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Create or Nurture?

Lessons from Cyberjaya: Malaysia's Promised Silicon Valley

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Introduction

Agglomeration economies, geographical concentration of firms and clusters, have become recurring and prominent themes in modern industrial policies. These geographical concentrations serve a wide range of purposes: from low cost production centers to high tech innovation hubs. These special zones or corridors may be linked with an export market or with a domestic market. Regardless of the purpose and linkage, the zones feature in all industrial policies. Given the relatively high degree of success which certain clusters have enjoyed, the industrial policy in developing countries aspires to replicate this feature of geographical concentration of firms. The outcome of replication is a heavily contested topic in the literature and the present essay will hopefully make a small contribution to this literature.

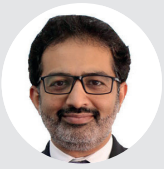
The main motivation is to study the role of government in the design and success of an industrial policy by analyzing industrial clusters. The overarching question is whether the government should create a cluster from scratch or nurture an existing one? The setting is an industrial and innovation cluster called Cyberjaya in Malaysia, which is one of the 25 most competitive economies in the world as ranked by the World Economic Forum and is ranked amongst the top 25 countries in terms of ease of doing business by the World Bank. Historically, Malaysia is considered a successful example of an active and deliberate industrial policy, which has helped in making this country one of the top manufacturing hubs for electric and electronic goods, including semi-conductors.

The methodology is literature review including government data. The literature covers both international and local facets of industrial and innovation clusters. The essay draws comparison between the arch type of the innovation cluster, California's Silicon Valley, and Cyberjaya, once dubbed as Malaysia's answer to Silicon Valley. The most important difference between these two clusters is that the Silicon Valley is considered an organic structure whereas Cyberjaya is recognized as a direct result of a deliberate public policy.

Why choose Cyberjaya as a case study? There are different reasons. First, the Cyberjaya example is extremely helpful in answering our main research question: to understand the role of government in industrial policy and especially explain the consequences of a centrally planned industrial cluster. Second, there is sufficient literature available on Cyberjaya which is crucial for our essay. Third, about twenty years have passed since Cyberjaya was launched offering us an advantage of hindsight while benefitting from availability of relevant economic data. A fourth reason is that Malaysia has re-elected Dr. Mahathir Mohamad as the prime minister after fifteen years, again, whose personal ambition is considered critical in launching this city. Thus, this essay may offer some policy lessons for the newly elected government.

After the introduction, the essay delineates the conceptual issues behind agglomeration economies and innovation clusters while giving some details about Silicon Valley itself. This part concludes by developing a general conceptual framework by indicating necessary ingredients of

success. The second part introduces Cyberjaya as a Malaysian government initiative to transform the location as the hub of innovation in the region and in the world. This part provides historical background of Cyberjaya and some information about its contribution in the jobs creation and export revenue. It then introduces the main literature produced on Cyberjaya and presents main lessons drawn. The paper concludes by drawing lessons from the successes and failures of Cyberjaya as a planned cluster, while underscoring the spontaneous order and government nurturing behind the original Silicon Valley.



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Agglomeration Economies and Rise of Industrial Clusters

Agglomeration economies are characterised by co-location benefits and external economies of scale which are exhibited in geographical concentration of firms. Michael Porter considers these concentrations, called clusters, a fundamental competitive advantage of nations. In his words:

> "The enduring competitive advantages in a global economy are often heavily local, arising from concentrations of highly specialised skills and knowledge, institutions, rivals, related businesses, and sophisticated customers. Geographic, cultural and institutional proximity leads to special access, closer relationships, better information, powerful incentives, and other advantages in productivity and innovation that are difficult to tap from a distance. (Porter, 1998, p.90)"

This marks the ascent of clusters in the history of both industrialized economies and newly industrialized nations. An industrial cluster is a set of industries related through buyer-supplier and supplier-buyer relationships, or by common technologies, common buyers/distribution channels or common labour pools (Porter, 1998). Whereas a region can [also] develop its own regional competencies and become a 'sticky' place and prosper' (Markusen, 1996).

Successful clusters may arise due to geographical, historical and institutional factors. Evolution of clusters is helped by access to a pool of skilled local labour and suppliers; local infrastructure and transport networks, emergence of codes of conduct and trade practices; and close (physical) proximity of firms and institutions which can facilitate a 'Marshallian industrial atmosphere', of tacit knowledge flows between (local) actors/firms and the exchange of ideas, generating positive externalities. (Krugman, 1991; Porter, 1990; Porter, 1998).

Durantan and Kerr (2015) have argued that models of agglomeration feature an upward sloping wage curve where increases in a locations economic activity boost the productivity of firms in the city or cluster and the wages that they pay (Durantan and Kerr 2015, p.3).

Kenny points out that Route 128 and Silicon Valley both had the finest research universities in the United States. Growth in their industries have been driven by entrepreneurship (Kenny 1999, p. 68). Counting the factors, he writes that variables critical to high – tech development of the two regions: supplier networks, proximity to research universities, labor mobility, cutting-edge technology, abundance of venture capital, and entrepreneurship have played important role.

Krugman has explained the rise of industrial clusters using the center-periphery dichotomy, treating industrial clusters at the center and other industries as peripheries (Krugman, 2009, p.485).

He has argued that manufacturing sites tend to be concentrated in few sites as it yields economies of scale, but more importantly, these sites serve bigger markets, and finally the markets then create a positive feedback to allow further deepening of industrial clusters.

Bailey, D. (2003) has argued that globalisation is prompting a refocusing on localized geographical agglomeration and spatial clustering, with regional scale canonized as a functional space for economic planning and political governance. He writes that all approaches share a common view that regional success or competitive advantage is to a large part embedded in social capital.

Bathelt, H., Malmberg. A. and Maskell. P. (2004) have worked on the spatial clustering of economic activity largely from the spatiality of knowledge perspective and interactive learning processes. They use the word "buzz" for transfer of tacit knowledge at local level and word "pipeline" for transfer of knowledge at global level. They consider both types of media important but recommend that policy makers will be better off by investing in the pipelines rather than artificially creating local buzz, which they consider tantamount to social engineering (p.49).

