Study about Locational Tendency of IT Companies in City Centers and Suburbs
-Case Study of Malaysia-

Fumihiko SETA, Takashi ONISHI and Tetsuo KIDOKORO
(The University of TOKYO)

Abstract

Locational tendencies of IT (Information Technology) companies in both developed and developing countries are generally said to be agglomerated and concentrated in a or some certain area(s). Especially those of corporate-service companies, contents makers and post-production industries tend to be concentrated on city centers of large cities, while those of hardware and software development companies seems to be near a university, a institute or existing accumulation.

Malaysia, which achieved highly economic growth by manufacturing industries, is now tackling to heighten their value-add by inviting many IT companies. During the era of former economic growth period, Malaysia has had relatively dispersed and multi-polarized national structure and some growth cores, not only the capital city Kuala Lumpur and its suburban satellite cities, but also Penang island and Johor Bahru. But since the late nineties, the Federal government are concentrating their investment and development on a certain suburban area for attracting higher value-added industries i.e. IT industries. The area, called Multimedia Super Corridor (MSC), was once a plantation of palm, but is now being provided with many kinds of infrastructures and locational incentives, and developed fully for a new agglomeration of IT companies. Now IT companies in Malaysia are deciding their locations between existing city/sub centers and MSC.

This paper is discussing locational tendencies of IT companies in Malaysia with actual proofs lead by plenty of data and some interviews to the companies. Included are not only those in the view of national development perspective, but also selections of city centers and suburbs by the origin of detailed classification of IT industries.

The result shows that Kuala Lumpur has by far the greatest dominance of locations of IT industries, compared with those of manufacturing industries. The locational tendencies can be generally seen as an uneven distribution in some specific points of city and sub centers of Kuala Lumpur metropolitan area. Movement of IT companies to MSC are now on the process and not so big, but some companies which uses huge IT infrastructure intend to move to the area, where large capacity and sufficient maintenance of IT infrastructure can be expected. And moreover, IT companies can be classified by locational features like CBD-oriented, suburban or some other types.

Keywords   Malaysia, IT Industry, Locational Tendency, Multimedia Super Corridor
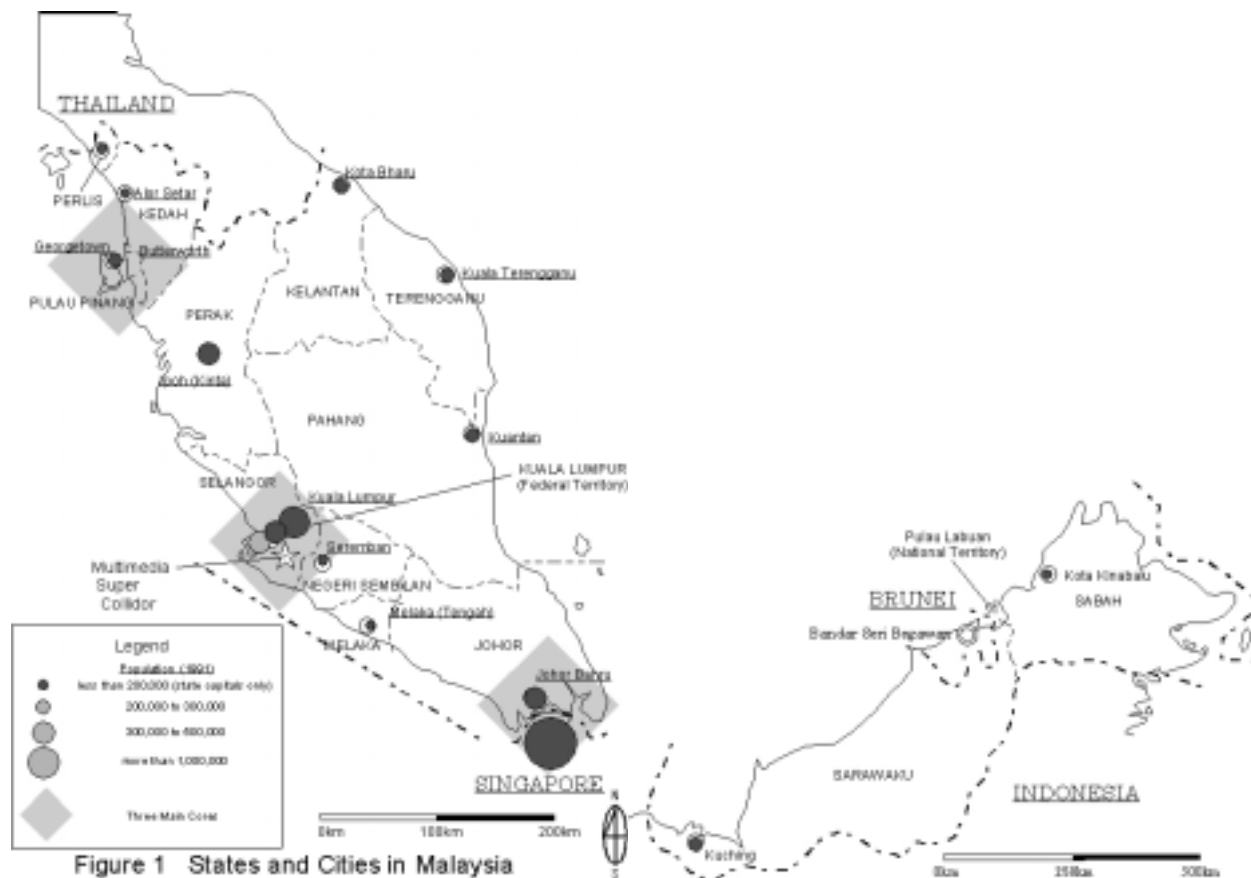
1. Introduction

