharmaceuticals with about 6000 MNCs setting up their business operations in the country. Other leading industry sectors include computer peripherals, shipbuilding, and petroleum refinery. These MNCs⁷, through their branches and subsidiaries located in Singapore, have expanded the scope of business beyond mere off-shore manufacturing to areas like merchandising, logistics management, customer support services, financial management and regional procurement.

Figure 4: Economic Growth In Singapore 1960 to 2000

	1960-70	1970-80	1980-90	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 Singapore dollars)	1,330	2,825	9,941	42,212

Source: Yearbook of Statistics Singapore

Because industrial development should be equally dependent on both indigenous firms and MNCs to sustain the country's long-term economic growth, the next stage of industrialisation must specifically nurture the former. In the case of Singapore, government institutions, industries and firms have traditionally focused on investment in physical assets such as sophisticated machinery and high-tech equipment, and have been somewhat slow to recognise the critical importance of knowledge assets. In recent years, Singapore has gradually focused on high value-added activities in the manufacturing sector, and the expansion of other knowledge and skill intensive activities. It has also established the knowledge intensive parts of the service sector such as accounting, marketing, legal services and management consultancy. To show the context of Singapore's economic development, a profile of its macro-economic indicators is summarised in figure 5.

Having recently concluded the Free Trade Agreements (FTAs) with the United States, Japan, Australia, New Zealand and the European Free Trade Association; and with better protection of intellectual property rights (IPR), Singapore's new wave of industrialisation must dedicate its efforts at developing an innovation-driven economy. As more FTAs⁸ are established, industries not only derive cost savings from lower tariffs and reduced technical barriers but stand to gain from better market accessibility, enhanced investment opportunities and more knowledge-intensive commercial activities. With innovations increasingly becoming the much sought-after assets for a knowledge economy, the success of future industrial policy is centred on the pursuit of innovation.

Figure 5: Macro-Economic Indicators For Singapore

INDICATOR	IN US\$
Gross Domestic Product ^a (GDP)	84.9 billion
GDP Per Capita	21,814
Real GDP Growth ^b	5.35%
Real Growth in Industrial Production ^c	8.8%
Export of Goods	114.6 billion
Growth in Export of Goods ^d	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)

But to be truly effective, its industrial policy-making efforts must also fit its socio-economic conditions – which are unique and have taken several decades to reach its current state. Economic transformation of Singapore would be difficult to achieve except through industrial upgrading; and the new wave of industrialisation warrants a deliberate shift of industrial policy in support of innovation, as articulated in Singapore’s Innovation Manifesto. Stated as a six-point declaration as shown in figure 6, future industrial policy-making and its implementation should be approached with like-minded ideology.

Together with the Innovation Manifesto, the Singapore’s government also elaborated the five pivotal points about innovation to place emphasis on the effective implementation of innovation. As summarised below, these points ground the concept of innovation in its value as a change process that results in quantum leaps.

- (1) Innovation takes many forms. Innovation can be a process, product, service, or anything that helps firms to perform better.

Figure 6: Singapore Innovation Manifesto

The Innovation Manifesto

We see Singapore as an Innovative Society that is able to offers limitless opportunities for all in the Knowledge Based Society. The Public Service for the 21st century, as an integral component of society, has to continually re-invent itself to support the innovative and enterprise movement so as to better anticipate, welcome and execute change. In doing so, we will be guided by the following principles:

- People want challenge in their work and recognition for what they do. People want to contribute and know that their contributions matter. Hence, they are motivated to contribute to a worthwhile higher purpose and cause, beyond self-interest.
- Everyone has talent and ability. Each individual has something to contribute and diversity of views must be encouraged for non-linear thinking and analysis.
- People want to improve themselves and can do so. People have an inherent thirst to learn. They can improve given time, opportunity and training.
- Individuals best realise and maximise their creative value through collaboration with others. Collaboration may vary from a network of relations to an integrated organisation. Innovation thrives best in a vibrant environment as opposed to being in a vacuum.
- Everyone thinking and doing will achieve more than a few thinking and doing. This is especially critical for Singapore with our limited manpower, to succeed, we will need to leverage on the diverse knowledge, skills and expertise of every single individual.
- The manager's role is to facilitate and allow his staff to optimise their innovative capacity. By instilling a sense of purpose and creating the broad framework and safe environment in which the staff could operate - new ideas, experiments and change become the norm rather than the exception. Supervisors must move from "managing resources" to "leading and inspiring people". Leadership skills must be honed for the New Economy.

We challenge everyone to ask themselves:

HAVE YOU INNOVATED TODAY?

© Courtesy of the Singapore's Public Service

- (2) Innovation can originate from anyone. Anyone can innovate, as innovation requires a mindset that probes perceived boundaries to bring new ideas to fruition.
- (3) Innovation is not creativity alone. Innovation is more than creativity as it begins with an idea and subsequent implementation to produce new value.
- (4) Innovation is more than improvement. Improvement is the refinement of existing methods to get more output from the same input while innovation breaks new ground, giving new outputs from less or different inputs.