In their article, Tomlinson and Branston (2014) use a life cycle approach to explain the rise, decline and fall or transition of industrial clusters and recommend widening of technological heterogeneity, more diffused governance structures, and re-invigorated collaborative networks.

In his extensive examination of the factors which led to the evolution of clusters, Vazquez-Barquero (2006) emphasizes self-organizing processes. He points to factors like lowering production and coordination costs in cluster firms. He mentions that firms within a cluster share a culture, history and institutions that emerge spontaneously. The emergence and development of a cluster is a process of self-organization based on the firm's strategies, and the interaction between the firms and the territory. Economies of scale, reduction of transaction costs and agglomeration economies make clusters an efficient organization of production mechanisms, and favour the growth of local firms, and their competitive advantage strengthens their presence in the market. However, market forces do not guarantee the steady growth of clusters and local productive systems (Vazquez-Barquero, 2006, p.19).

Silicon Valley

Silicon Valley, in the southern San Francisco Bay Area of California, is home to many start-up and global technology companies. Apple, Facebook and Google are among the most prominent. It's also the site of technology-focused institutions centered around Palo Alto's Stanford University. Started from the first signal of the Telegraph received from a US ship returning from the Spanish-American war in 1899 to internet as a requirement of US department of defence in 1960s, to present day giants like Facebook and Google, Silicon Valley has always represented disruptive technologies with high degree of commercial success.

Silicon Valley is widely presented in the literature on agglomeration economics as the arch type of innovation clusters for other countries. It is understood that an aggregation of entrepreneurs, venture capital investors, mature corporations and strategic investors, universities, R&D centers and specialized service providers and management has played vital role in the evolution of Silicon Valley. In an article "Global Clusters of Innovation: Lesson from Silicon Valley", Engel (2015) has identified essential components as well as behaviours that define successful clusters of innovation, while considering Silicon Valley as the arch type. This is based on a world-wide study in which he led a team studying 13 innovation clusters in 11 countries spread across North America, Europe, Latin America, Asia and the Middle East. The author has subsequently laid out lessons for government, policy makers as well as for businesses. The lessons for the government and policy makers are briefly captured here.

Importantly, Engel believes that *"many cluster initiatives fail when government attempts to engineer an entirely new cluster from scratch, directed by policy and theory."* (Engel, 2015, p.52, italics added). He further argues that, "Top-down policies can help articulate a vision, but government initiatives are most successful when they focus primarily on incumbent stakeholders, not on emergent elements of society and the economy. It is essential to empower and enable innovation from the bottom, building on local innovations and successes (Engel, 2015, p.53)."

While documenting lessons from Silicon Valley success, Berger and Brem (2016) have highlighted the role of American defence and space policy especially NASA and US military. In addition, they emphasize on the cultural attribute of the courage to "fail successfully" (Berger and Brem, 2016, p.59).

Macdonald (2016) in his fascinating and convincing article "Milking the myth: innovation funding in theory and practice" has taken a contradictory view to the widely held notion of the role of universities in general, and that of Stanford University in particular, in the technology transfer and innovation. Based on his decades of research, he has concluded that the knowledge about innovation has flown more from the industry to firms, rather than vice versa. His analysis weakens the centrality of a research university or a so-called science park in the spread of innovation.

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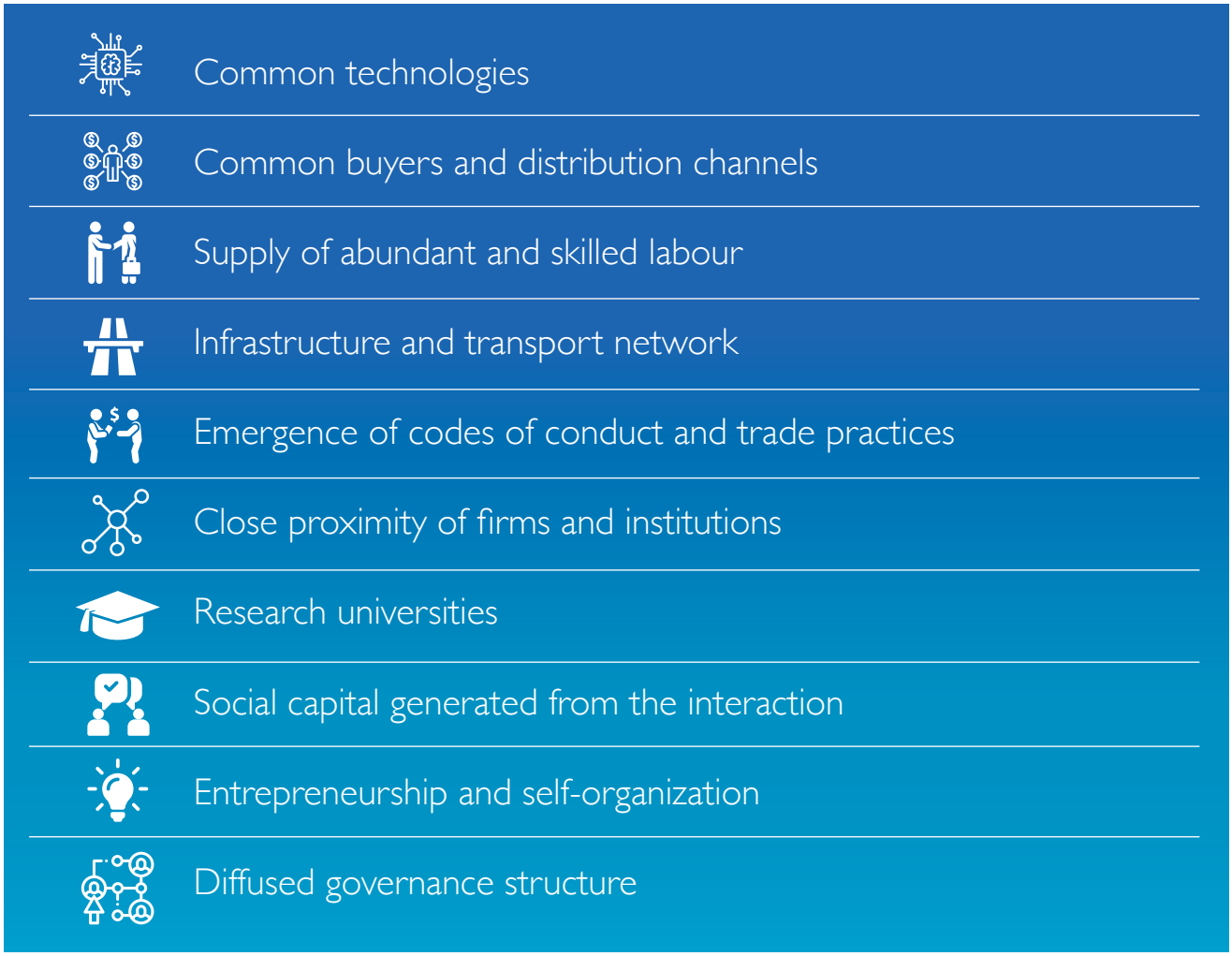
Major Ingredients