Asian countries have achieved economic growth mainly by manufacturing industry, but competition among these countries has been more and more intense, and less value-add processes inevitably moved away to countries which have cheaper workforce. As a result, some countries start to try to promote more value-add industries including IT(Information Technology) industry in stead. In recent years, especially after the drastic expansion of internet technologies, many kinds of regional development plans and strategies containing methods to attract IT companies are being enacted and implemented in many countries.

In case of Malaysia, a large-scale and integrated regional development plan called "Multimedia Super Corridor (MSC)" is proceeding in the suburb of Kuala Lumpur (KL). The plan includes construction of a new information city called "Cyberjaya" and a new Federal administrative city called "Putra Jaya", equipment of IT and many other infrastructures like telecommunication network with fiber optic cables, road network, greenery etc., and privileges for inviting IT companies in and out of the country. Planned total cost for these development projects is estimated at 50 to 100 billion ringgit (2 to 4 billion dollars of those days).

One of the main characteristics of MSC is the location. The main area for development is at the suburb of Kuala Lumpur and 20 to 30 km away from there. Generally, locational tendencies of IT companies in both developed and developing countries are said to be agglomerated and concentrated in CBD(Central Business District) or sub-centers like in Tokyo, New York, San Francisco (Ogawa and Ishikawa[1989][1990] and Yukawa[1998][1999][2000]), except some cases like R&D-based high-tech firms in (former West) Germany agglomerating not only in city centers but also in their suburbs (Bade and Nerlinger[2000]). In that sense, MSC, which intend to invite many IT companies to fully equipped suburban area, seems to be a model case for testing original tendency of IT and high value-add companies.

This paper intends firstly to find general locational tendencies of IT companies in Malaysia, which is one of newly-industrialized countries by manufacturing industry, but now tries to shift to more high value-add industry. And next, a brief evaluation of MSC project regarding IT agglomeration is shown. If there can be seen more and more IT companies which are located at project areas in the suburb, the agglomeration of IT companies will be available provided the areas are fully equipped.

Figure 1   States and Cities in Malaysia

2. IT Strategy of Malaysia in the late 90s
2.1. Situation of Information Technology in Malaysia

Malaysia (**Figure 1**) has been achieved rapid economic growth from the late 1980s to 1997 chiefly by introducing much amount of Foreign Direct Investment (FDI) and inviting many manufacturing companies. But during the period, some problems, namely shortage of reasonable labor force, lack of high-skilled human resources and increase of competing companies in and out of Asia, have led Malaysian Federal government to try to change industrial and economic structure to more high value-add. And information technology has been especially selected since the mid 90s as a new method to enhance national capacities and international competitiveness and to achieve continuous and stable growth.