- (5) Innovation pays in quantum amounts. The impact of innovation results in quantum leaps in value creation that encompasses effective results.

Apart from the Innovation Manifesto, the Singapore's Public Service also identified ten factors critical to the "health of innovation" in any organisation. Through consultations with world's most innovative organisations in both the private and public sectors, the critical factors are listed in figure 7 as follows:

- (1) **Figure 7: Critical Factors for Innovation** Passion for Fuel: Commotional Motion. An innovative organisation is first a motivated one. It acts for a cause that is powerful enough to stir the passion of its people.
- (2) Fish-Eye Vision: Broaden the Mission. The innovative organisation stretches and broadens the way it looks at its mission.
- (3) Mindset Makeover: Risk to Opportunity. To be innovative, it is necessary to shift the mindset away from incumbency to welcome change. A mindset makeover is what lies between the "before" and "after," what allows a risk to become an opportunity.
- (4) Open-House Day, Everyday. An open organisational culture, which allows for continual sharing and dispels fear of failure, will lead to an Open-House atmosphere in which innovation can thrive.
- (5) F.M. Radio: Fresh Mentalities on Air. An organisation intent on being innovative makes sure to devote airtime to the young and less experienced in the ranks so that they can bring fresh mentalities and perspectives to the drawing table.
- (6) Mindreader: System for Sharing. Innovation flourishes best where the free, unhindered flow of information is enabled. To this end, a viable system for sharing – of ideas, tacit knowledge, techniques, lessons and mistakes – must be in place so that the entire organisation enjoys the collective knowledge of its people and their experiences. The organisation can virtually "tap" into the minds of all its members.
- (7) Mandollar: Invest in People. To count on people in an organisation (and we need to since people are the generators and storehouses of ideas), we need to learn to count people in. We need to view them as crucial and valuable investments, both when we hire them for the strength of their values, and as we enhance them through training and continuous learning.
- (8) Stun-Gun: Fire Shocks at the System. The Stun-Gun makes it impossible for an organisation to rest on its laurels, simulating conditions that call for alertness and imagination, bringing about innovation where complacency might otherwise reside.
- (9) Good Old R&R: Recognition and Rewards. Organisations that have successfully implemented innovation always appreciate and celebrate, in monetary and non-monetary manners, the good work of its innovators.
- (10) Tag-Team Innovation. Wherever possible, innovation is aided by the value-creating, barrier-crossing, resource-harnessing cooperation of organisations and collaboration of people across ranks, jurisdictions, and sectors.

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New Challenges Of Industrial Policy-Making

Even in the best of circumstances, industrial policy is a tricky business, let alone the focused intention of developing an innovation-driven economy that must produce positive consequences in economic progress. Presently, as far as industrial policy-making is concerned, all nations of the world are undergoing a trying time due to the new challenges of economic development arising from changes in labour productivity, industry structuring and international trade. Together with the global economic gloom in the last seven years that has placed unprecedented strain on all industries to remain competitive, developing economies urgently requires a primary focus in industrial policy-making.

Yet, we all know that the most demanding challenge posed to industrial policy-makers is to accommodate between a set of industrial system ideas that constitute the currency of contemporary debate; and its formulation based on the reality of concerns arising from the debate. As globalisation hastens and cross-border barriers between nations are dismantled, economies will rely less on natural resources and more on human capital. With the new global economic paradigm gradually emerging to be highly knowledge-intensive - which dictates the way businesses compete, it seems convincing that innovation-driven value creation will be the “best bet” for developing nations to remain competitive and to secure high economic growth. This article has argued that, with the growing importance for a transition to a knowledge economy, the primary focus in industrial policy-making should be innovation - which offers opportunities for developing nations to enhance their global competitiveness through areas such as new product development, high-tech venture creation and the like; and hence shape their economic destiny. From the standpoint of industrial policy-makers, the search for answers lies nowhere but within the innovation landscape.

However, due to the success stories of the industrialised world, policy makers and central planners have argued fervently for a greater role of interventionist⁹ industrial policies as models of economic development for developing nations. While many schools of thought in economic planning agree that the pursuit of innovation constitutes the driving force behind the competitive performance of nations, the substance of its supporting industrial policy is still subject to debate. To cite one example - although an interventionist role may aid in the initial pre-competitive phase of any innovation project, a more “neutral” approach to state assistance for innovation pursuits is generally favoured. In some instances, there may be no compelling reason for state intervention in a particular innovation project, where governmental actions are neither efficient nor needful. One case in point was the US government’s US\$1 billion involvement to help defence contractors develop high-speed integrated circuits (ICs) for military equipment only to find out later that Intel got there first on their own without any federal funding. For this reason, some critics oppose industrial policy intervention in the domain of private sector business and strongly discredit its relevance because it is viewed as unnecessary and fruitless, since firms are themselves jumping on the bandwagon of joint ventures, mergers and strategic alliances to initiate innovation projects.