We now attempt to consolidate the discussion and identify some of the common and critical factors which should be present before any government embarks on creation of industrial clusters. These 'building blocks' are indicated with the important disclaimer that a replication of these building blocks may not lead to a successful cluster. Ultimately, it is not just ingredients which matter, rather the recipe, which matters more. A recipe denotes both relative quantity of each ingredient and fundamentally, the process, through which these ingredients are added. Based on the study of industrial clusters located in the West, these building blocks or ingredients are:



From Silicon Valley, our arch-type of innovation clusters, we can list additional ingredients.

From this discussion, we conclude that industrial clusters hold a special importance in industrial development and economic growth of a nation. That explains why the modern industrial policy accords special importance to clusters, zones and corridors. A lot of literature has been produced on finding the right mix or a 'recipe' of success. Especially in the context of ICT based clusters, these standard recipes would include presence of one or two hi-tech universities, venture capital and favourable laws. However, as one would expect that while many elements are common, there is no single route to success. It is not just universities which contribute but research inputs have equally been contributed by large firms like Hewellet & Packard and Intel. We can say with some degree of confidence that abundant supply of skilled labour and proximity to markets or access to global markets on the demand side are two vital factors. The factor of physical connectivity is important and cannot be discounted but in the ICT sector, where services and products often travel without a physical or hard infrastructure, the physical connectivity is less important. Although of course, even soft infrastructure relies on stable and reliable supply of electricity and telecom facilities including fiber optics.

Role of Government

The list of ingredients remains incomplete without mentioning the role of government and public policy. We have deliberately not included it in the list, in order to accurately reflect the literature on industrial policy especially written on the clusters in the West, which has not accorded prominence to the role of the government. Thus, the difficult policy question is: what is the role of the government in the creation, expansion and growth of an industrial cluster? To simplify, does the government play the role of a creator or a facilitator? Do firms cluster themselves spontaneously or under a government directive? And once a cluster exists, then does government play a further role in expansion by say, investing in infrastructure?

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It is important to clarify that the role of government in the case of Silicon Valley was not on the supply side (as a planner), but serves as a demand, which was defense related in the particular case of the US. Thus, it is simplistic to present this as a case where government and public policy played a deliberate role. This demand function can be substituted by local industry or by internationalization, including exports. Thus, it leaves us with the need to investigate further the exact role of government in nurturing a cluster.

In the case of industrial clusters in Asia, the role of government becomes more noticeable, or at least it gets more prominence in the literature. Is there a difference between a spontaneous or organic cluster and planned or policy led cluster? The following discussion is an attempt to locate the role of government in the formation of industrial and innovation clusters.

Nurtured or planned? Policy led or spontaneous order?

In their comparative account of industrial clusters around the world, Brasnahan, Gambardella and Saxenian (2001) have reviewed the performance of a wide number of clusters, especially focusing on Information and Communication Technologies. They have included clusters from Northern Virginia (US), Cambridge (UK), Ireland, Israel, India and Taiwan. They have concluded that building economic fundamentals and finding the "spark of entrepreneurship" is a prior condition before industrial clusters can kick off as source of economic growth.

These economic fundamentals include: firm-building capabilities, managerial skills, substantial labour supply and connection to markets including links with commercially oriented activities in universities and laboratories. They also point out that at the time of foundation, Silicon Valley had no mentoring facilities for young entrepreneurs or network of suppliers and marketing partners. (Brasnahan, Gambardella and Saxenian, 2001, p.857). In their words:

> "It is particularly significant that Silicon Valley 40 years ago is also closer to today's nascent clusters than either is to the Silicon Valley of today (Ibid, p.842)."

Technological and market opportunity are important determinants of success of ICT based clusters. However, the routes of success for industrial clusters vary a great deal. What matters is the ultimate outcome and not a specific mechanism or a recipe.

More importantly, they write that *"clusters of innovative activity do not respond well to being directed, organized or jump-started, entrepreneurship being a quirky thing"* (Ibid, p.857, italics added).

Su and Hung (2009) observed that spontaneous clusters are located in western countries and policy-driven clusters are largely concentrated in Asian countries. Their study demonstrates that spontaneous clusters have the capacity to evolve through venture capitalists and social capital structured by the entrepreneurs (cited by Hassan and Abu Talib, 2015, p.526). According to another author, directive public policy efforts to jump-start clusters or to make top-down or directive efforts to organize them are foolish (Kenny, 1999, p.857).