Now the situation of Malaysian IT infrastructure is improved than other ASEAN countries except Singapore. For example, the diffusion of internet (2.2%, 1998), that of mobile telecommunication devices (9.6%, 1998), that of fixed telephone (20.1%, 1998), the amount of e-commerce (1,000 million dollar, 2003 estimated) and that of electric, electronic and telecommunication investment (2,191 million U.S.dollar, 1999) [Nihon Keizai Shinbun(2000)] show higher standard of IT infrastructure among most Asian countries, but lower than East Asian countries and regions, shown typically by the diffusion of internet in Korea(21.3%, 2000), Taiwan(21.7%, 2000) and Japan(21.4%, 2000).

However, one of the most significant characteristics of IT development in Malaysia is locational focus to a suburb of the primate city Kuala Lumpur (KL). In the period of economic growth by manufacturing industries, three main cores, i.e. KL-Selangor corridor, Penang, and Johor, formulate relatively dispersed national and urban structure compared to other Asian countries. But in this case, Malaysian government sets a large area named "Multimedia Super Corridor (MSC)" and draws plans and strategies to formulate a exclusive new agglomeration on a suburb of KL.

2.2. Multimedia Super Corridor

MSC is started in the late of 1990s, in order to enhance IT industry as one of knowledge-intensive industry. Strategies of MSC for attraction for IT companies is held mainly in four "Cybercities" (See Figure 3). MDC (Multimedia Development Corporation), which is a government company in charge of integrated planning and management of MSC, gives a title named "MSC status" to companies which satisfy several conditions as to contribute to development of MSC. Among these is a locational condition that regulates MSC status companies to locate one of cybercities. In return, if a company has the title, MDC and Malaysian government supply many privileges like tax exemption, freedom of employment of foreign human resources and capital raising internationally, etc., most of which are originally restricted by government policies in Malaysia.

Among four cybercities, three are not located at the city center, but in suburbs of Kuala Lumpur. Especially a main cybercity called "Cyberjaya" is about 30km far from Kuala Lumpur. So before the start of the plan, it is doubted by IT companies and even MSC status companies whether cybercities can invite enough companies to make agglomerations.

Initially, MDC meant to give MSC status only to companies located one of cybercities. However, development of Cyberjaya was put off due to the economic crisis on 1997 and MSC status is now being given to companies prior to their movement to one of cybercities. MDC set a deadline to move from anywhere to one of Cybercities until July of 2000, when just one year has passed since the formal opening of Cyberjaya.

So it is worth observing locational situation of MSC status companies and comparing it with general locational structure in Malaysia. If many IT companies are moved from city centers to suburbs, regional development strategies in suburban areas including attraction of IT industry seem to be effective, regardless of original characteristics of IT companies. And the fact will give us an important idea for formation of future urban structure.

3. Locational Tendency of IT Industry in Malaysia
3.1. General Tendency

Data using in this paper is collected by the reference named "Malaysia Times Guide to Computer 2000" published by Times Publishing Group. There are 1,563 companies some of which belong to plural industrial groups.

Regarding the situation of national locational characteristics in Malaysia (See **Table 1**), a large agglomeration to Kuala Lumpur and its suburban area Selangor state is quite intensive. As a entire metropolitan area, more than a half of IT companies in Malaysia are concentrated (65.7%) and the ratio is higher to that of population or other sectors, in contrast to major manufacturing companies, which are concentrated not only on Kuala Lumpur (8.1%) and Selangor (36.9%), but also in Pulau Pinang (10.4%) and Johor (16.5%) (aggregation of FMM companies, FMM[1999]). In case of IT companies, however, the agglomeration to Pulau Pinang(9.9%) and Johor(6.9%) is not so intensive. In case of Johor, it is inferred that Singapore has a role of the city center and Johor is interpreted as a suburban area of the city where less IT companies are located generally.