While numerous studies were undertaken on innovation at the firm level, most of the literature in this field continues to offer limited guidance to industrial policy-making.

This article has thus taken a closer look at how industrial policy-making can address issues surrounding the pursuit of innovation. These issues collectively constitute a normative quest to further extend understanding on effective industrial policy-making, in particular, as to how government facilitation can aid innovation-driven economic development. To offer further insights, it is important to articulate the new challenges facing industrial policy-makers which merit attention.

Firstly, as innovation encompasses the application of different aspects of technologies, processes, techniques; and organisational, social, economic and other forms of codified knowledge, it requires the integration of human imagination, intuition and creativity at all levels to achieve success. To unleash the potential of innovators, industrial policy-making must therefore enable innovation-related imperatives to permeate all layers of industry - societal, organisational and humanistic structures. This would then enable the economy to adapt its industries, with appropriate human capital, to participate in the mainstream activities of international trade and investment.

Secondly, although the main purpose of industrial policy-making is to aid economic development, it should not be viewed as the “magic cure” for ailing economies. Paradoxical as it may sound, the fewer industrial policies a national economy requires, is also a reflection that its economic policies have taken care of the country’s industrial policy imperatives. The challenge posed to governments involves transforming economic agencies, statutory bodies, and public organisations tasked with economic developmental functions to champion innovation-friendly rules, regulations and legislation. Take for instance, governments should introduce liberalised laws relating to industrial investments that involve innovation pursuits, especially with respect to providing better protection and guarantees to ownership issues.

Thirdly, for the benefits of an innovation-driven industrial policy stance to be felt, it must be implemented within an enabling environment. In an industrial policy ecosystem, an enabling environment includes, *inter alia*, stable socio-political conditions; an effective system of corporate law and guarantees for intellectual property rights; an all-round educational system; availability of well-developed physical infrastructure like electric power, transportation and telecommunications; institutional infrastructure and mechanisms for mobilisation of “investible resources”; and providing institutional support for the developing competitive and sustainable capability in innovation.

In conclusion, like any form of public policy, industrial policy, too, is formulated without “perfect capacity” for understanding everything in its detailed sense on what will work and what will not. In reality, it contains an element of “approximation” – meaning that any industrial policy is not really “final” but always subject to “modification”. Yet, it is apparent that, although industrial policies in developing countries have at various stages been influenced by political and socio-economic priorities, present-day industrial policy-makers seem to show a strong preference for the institutional approach of creating and fostering a business environment favourable to promoting innovation. But it must be acknowledged that the ultimate goal of developing a truly effective industrial policy to achieve an innovation-driven economy is perhaps one for all policy-makers to strive for, but never to be fully accomplished. Clearly, an institutional approach, tailored to the country’s unique context, of governmental facilitation, subject to constant “fine-tuning”, stands a far better chance of success.

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Dr Andrew Goh received his PhD and MSc degrees from the University of London. He has published widely in international refereed journals, *inter alia*, the International Journal of Technology, Policy & Management (IJTPM); the International Journal for Public Sector Management (IJPSM); the Journal for Institutional Innovation, Development & Transition (JIIDT); the International Journal of Applied Management & Technology (IJAMT); the International Journal of Innovation & Learning (IJIL); the Electronic Journal of Knowledge Management (EJKM); the Australian Journal of Information Systems (AJIS); and the Journal of Knowledge Management Practice (JKMP). His current research interests lies in knowledge and innovation management, industrial policy and business strategy.

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Endnotes:

- (1) Industrial policy can be defined as a wide range of government actions designed to promote growth and increase the competitiveness of a particular sector or sectors in an economy. Such actions often imply preferential treatment.
- (2) Traditional industrial policy instruments include macro-economic and tax policies, subsidies, government procurement programmes, support to research and development (R&D), procedures for elaborating technical standards, education and infrastructure improvement programmes, favourable anti-trust regimes, export assistance, and foreign trade and investment policies.
- (3) An approach of selective intervention strives for a ‘middle way’ stance to policy-making. It is neither a completely ‘hands-off’ industrial policy nor an industrial policy of *laissez faire*, but one which intervenes ‘selectively’.
- (4) 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 now).
- (5) 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 the same as how the established foreign MNCs regard Singapore in the 1970s.
- (6) 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.
- (7) In the 1990s, on the average, about 75 percent of Singapore’s manufacturing output and 80 percent of exports are from foreign MNCs.
- (8) Singapore’s growing portfolio of FTAs has kept its trading activity buzzing. Due to the increasing FTA portfolio, Singapore’s direct investments overseas rose from \$22 billion in 1992 to \$146 billion in the past decade. In all, they account for more than 27 percent of Singapore’s domestic trade (Straits Times, 2004).
- (9) In practice, nations in the ‘catch-up’ stage of economic development tend to pursue more interventionist industrial policies than developed nations (COM, 1994).