Mathews (1997, p.26) has drawn a clear line between the cluster of "home-grown" SMEs of Taiwan and that of Singapore and Malaysia. It is Taiwan's SMEs based cluster, known as Hsinchu Science-based Industry Park, which has been on the forefront of innovation and production of semi-conductors and personal computers in the world. Mathews notes that a peculiar feature of Taiwan's industrial cluster was its close linkages with American and European MNCs as well as Taiwanese diaspora returning from the US. Taiwan's Silicon Valley is contrasted from California's Silicon Valley due to the role of a deliberate public policy in the case of the former. At the same time, Taiwan's experience is also different from Malaysia, that will be discussed below, as there was no existing cluster of SMEs in the region where Malaysian government launched its own version of the Silicon Valley. Clearly then, there are differences within the so called Asian version of state-led industrial policy.

In his own words:

> "Make no mistake, Taiwan's semiconductor industry is a flourishing market-driven industry. It has no "nationalized" firms within it; all are privately owned and managed. It is strongly export-oriented. *It has never imposed any protective tariffs on its semiconductor products. There are no government "handouts" to any of the firms involved in the industry for any of their current activities.* And yet its creation, its nurturing and its guidance have been entirely the product of government and public sector institutions. This is the paradox and the fascination of Taiwan's emerging high-tech cluster…What was created in Taiwan was, in effect, an artificially induced industrial ecology oriented towards the creation and sustenance of clusters of new, high-technology industries linked directly to the world's most advanced centers of innovation. (Mathews, 1997, p.28-29; italics added)."

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As part of the industrial ecology, the Taiwanese government also created the Industrial Technology Research Institute as a technology transfer center. Its main mandate has not been innovation, but plainly import, adoption and diffusion of technology in domestic industry. In other words, the government has used reverse engineering as a main vehicle for technology diffusion. But this is not something new. After the industrial revolution in England, the same strategy was also adopted by US industrial planners and engineers.

This discussion concludes that the role of government and public policy cannot be discarded from the analysis of industrial clusters. In the case of Silicon Valley, the role of government comes later, and self-organization of firms comes first. However, Silicon Valley got a leapfrog jump once the US federal government linked the Valley with its defense strategy. This intervention is not by design or by policy, it was led by the special circumstances which were developed after the second world war, placing the US on the forefront of technological development and commercialization of innovation.

We can safely conclude that industrial clusters are usually nurtured rather than planned by governments. This nurturing can happen through both demand and building conducive infrastructure and investment in public goods. Often the government's role is to set up infrastructure and institutional support for cluster development after its birth. What if a government ventures to plan and launch a cluster rather than nurture it? Does such a kind of planned cluster exhibit the same kind of features and advantages which are displayed in the nurtured clusters? Can we replace spontaneous order behind evolved clusters with a central plan to create new clusters? We consider a case study in the following section to answer some of these important questions.

Cyberjaya - a planned industrial and innovation cluster

In the mid-90s, Malaysia's economy was dubbed one of Asia's 'tiger cubs', thanks to an aggressive 8 per cent growth since 1988—the second fastest after China. Capitalizing on the gains from sophisticated industrial production, the Malaysian government incorporated an information and communication technology (ICT) plan in the Sixth Malaysia Plan (1991-95). This plan emphasized embracing ICT in public service delivery, enhancing managerial effectiveness, promoting public access and cutting red tape (Yusof and Loon 2012, p.300).

Cyberjaya was a brainchild of the then prime minister Dr. Mahathir Mohamad[2], who proclaimed that:

> This special area will be a global testbed for the new roles of government, new cyberlaws and guarantees, collaborations between government and companies, companies and companies, new delivery of healthcare, and applications of new technologies." [Ibid, p.299]

Ultimately, the state-led project of Cyberjaya was conceived as a major attempt at the social and cultural engineering of a community in Malaysia — "a new Malaysian identity"— in a global context (Ibid, p.300).

In 1995, the idea of a high-tech city akin to the Silicon Valley was crystalized in a study on the setting up of the Multimedia Super Corridor (MSC) Malaysia by the management consultancy McKinsey & Co. Cyberjaya was presented as the core of MSC Malaysia as a place which "will be a designated zone where technology entrepreneurs and global multinationals enjoy attractive tax breaks, access to world-class human capital and infrastructure, at developing nation costs."

> "The MSC project is an audacious dream to transform Malaysia into a modern nation with a powerful economy, a nation whose populace are members of a knowledge-based society, a nation that has the capacity to "become global" (Ibid, p.299).

In 1997, on 2,800 hectares of mostly undeveloped land, 40km south of Kuala Lumpur, Cyberjaya was launched- adjacent to another 'created' city, Putrajaya, the administrative capital of Malaysia. The MSC was the first major investment by the Malaysian government in the IT and multimedia sector and included significant outlays of up to US$2 bn on installing fibre-optic networks to ensure top-of-the-range physical and information infrastructure, with the ultimate aim being to replicate the successful Silicon Valley (Richardson, 2010).

The incentives offered to the high-tech companies included:

- financial incentives (e.g. exempt from some taxes for 10 years);
- exemption from local ownership requirements;
- unrestricted employment of local and foreign knowledge workers; and
- the provision of aforementioned high-quality infrastructure.

[2] It is a historical coincident that, in the general elections held on 9th May 2018, Malaysia has once again chosen Dr. Mahathir as its seventh prime minister in a shocking elections which led to a change in the government after 61 years!

To receive these benefits, firms need to be awarded "MSC Malaysia Status" by the Malaysian government, which in turn requires them to (re)locate at least 10 percent of their workforce in the MSC cluster, to be a primary provider of IT and multimedia services and products, pledge that at least 15 percent of their workforce will be knowledge workers (i.e. engineers and other white collar workers), and, in the case of foreign firms, to be engaged in technology transfer (Ibid).

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Under the lead of Cyberview Sdn Bhd[3] as the Cybercity Manager, a supportive and supple ecosystem was developed to attract investors. This included providing a collaborative environment and incentives such as competitive rental rates, flexible repayment schemes, building allowances, and customised solutions for investors based on their business requirements, budget, and growth plans. With all systems in place, the next step of the strategy was simple, on paper at least: Woo the big tech players to settle in.