State	City/County	Area(km2)	Absolute Locations	Component Ratio	Rate of Concentration*1	Total Number*2
Johor	Johor Bahru	1,818	71	4.5%		76
	Others	18,078	37	2.4%		37
Johor		**19,896**	**108**	**6.9%**	**65.7%**	**113**
Kedah	Alor Setar	666	14	0.9%		14
	Others	8,760	6	0.4%		6
Kedah		**9,426**	**20**	**1.3%**	**70.0%**	**20**
Kelantan	Kota Bharu	406	21	1.3%		54
Kelantan		**14,920**	**21**	**1.3%**	**100.0%**	**54**
Kuala Lumpur		**243**	**504**	**32.2%**		**589**
Melaka	Melaka Tengah	299	40	2.6%		43
	Others	1,352	4	0.3%		4
Melaka		**1,651**	**44**	**2.8%**	**90.9%**	**47**
Negeri Sembilan	Seremban	951	29	1.9%		29
	Others	5,692	5	0.3%		5
Negeri Sembilan		**6,643**	**34**	**2.2%**	**85.3%**	**34**
Pahang	Kuantan	2,960	30	1.9%		35
	Others	33,004	8	0.5%		8
Pahang		**35,964**	**38**	**2.4%**	**78.9%**	**43**
Perak	Kinta(Ipoh)	1,958	57	3.6%		89
	Others	19,047	11	0.7%		11
Perak		**21,005**	**68**	**4.4%**	**83.8%**	**100**
Pulau Pinang	Penang (Island)	292	120	7.7%		189
	Butterworth	497	29	1.9%		53
	Others	241	5	0.3%		6
Pulau Pinang		**1,030**	**154**	**9.9%**	**96.8%**	**248**
Sabah	Kota Kinabalu	350	7	0.4%		18
Sabah		**73,619**	**7**	**0.4%**	**100.0%**	**18**
Sarawak	Kuching	1,869	2	0.1%		6
	Others	122,580	2	0.1%		5
Sarawak		**124,449**	**4**	**0.3%**	**50.0%**	**11**
Selangor	Petaling	484	446	28.5%		662
	Klang	627	39	2.5%		52
	Others	6,844	39	2.5%		42
Selangor		**7,955**	**524**	**33.5%**	**92.6%**	**756**
Terengganu	Kuala Terengganu	605	21	1.3%		42
	Others	12,955	15	1.0%		24
Terengganu		**12,955**	**36**	**2.3%**	**58.3%**	**66**
n.a.			1	0.1%		1
Total		**329,733**	**1,563**	**100.0%**	**87.4%**	**2,100**

*1 Rate of absolute locations of central cities in each state

*2 Number of locations counting different industrial origins separately

Table 1. Locations of IT Companies in Malaysia

And then, if we focus on each state, IT companies are concentrated on the primate city (or cities) in each state. Not only in west-coast states, where the economic level is relatively higher, but also in east-coast and Borneo states, companies make agglomerations on major cities with ratios of more than 50%. These results shown by Table 1 typically show a general tendency of IT companies which are eager to concentrate each other particularly on the primate city (Kuala Lumpur) and its suburb (Selangor). And even if some of them are located in other areas, most of them tend to go to major cities of regional areas. A typical characteristic of IT companies can be also seen in Malaysia.

3.2. Analysis by Industry

Analyses by the origin of industries are also done, using the same categories as those in the reference. Categories of IT companies are still variable and inconstant because of technological innovation, but basically some large categories (Hardware, Software and Service or Network) are usually used for aggregation research. In the reference, there are 186 industrial groups, but most of them cannot be easily aggregated to large categories like hardware, software or service. So typical groups in each of these three large categories are picked up and added up in major counties (**Table 2**).

All typical groups tend to make agglomerations in Kuala Lumpur and Petaling County in Selangor. But companies in charge of "Computers" and "Accessories", both of which are categorized as hardware, are relatively dispersed to some other counties. On the other hand, "Software Suppliers & Development" and "Software" are more concentrated to KL and its suburbs, and there are few companies which are located in counties except KL, Selangor, Penang and Johor Bahru, all of which compose three major industrial agglomerations. Groups in service categories are rather varied. Those which are in charge of "System Integration" are intensively concentrated like those of software, but companies in charge of "Training Center" are rather disseminated to many counties.

