Chapter Nine

MANY ASIA-PACIFIC NATIONS ARE POISED TO DO WELL IN THE INFORMATION REVOLUTION, SOME ARE NOT

ASIA-PACIFIC NATIONS VARY GREATLY IN THEIR INFORMATION REVOLUTION POSTURES

How goes the information revolution in the Asia-Pacific region?[1] That question is best answered in two parts: To what extent do Asian countries *use* information technology, and to what extent do they *produce* IT hardware and software? Not surprisingly, they vary greatly on both counts, and not all the big users are big producers and vice versa. Figure 9.1 illustrates the latter point—showing (1) the major IT user and producer nations, (2) China and to a lesser extent India (rapidly emerging as important IT users and producers), and (3) other nations that are lagging behind—and provides a reference for the following discussion.[2]

Several Asia-Pacific Nations Are Doing Well Today in the Information Revolution

Among the Asia-Pacific nations, Japan, South Korea, Singapore, and Taiwan are today both big users and big producers of IT. Australia, Hong Kong, and New Zealand are big users but not big producers, whereas Malaysia, the Philippines, and Thailand are big producers but not big users.[3] All these nations can be said to be doing relatively well today insofar as the information revolution is concerned.

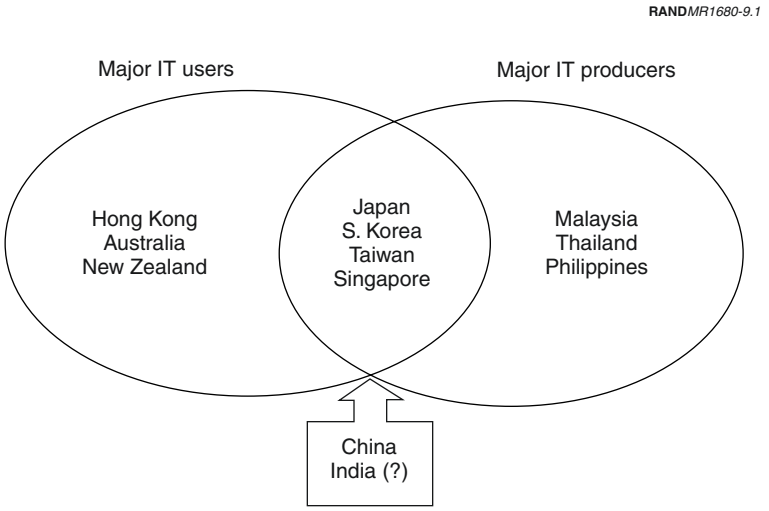

Figure 9.1—IT Users and Producers in the Asia-Pacific Region

Regarding IT usage, in 2000 Internet penetration in South Korea, Hong Kong, Japan, and Australia (in that order) exceeded even the U.S. level, with Singapore, Taiwan, and New Zealand (in that order) not far behind.[4,5] In contrast to the situation in the United States, however, most Internet usage in Asia today is by businesses, not from the home.[6] Usage by businesses, though, is not terribly sophisticated. Functions like email, supply chain management, and office automation dominate.[7]

Today the Asia-Pacific Region Is a Much More Significant Global IT Producer Than a Consumer

Japan, Singapore, Taiwan, South Korea, Malaysia, Thailand, and the Philippines are all major IT producers, with IT exports being a major fraction of the total economy in all these nations except Japan.[8] Indeed, the Asia-Pacific region is a much more significant global IT producer than a consumer. It accounts for more than 80 percent of the total world output of the following IT products: desktop PCs, notebook PCs, cathode-ray tube (CRT) monitors, flat-panel displays,

modems, network interface cards, hard disk drives, mouses, keyboards, televisions, game boxes, mobile phones, PDAs, entry-level servers, hubs, and switches.[9]

Asia is equally dominant in its output share of critical components and materials used in the IT industry. For the world's semiconductor industry, Asia produces more than 70 percent of all bare silicon material, more than 90 percent of epoxy resin for integrated circuitry (IC) packaging, more than 80 percent of memory semiconductors (DRAMs, SRAMs, and flash memory), and more than 75 percent of outsourced manufactured semiconductors. Other critical IT parts made primarily in Asia include a wide range of passive components (resistors, diodes, capacitors), connectors, sockets, switched power supplies, liquid crystal display (LCD) panels, printed circuit boards, and casings.[10] Asia's share of global IT hardware output is not only large but is still on a steep upward climb, as a growing number of ever-higher-value parts and products get outsourced to the region for production.[11]

Asian Nations Generally Follow the "Japan Model" in the Evolution of Their IT Production Activities