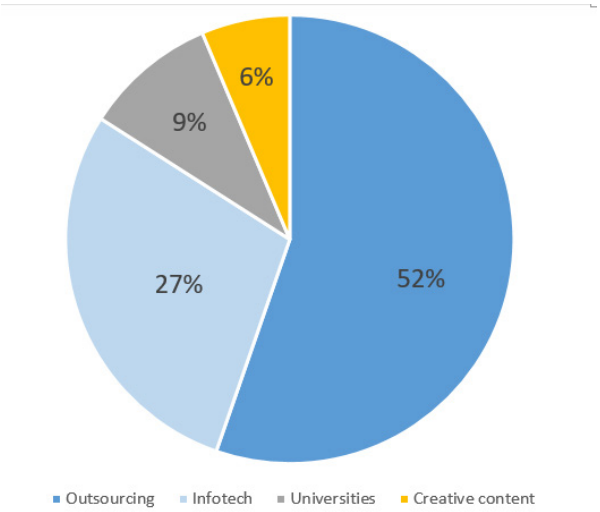
In 1996, Nippon Telephone and Telegraph (NTT) agreed to develop a research and development (R&D) facility in Cyberjaya, which proved to be the project's catalyst. Soon, other giants like Dell, HP, DHL and Shell began to follow suit. With the global icons establishing their presence in Cyberjaya, the entire ecosystem began to form *naturally*. Cyberjaya was launched on 17 May 1997 as a fully integrated city, and Malaysia's pioneer tech hub.

To date, 71% of Cyberjaya's land has been developed, is under construction, or in planning stages. About 85,000 people live here. Meanwhile, the number of renowned multinationals relocating their operations to Cyberjaya continues to increase. From a mere 21 pioneering companies, Cyberjaya is today home to more than 800 companies, of which 40 are global and regional multinationals. It is important to clarify that the total number of firms enjoying MSC status is more than 3,000 however, most of them have chosen to locate outside Cyberjaya.

The Malaysia Digital Economy Corporation (MDEC) is the lead agency in driving the digital economy in Malaysia. Its role is "to build a vibrant digital economy and ensure that Malaysia plays a leading part in the global digital revolution."

[3] Sdn Bhd Malaysian version of a limited liability company

Figure 1: Jobs Distribution in Cyberjaya MSC Companies



(Source: MDEC)

According to MDEC, as of February 2018, with 3,241 active MSC Malaysia Status companies, a total of RM47.1 billion (approximately USD 12 billion) in revenue generated and 167,044 jobs created, MSC Malaysia continues to lead the way in developing the digital economy (MDEC, nd).

It will be instructive to slice down the jobs creation. It turns out that outsourcing and global business services contributes the lion share of 52% with 86,801 jobs[4], Infotech provides 27% with 45,327 jobs, universities and incubators 9% with 15,782 jobs and creative content makers 6% with 10,639. The same is depicted in the figure 1 above.

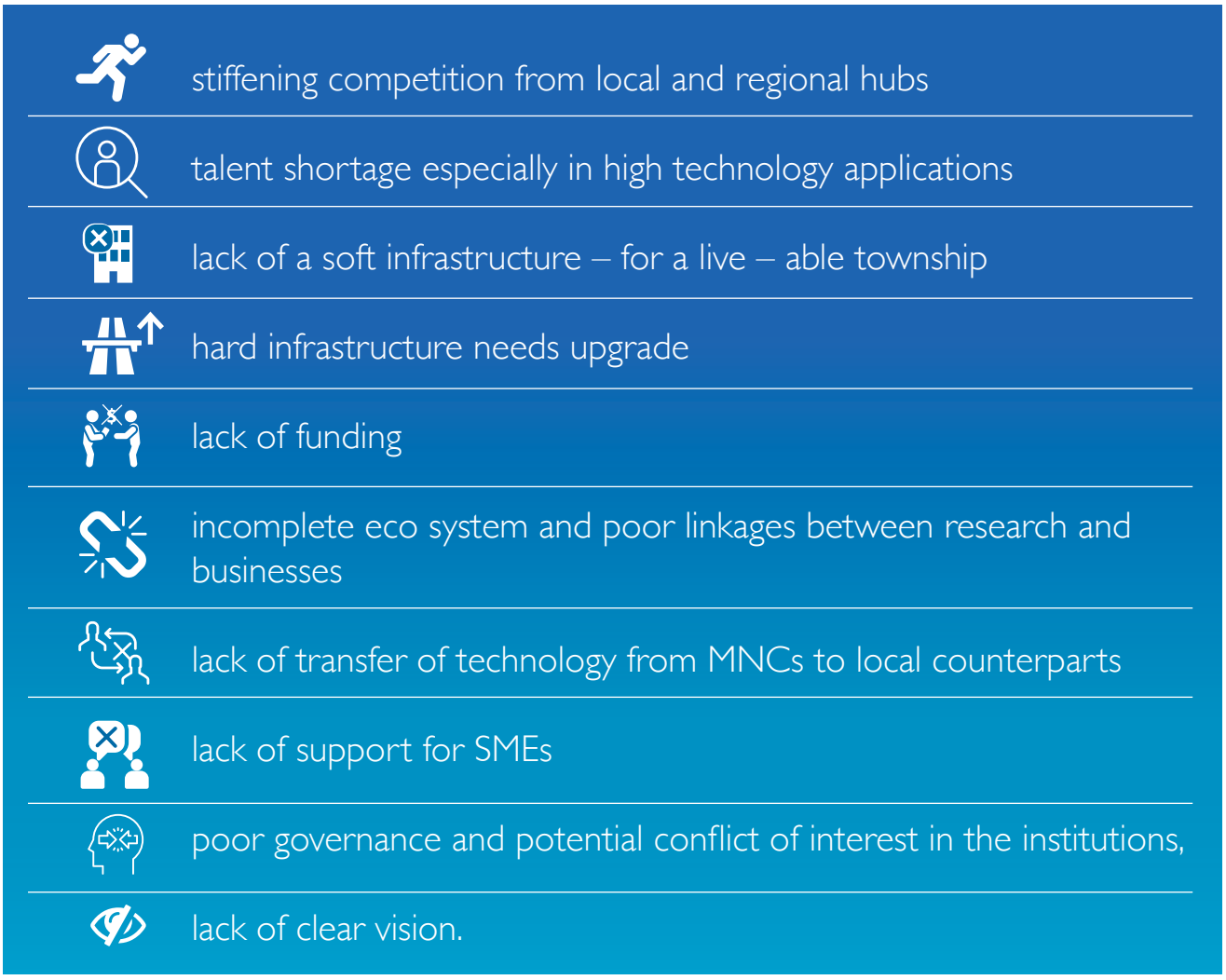
[4] The apparent conflict between this number of jobs with the total population in Cyberjaya (85,000 plus) is due to reporting. MSC companies may or may not be located within Cyberjaya.