Another analysis by industry shows exclusive locations to bigger agglomerations (**Figure 2**). Companies for data communication (9 companies), equipment and supplies for data communication (9 companies) and multimedia (7 companies) are located only in the largest agglomeration (Kuala Lumpur and Petaling County). Bar Code Equipment (15 companies), Internet Software (11 companies) or Work Station and Servers (9 companies) are exclusively in KL, Petaling or the second agglomeration (Penang and Butterworth). Several other categories are exclusive in some or several populous cities as shown in Figure 3. And (re-)categorization of cities and industrial categories can be done by the analysis.

State	County	Total		Hardware				Software				Service			
				Computers		Accessories		Software Suppliers & Developers		Software		System Integration		Traning Centres	
Total		2,099	100.0%	457	100.0%	90	100.0%	54	100.0%	46	100.0%	40	100.0%	80	100.0%
Selangor	Petaling	662	31.5%	82	17.9%	19	21.1%	14	25.9%	16	34.8%	16	40.0%	11	13.8%
Kuala Lumpur		589	28.1%	110	24.1%	25	27.8%	27	50.0%	16	34.8%	18	45.0%	30	37.5%
Pulau Pinang	Penang	189	9.0%	35	7.7%	8	8.9%	6	11.1%	4	8.7%	2	5.0%	1	1.3%
Perak	Kinta	89	4.2%	26	5.7%	10	11.1%							9	11.3%
Johor	Johor Bahru	76	3.6%	21	4.6%	4	4.4%	3	5.6%	4	8.7%			5	6.3%
Kelantan	Kota Bharu	54	2.6%	17	3.7%	3	3.3%					2	5.0%	3	3.8%
Pulau Pinang	Butterworth	53	2.5%	10	2.2%	1	1.1%	1	1.9%					1	1.3%
Selangor	Klang	52	2.5%	16	3.5%	1	1.1%	1	1.9%	2	4.3%			3	3.8%
Others		335	16.0%	140	30.6%	19	21.1%	2	3.7%	4	8.7%	2	5.0%	17	21.3%

Source: Aggregation of Malaysia Times Guide to Computer 2000

Table 2. Locational Situation of IT Companies of Typical Categories

	1	2	3	4	5
	Kuala Lumpur, Petaling	Penang/Butterworth	Kinta(Ipoh), Johor Bahru	Populous Cities/Counties*1	Other Cities/Counties
Concentrated	Data Communication(9), Data Communication Equipment & Supplies(9), Multimedia(7), Audio-Visual Equipment(6), Fibre Optics(6), Chinese Software(5), Electronic Commerce(5), Consultants -				
	Bar Code Equipment(15), Internet Software(11), Work Station & Server(9), Graphic Systems(8), Sales/Marketing/Distribution(7), Desktop Publishing Systems(5), Banking/Finance(5)				
	System House/System Integration(15), Local Area Network(13), Manufacturing(13), Payroll System(10), Human Resource(8), Inventory Control(7), Unix System(6), Filters(6), POS Systems & Computerised Cash Registers(5)				
	Cables & Connectors(26), Uninterruptible Power Supplies(24), Software Consultants(23), Telecommunication Products(21), Software Manufacturers(17), Internet(16), Maintenance(15), Disk Drives(15), Media(14), Software - Customizing(13), Cad-Cam (Software)(13), Software Engineering(8), Hardware(8), Industrial Control Systems(7), Automation Systems & Equipment(6), Health(6), Bureau Service(5)				
Dispersed	Computers, Accessories, Computer - Personal, Traning Centres, Accounting , Peripherals, Software Suppliers & Developers, Computers - Micro, Software, Network Systems, System Integration, Wholesale Distribution, Consultants, Multi Media, Printers, Forms , Modems, Monitors, Office Automation, Network - Cabling Systems, Computes - Workstation & Services, Education, Ribbons, Network Services, Scanners, Furniture, Data Storage, Motherboads, Toner Refills & Supplies, Keyboards, Finance, Boards & add - on Cards, CD - ROM Equipment, Traning Systems & Courseware, Computers - Upgrade, Computers - Mainframe				

*Notice: For example, "Data Communication(9)" means that there are nine IT companies in charge of data communication in Malaysia, and they are located exclusively in either Kuala Lumpur or Petaling. Industrial groups with more than 5 companies are taken into account.

*1: Populous Cities/Counties are Kota Bharu, Klang, Melaka Tengah, Kuala Terengganu, Kuantan and Hulu Langat

Figure 2. Situation of Exclusive Locations by the origin of IT Industry

3.3. Agglomeration in KL and sub-center

In former sections, it is clarified that locations of IT companies in Malaysia tend to be concentrated in KL and Selangor. But here shown is minute locational situations in the area, in order to evaluate locational strategies of MSC later.

Figure 3 shows locations of IT industries in Kuala Lumpur and Selangor State. Kuala Lumpur (589) and its main sub-center Petaling-Jaya(439) in Petaling county are two main places for locations. The next one is Subang Jaya(162), which is one of satellite cities of Kuala Lumpur and near to a domestic airport (formerly an international airport). Shah Alam and Klang are also satellite cities formulating Klang Valley Corridor (from KL to Klang), in which many industrial and residential developments like new towns and industrial estates have been done since the economic growth period achieved by manufacturing industry, but they don't have so many IT industries (41 in Shah Alam and 52 in Klang). And there are few other agglomerations in the rest of Selangor State.
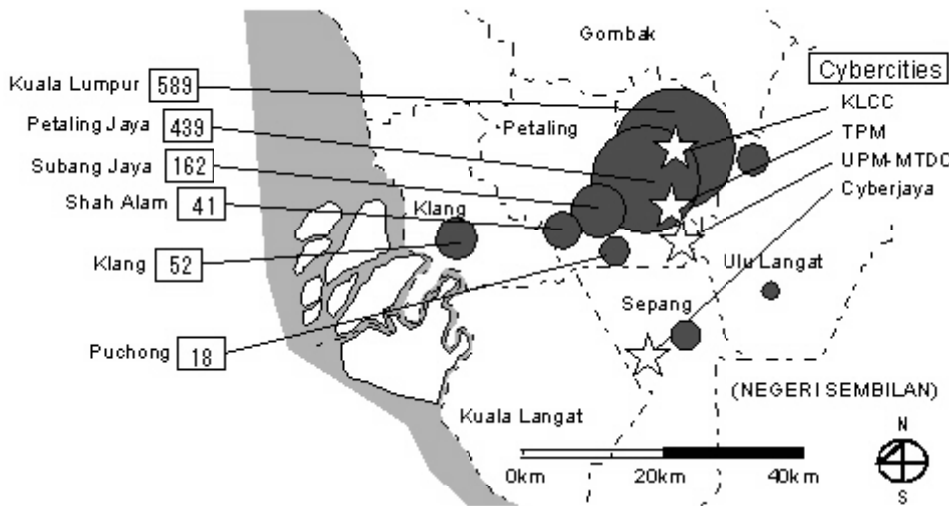
Figure 3 IT Companies in Kuala Lumpur and Selangor State

The result shows locations of IT companies are more intensively concentrated not only in national scale (to KL metropolitan area as the primate city) but also in regional scale (to KL CBD and sub-center Petaling Jaya, or to main cities in each state). It can be interpreted, in turn, that locational inducement of IT companies to suburban areas like strategies of MSC seems to be difficult in principle.

3.4. Location to MSC Status Companies

Objective locations of IT companies in MSC, called cybercities, are also shown in **Figure 3**. Location of Cyberjaya is said to be a bit too far to maintain their work, according to preliminary interviews held by authors (to 13 companies which obtained MSC status). Cyberjaya fulfilled many kinds of infrastructures, not only telecommunication network (2.5 to 10 Gbite/second as the whole area)[MDC(2000)] and facilities, but also road network, proximity to international airport and many kinds of urban facilities. And also it will be equipped with calm and greenery circumstance by rigid town planning in near future. So the only problem for companies to locate here is the location (from the present city center) and related problems like proximity to accumulation of the same industries, clients and customers, or amenity infrastructures, all of which are already prepared in the city center.