Is the vision realized?

The official website of Cyberjaya Sdn Bhd claims that: "Innovation is at the heart of daily life in Cyberjaya. While its original aspirations were focused on ICT, Cyberjaya is now moving to the next level by positioning itself as a more encompassing global tech hub."

In 2014, the authorities published a new roadmap, "Global Tech Hub Blueprint", designed to "create a vibrant ecosystem for entrepreneurs and small to medium enterprises (SMEs) to flourish and drive the city's economic growth."

This document is a useful resource to understand challenges faced by Cyberjaya, after 20 years of its establishment, as acknowledged by officials. A list of these challenges is educative:



One can interpret from this list that even the authorities find that the stated goal of an ICT innovation hub is elusive. The literature on Cyberjaya reaches the same conclusion, though not necessarily entirely pessimistic.

Competitive Challenges

Cyberjaya faces challenges from other similar initiatives in the region, mainly in Singapore. Singapore hosts a multitude of technology and start-up business events—including Tech in Asia, innovfest unbound, Echelon Asia Summit, the 2016 CSX Asia Pacific Conference on cybersecurity, the Internet Engineering Task Force and the Singapore International Robotics Expo. It even hosts Inside 3D Printing Singapore, the world's largest professional 3D printing event. At these meetings, regional start-ups and others like them raise funding, seek inspiration and acquire expertise. Singapore's other notable start-up institutions include the Advanced Remanufacturing and Technology Centre (ARTC), Asia's first R&D center to develop technologies for remanufacturing, and Blk 71, a vibrant entrepreneur enclave, home to hundreds of tech start-ups, venture capitalists and incubators. From 2016 to 2020, Singapore plans to pump S$19 billion into scientific and technological research under the Research, Innovation and Enterprise (RIE) 2020 plan. This all suggests that both supportive public policy and existing social capital exists in Singapore to make it a global IT hub which is being fueled by venture capital and other sources of funding. And importantly, this is why Singapore poses a competitive challenge to Malaysia.

Leading from the back?

In an evaluation, Brooker (2013) argues that despite the state backed ICT oriented strategies, Cyberjaya has become a centre to support back office operations of MNCs, thus 'servicing a world elsewhere' (Brooker, 2013, p.2). In fact, Brooker chillingly compares Cyberjaya as Malaysia's "New Bangalore", rather than "Silicon Valley" (ibid., p.10). This has been considered somewhat similar to the Malaysian electronic industry, which thrived on back of foreign investment, but did not lead to significant technology transfer. As the back office facilities are easily portable, there is a risk that similar facilities can be offered elsewhere leaving Cyberjaya deserted (ibid.).

One example of MNCs which have set up their customer services and back office operations is IBM- which has set up the Malaysia Client Innovation Centre providing high-value information technology (IT) services to IBM's clients all over the world. Kicking off operations in January 2012, the center represents a US$320M investment, and will grow to employ 3,000+ high-skilled IT professionals in the next five years (IBM, nd).

An official promotional line inviting businesses to invest in Cyberjaya proclaims as thus:

> "People in Cyberjaya work hi-tech environment and focus on knowledge and browse the internet for all types of information." (Cyberview Sdn Bhd, n.d.)

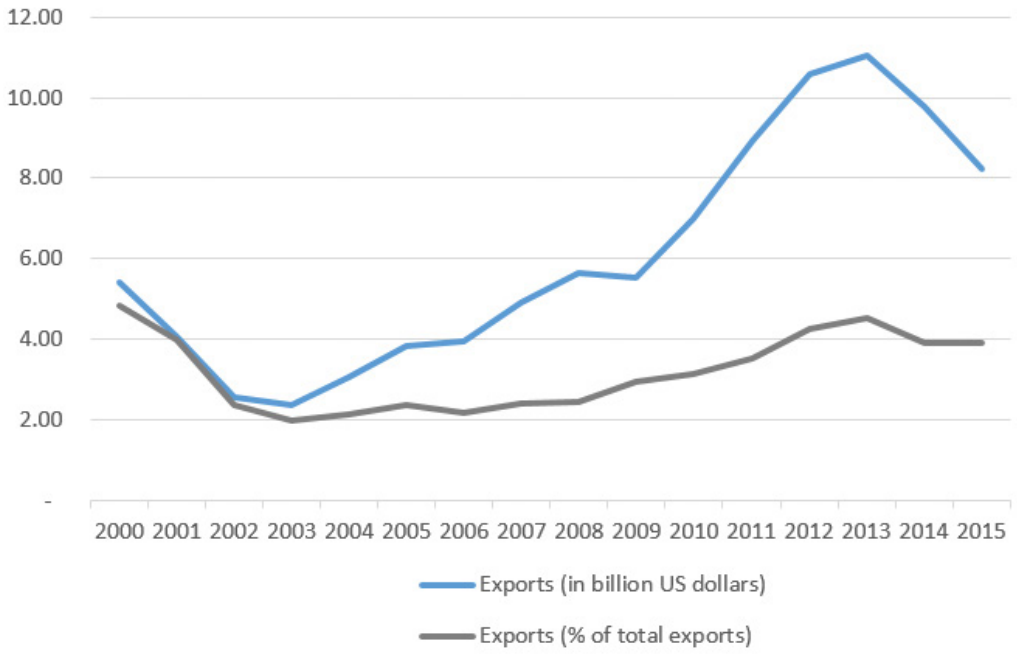
ICT Output and Exports

According to latest available data as reported in 2016, the services under ICT sector recorded the gross output of around RM 100 billion (approximately $25 billion) in 2014, however 62% of this output is attributed to the telecommunication sector, whereas the remaining 38% can be divided into computer programming, broadcasting, information services, motion picture, video production, and publishing (DOSM, 2016).