Two other cybercities in suburbs, called Incubator Center (UPM-MTDC) and Technology Park Malaysia (TPM), are nearer to the city center of Kuala Lumpur than Cyberjaya. Both of them originally don't have agglomerations of IT industry, but the processes of development have been earlier than Cyberjaya and they already invite companies in the late 90s. UMP-MTDC is a bit farther to KL than TPM and in the University (University Putra Malaysia) which seems to have much knowledge source of R&D and high-skilled labor. TPM is on the fringe of KL administration boundary and has a terminus of Light Rail Transit to the city center of KL. Kuala Lumpur City Center (KLCC), is the other and only one cybercity in the present city center, and the world-highest Petronas Twin Tower chiefly provides floors for MSC status companies and others. No problems exist about proximity to other infrastructures and activities but the rent is much higher than other cybercities.

Table 3 shows the locational situations of MSC status companies in two different points of time. The whole number of MSC status companies is increasing from 214 (Sep. 1999) to 366 (Nov. 2000). The tendency to concentrate on Kuala Lumpur (44.9%(Sep. 1999) to 48.4%(Nov. 2000)) and Petaling County (37.4% to 33.9%) is the same as general locations of IT companies in Malaysia. And their locational structures by the origin of industries are also not so different from those of general IT companies. Companies in charge of Hardware are a bit dispersed than other categories, for 20.0%(Nov. 2000) among them are located in other states in Malaysia. But as a whole, they are basically concentrated on KL and Petaling Country.

7

But strategies of MSC surely have influence on locations of IT companies. Not only absolute numbers but also ratios of MSC status companies which are located in four cybercities steadily increases from 23.4%(50 companies) to 34.2%(125 companies). While most of them are located in either KLCC (5.1% to 9.6%) or TPM (13.1% to 13.9%) in KL, the number and the ratio of the companies in cybercities in suburbs also increase steadily (UPM-MTDC: from 2.8%(6) to 4.1%(15), Cyberjaya: from 2.3%(5) to 6.6%(24)). It shows the possibility to induce IT companies to suburbs which originally have no agglomerations.

Among 13 MSC status companies in interview surveys held by authors, those which regard large-scale IT infrastructure as important tend to move and stay in cybercities, while those which are more nervous about living conditions of employees or relationship with other industries tend to be negative to the movement. But there are few relationships between degree of importance of IT infrastructure and groups/categories of IT industry. In the interview survey it is clarified that ways and degrees of IT infrastructure are varied even among companies which produce the same products, e.g. semiconductors or personal software.

Location	Sep. 1999 Total		Nov. 2000 Total		Hardware: Hardware/Electronics		Software: Software Development		Service: Systems Integration		Service: Consultancy/Education/Training		Compounded: Internet-based Business/Content Development/Postproduction/Telecommunications/Networking/Computer/System Security	
<*>KLCC	11	5.1%	35	9.6%			8	7.4%	3	9.1%	3	13.6%	21	11.8%
<*>TPM	28	13.1%	51	13.9%	2	8.0%	15	13.9%	5	15.2%			29	16.3%
KL (Others)	57	26.6%	91	24.9%	8	32.0%	24	22.2%	9	27.3%	6	27.3%	44	24.7%
KL	**96**	**44.9%**	**177**	**48.4%**	**10**	**40.0%**	**47**	**43.5%**	**17**	**51.5%**	**9**	**40.9%**	**94**	**52.8%**
<*>UPM-MTDC	6	2.8%	15	4.1%	3	12.0%	5	4.6%	1	3.0%			6	3.4%
Petaling (Others)	74	34.6%	109	29.8%	3	12.0%	36	33.3%	10	30.3%	9	40.9%	51	28.7%
Petaling	**80**	**37.4%**	**124**	**33.9%**	**6**	**24.0%**	**41**	**38.0%**	**11**	**33.3%**	**9**	**40.9%**	**57**	**32.0%**
<*>Cyberjaya	5	2.3%	24	6.6%	2	8.0%	5	4.6%	3	9.1%	2	9.1%	12	6.7%
Klang	1	0.5%	1	0.3%			1	0.9%						
Ulu Langat	7	3.3%	12	3.3%	1	4.0%	3	2.8%	1	3.0%			7	3.9%
Other Counties	**13**	**6.1%**	**37**	**10.1%**	**3**	**12.0%**	**9**	**8.3%**	**4**	**12.1%**	**2**	**9.1%**	**19**	**10.7%**
Other States	**11**	**5.1%**	**13**	**3.6%**	**5**	**20.0%**	**3**	**2.8%**					**5**	**2.8%**
Other Countries	**14**	**6.5%**	**15**	**4.1%**	**1**	**4.0%**	**8**	**7.4%**	**1**	**3.0%**	**2**	**9.1%**	**3**	**1.7%**
Total	214	100.0%	366	100.0%	25	100.0%	108	100.0%	33	100.0%	22	100.0%	178	100.0%
<*>Cybercities	50	23.4%	125	34.2%	7	28.0%	33	30.6%	12	36.4%	5	22.7%	68	38.2%
Out of Cybercities	164	76.6%	241	65.8%	18	72.0%	75	69.4%	21	63.6%	17	77.3%	110	61.8%