An objective measure of Malaysia's ICT sector will be its exports over years. A vibrant and growing ICT sector, on the back of a well-planned ICT innovation cluster would experience a steady increase in exports. This should be especially visible in the years after the inauguration and initial development of Cyberjaya, and soon after a few companies had already established their offices. The following figure 2 portrays the growth of ICT exports, both in absolute and relative terms. As it is visible, the ICT exports of Malaysia, both in absolute and relative terms, dropped drastically in a few years after MSC was inaugurated. In subsequent years, we notice a steep rise in the absolute levels of ICT exports, however, relative to overall exports, ICT exports did not rise as much and eventually decreased. In fifteen years, the relative share of ICT exports has actually fallen down to around 4%, which was 5% in 2000.

These results would be further dampened if one were to consider that most of MSC firms in Malaysia are actually located outside the core of MSC- Cyberjaya! Thus, it is very likely that a bulk of export revenues are being contributed by the firms which are not particularly enjoying any co-location benefits- a central feature of any industrial or innovation cluster in the world. Malaysian ICT exports have been rising, possibly, not due to industrial cluster, rather despite of it!

Figure 2: ICT Exports of Malaysia (Source: UNCTAD)



Wrong Incentives?

Just like other industrial clusters around the world, and particularly in Asia, the Malaysian government has offered generous incentives to incumbent companies. These incentives have been successful in encouraging companies to re-locate. However, a critic observes that SME firms in this "constructed cluster" are not enjoying the benefits of co-location externalities, but rather consider government's financial support as an important factor affecting their co-location decision (Brooker, 2013). It is generally argued that the promised Silicon Valley is significantly short of its vision. The MNCs are present, but most of them use the discounted space as call centers and customer support. It has not become the hub of new "discoveries" and few will believe in its potential to place Malaysia on the world map of information and communication technology innovations.

In an ethnographical evaluation, Yusof and Loon (2012) argue that "zoning in Cyberjaya makes it difficult to gain access to various facilities. Among the main problems associated with zoning is the distance from one area to another… This physical constraint, which is the direct consequence of zoning, leads to the phenomenon of a limited social experience among its inhabitants and visitors." These authors consider Cyberjaya a "non-place", i.e. a place without history, memory and identity (Yusof and Loon, 2012, p.311).

Brasnahan, Gambardella and Saxenian (2001), had declared, just four years after the launch of Malaysian Super Corridor and Cyberjaya, as "failed". Was that conclusion premature or surprisingly accurate?

Taking advantage of hindsight and comparing with the original vision of Cyberjaya, we can confidently endorse the conclusion reached by these authors. In their framework, they had emphasized finding an entrepreneurial spark before government intervention, a condition they found glaringly missing in the MSC experiment. Furthermore, they were relying on important economic indicators such as growth of ICT based firms, their revenue and growth of revenue as well as their respective share in a country's GDP and exports. This framework has helped them in reaching a rather pessimistic conclusion in a very short span of time.

In the foregoing analysis of Malaysian ICT exports, which have declined over years in relative terms, we have already presented evidence that actually proves this forecast as a foresight.

Ibn-e-Hassan and Noraini Abu Talib (2015) have done a comprehensive literature review on the Multimedia Super Corridor project, considering it as an example of a policy led industrial cluster as opposed to the other type, led by spontaneous order. They conclude the overall literature is generally dismissive of success claims often made by the Malaysian government. They highlight that the firms opt to situate themselves in Cyberjaya essentially due to government incentives and not due to agglomeration benefits (Hassan and Abu Talib, 2015, p.530). They also note that the networking between universities and industries in Cyberjaya is very weak at the moment thus denying one of the core spirits behind the MSC.

In his evaluation of Cyberjaya, Mohamed Ariff (2008) concludes that policies designed to relocate R&D companies and ICT as well as Electric and Electronic Companies to the MSC have largely failed. Ariff has identified continuation of liberal trade policy, good physical infrastructure, availability of investment incentives and general utilities elsewhere in the country as competitive factors. In comparison, many of the companies involved in R&D have found relocation to MSC as costlier, thus eroding their competitive advantage. Ariff also argues that most of local firms do not regard universities and research organizations as a source of R&D thus weakening academia-industry linkages. A general factor, with or without MSC and Cyberjaya, is the rising of wage levels which exceeds productivity growth.

It is notable that the Malaysian government undertook development of five other regional economic corridors. They include: Iskandar Development Region (IDR), Northern Corridor Economic Region (NCER), Eastern Corridor Economic Region (ECER) Sabah Development Corridor (SDR), and Sarawak Corridor of Renewable Energy (SCORE). These corridors cover several existing industry clusters. For example, the IDR in Johor encapsulates various resource-based industries, E&E (extension from Singapore), furniture, and textiles. (Ariff, 2008, p.371).

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A cursory comparison between these industrial clusters and Cyberjaya yields an interesting insight. Unlike Cyberjaya, in which the central government planned a new city from scratch, all other industrial clusters and economic corridors are examples of nurturing. Before the announcement of economic corridors, firms already established in these regions were playing an important role in different resource based and manufacturing based sectors. The announcement of economic corridors in these areas should be interpreted as a step towards a more integrated design of government facilitation. This is interestingly akin to the Silicon Valley, in which government intervention came *after*, and not before, the emergence of an industrial cluster.