Source: List of MSC status companies (MDC website: http://www.mdc.com.my/partner/index.html) as of Nov. 3rd 2000
Notice: Industrial groups are based on those of the list of MDC website

Table 3. Locations of MSC status companies by industrial origin as of Nov. 3rd 2000

4. Conclusion

Typical characteristics of IT companies and influence by intensive locational strategies by the government sector can be found in this paper. Like in most countries, IT companies generally make a large agglomeration in the primate city and its sub-center in Malaysia, and small agglomerations in regional cores in each state or region. Among IT companies the tendency is stronger in software and service groups than in hardware-related groups. But on the other hand, MSC strategies led by Malaysian government to make a new agglomeration to a suburb of KL have some degree of influence to locations of IT companies. It will give some implications to other development projects and strategies in Asian countries which also try to induce IT industry.

MSC projects are still now on the process of development, so surveys have to be continued carefully, together with those of general IT industry in Malaysia and other countries. And classification of industries should be more sophisticated in order to indicate locational characteristics explicitly.

Acknowledgements

Reference

Bade F.J. and Nerlinger A.N. 'The spatial distribution of new technology-based firms: Empirical results for West-Germany',*Regional Science*, vol.79, 2000, p.155-176,

FMM(Federation of Malaysian Manufactures) *"FMM Directory 1999, Malaysian Industries"*, vol.30, Kuala Lumpur, Federation of Malaysian Manufactures, 1999

MDC (Multimedia Development Corporation) Website [2000] (referred on Nov. 2000) http://www.mdc.com.my/

Ogawa T and Ishikawa M, 'A Study on the Location and the Factors of Agglomeration of the Information Processing Industries in Tokyo Metropolitan Area', *Papers on City Planning*, vol.24, 1989, p.67-72 [Japanese]

Ogawa T and Ishikawa M, 'A Study on the Form of Specialization and the Structure of Location of the Information Processing Industries in Tokyo', *Papers on City Planning*, vol.25, 1990, p.427-432 [Japanese]

Nihon Keizai Shinbun, 'Comparison of IT infrastructure in Asian Countries and Regions' on 22nd, May, 2000 [Japanese]

Yukawa Koh 'Regional Dependency of Contents-making Industry –Multimedia Gulch', *FRI Research Report*, vol.40, Dec. 1998, [Japanese] http://www.fri.fujitsu.com/hypertext/fri/reports/report40.pdf, (Japanese)

Yukawa Koh 'Growth of Contents-making Industry and Correspondence by Policies', *FRI Research Report*, vol.47, Apr. 1999, [Japanese] http://www.fri.fujitsu.com/hypertext/fri/reports/report47.pdf,

Yukawa Koh 'Agglomeration of Net Companies in Tokyo –towards the development of Japanese "Silicon Valley"', *FRI Report*, vol.88, Jul. 2000, [Japanese] http://www.fri.fujitsu.com/hypertext/fri/review/rev051/02yukawa.pdf,