A critical feature of all industrial clusters worldwide is co-location of similar firms. However, this feature has been ignored in the "hasty" expansion of the Cyberjaya into different zones. The potential of successful clusters around the world for enhancing internationalisation is based on the co-location of actors in a similar or related industry, and therefore, the localised nature of a policy-driven cluster needs to be prioritised, particularly as the cluster grows (Richardson, 2010, p.224). The same author also points out that the organic networking and peer to peer relationships which are an essential feature of successful clusters cannot be substituted by planned networking events.

Central planning does not work

In the foregoing analysis, we have introduced the work of Engel (2015, op. cit.) and the lessons he drew for the government while planning industrial clusters. It will be instructive to compare these lessons with the vision behind Cyberjaya. In many respects, the central planning and a top-down vision that propelled Cyberjaya offer the exact opposite route to what Engel has found as the ingredient of success for clusters of innovation. Cyberjaya was born out of a central plan to create a new city on a literally undeveloped piece of land, and not in any organic manner as Engel would have advised. Silicon Valley has two famous universities in its direct access- University of California Berkley and Stanford University. Cyberjaya had no such university to begin with, though educational institutions were set up later. One critical point worth mentioning is that Cyberjaya was built on concepts and visions, and not on strengths of incumbent companies, as there were no incumbents to begin with in the palm oil plantation.

This section concludes that the Cyberjaya has not been successful in realizing the vision of transforming Malaysia into a global ICT hub. This has been demonstrated in the literature produced on Cyberjaya which has discussed its social and economic limitations. This is further proven by the fact that ICT exports have not increased in relative terms. The flight of talent from Malaysia to greener pastures has continued to thwart such ambitious plans. While the number of companies seeking MSC status has continuously been rising, most of them are located outside the core Cyberjaya. This has denied the fundamental advantage that firms in any industrial and innovation cluster would seek- that of co-location.

Conclusion and Policy Implications

This essay was motivated to study the role of government in the design and success of an industrial policy by analyzing industrial clusters. The overarching question is whether the government should create a cluster from scratch or nurture an existing one? To answer this question, we started with the overall conceptual framework of agglomeration economies and the benefits of the co-location of firms. We then discussed the case of Silicon Valley as an innovation cluster which was organic in nature. The government did play a role, but this role was manifested in ensuring a demand of particular products, and not that of a planner on the supply side. We also introduced some international literature on industrial clusters including those in Asia, while noting that the Asian examples of industrial clusters were characteristic of a deliberate role of public policy. While giving the example of Taiwan, we argued that the government was actively planning specific kind of firms, however, this intervention was not industrial support of any kind, as the state did not offer any kind of protection or subsidies. Thus, while the state provided an enabling environment, as well as linkages with the international market, it did not venture into the business itself. Finally, we introduced the case of Cyberjaya, which can be considered as a sharp contrast to California's Silicon Valley in terms of role of central planning.

General literature on industrial clusters and Silicon Valley in particular and the historical analysis of Cyberjaya converge in generating one intuitive lesson: central planning cannot create successful industrial clusters, but an efficient industrial policy can certainly help in nurturing a cluster. An organic process of combining market demand with the supply of skilled labour which is spatially concentrated, brought together through a sophisticated entrepreneurial process is critical to success. This cannot be replaced with a top-down government directive or a vision. That the Cyberjaya was introduced as a grand and ambitious vision may have introduced failure in its design.

We would like to qualify the use of the word "failure" which may seem a harsh judgement, given the number of MSC companies and presence of MNCs. It is not denied that Cyberjaya has helped in placing Malaysia as a player in global outsourcing operations, but obviously evaluation is always done by comparison with the announced objectives. The fact that the Cyberjaya has become host to hundreds of companies and some universities, may, at some point in time, help in creating new places of innovation for the industry.

Are we suggesting that the government should play no role in the formation of industrial clusters? Our simple answer is negative. In fact, it is evident from Malaysia's own history that the government did play a role in bringing international companies as FDI into Malaysia back in the seventies thus propelling this nation into a manufacturing hub for electronics and electrical equipment. However, a crucial point is that the government was creating linkages between international demand and the local partners through joint ventures with the MNCs. Provision of incentives for these firms is not something necessarily harmful, however to do only that and not to link up with external or domestic demand does not help.

A related point is that the policy design which worked successfully in the case of semi-conductor manufacturing plants, which did not require any innovation, cannot work when we need innovation in the high-tech industry. In the plants churning out cheap and standardized memory chips, white goods and computers, one does not need to innovate. All one needs is an educated and disciplined workforce, which Malaysia has consistently produced over years. On the other hand, creation or replication of Silicon Valley is a very different undertaking. We not only need a critical mass of these knowledge workers but we also need to ensure cross pollination of their ideas through creation of social capital. As we noted in the discussion on Cyberjaya, this is unfortunately totally missing. The spark of entrepreneurship and risk-taking, which has defined Silicon Valley since the sixties, is not a common sight in the Malaysian Silicon Valley. There is a lot of government everywhere in the valley, both in the form of urban design and in the form of companies, but there is not much of a risk-taking private venture capital and entrepreneurial culture.

To draw a bigger point, let us use the example of baking a cake to explain the role of government in any economy[5]. A cake has many ingredients, such as flour, chocolate, sugar, milk, and eggs. While these are prominent ones and occupy our main attention while baking a cake, a very crucial, yet hidden ingredient is the raising agent - which in this case is baking powder or soda. Without this agent, no cake can be baked. Consider that for a one pound cake, all you need is hardly one spoon of raising agent. Then again, we can have different types of raising agent, such as baking soda and baking powder just like you can have different forms of a government with the same outcome. One special thing to note in this analogy is that if you add strictly more than one spoon in a one pound cake, the latter will get spoiled. No cake is baked by adding more quantity of baking soda- thus small is beautiful aptly applies here. Similarly, no economy can function with zero government (read without a spoon of the raising agent) or with a too much government. It gets rotten, just like how a big government ultimately leads to rents and corruption. Like raising agent, the government's role has to be hidden and judged just right. You don't see the raising agent in a cake, and you don't taste it either. The same is true of good government.

[5] I give the credit of this analogy to my wife, Shagufta, who is fond of baking and makes successful attempts in summarizing my views on the economy!

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