Asian IT producers have generally followed the "Japan model" of progressively sophisticated production technology, beginning with labor-intensive, low-value manufacturing. The model, shown in Figure 9.2, can be seen as a compromise between European top-down regulation and U.S. bottom-up entrepreneurialism.[12]

Because they all follow the Japan model, the industrial sophistication of the various Asian IT-producing countries can be compared according to their level in that model, as shown in Table 9.1. South Korean and Taiwanese companies are thus among the more technologically advanced and diversified, after Japan, but they face challenges on their road to becoming global IT innovators. At the other end of the spectrum, most Southeast Asian IT producers appear to be stagnating at lower rungs on the production ladder. The reasons include their lack of indigenous IT companies and the rise of China (which we discuss below).[13]

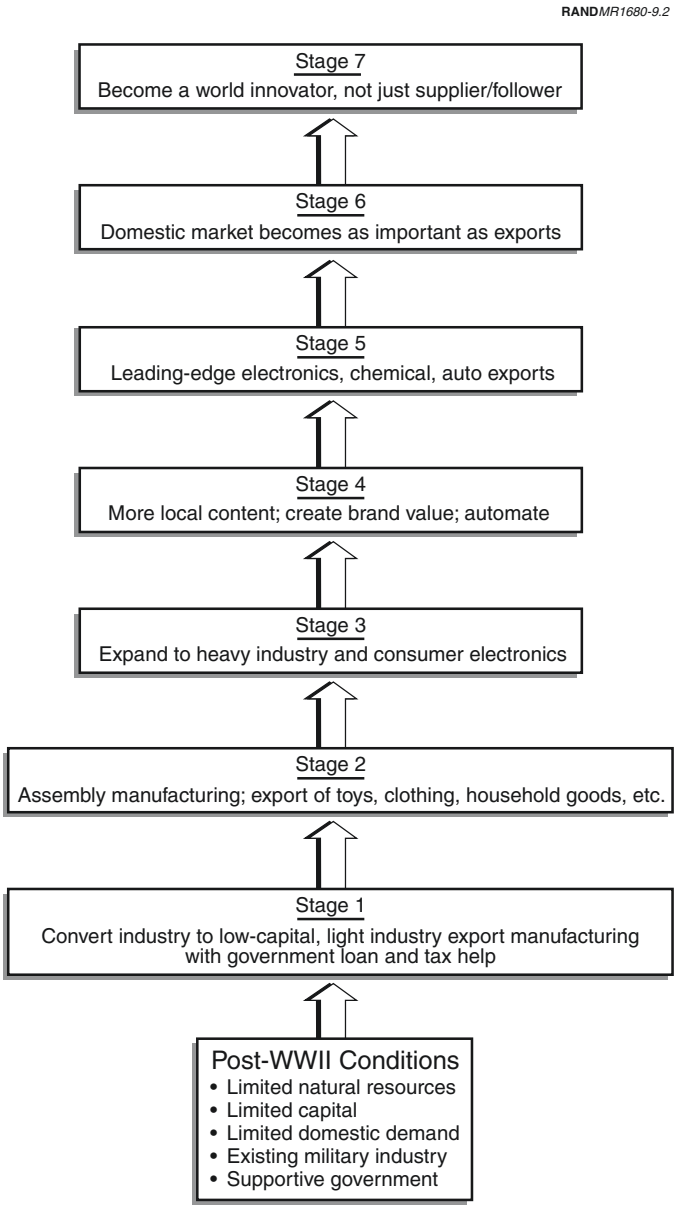

Figure 9.2—The "Japan Model" of the Evolution of IT Production

Table 9.1

Sophistication of IT Producers in the Asia-Pacific Region

IT Producer	Stage	IT Ownership	Expertise
Japan	7	Domestic	Consumer electronics, advanced materials and components, IC design and manufacturing, computers
South Korea	6	Domestic	Consumer electronics, phones, peripherals, IC design and manufacturing
Taiwan	5	Domestic	PCs, peripherals, components, IC design and manufacturing, some communications equipment
Singapore	4	Domestic and foreign	Disk drives, PC peripheral assembly, some IC manufacturing
Malaysia	3	Foreign	Disk drives, PC peripheral assembly, cell phone assembly
Thailand	2	Foreign	Disk drives, disk drive component assembly
Philippines	2	Foreign	Peripherals assembly, some software and services

Japan Has Something of a "Split Personality" Today Regarding the Information Revolution

There is no question that Japan is one of the world's leaders in IT today.[14] However, much has been written in recent years regarding the rigidities of the Japanese society, economy, and government, the difficulties this causes Japan in coping with rapid, profound change, such as that brought on by globalization and the information revolution, and the resulting stagnation of the Japanese economy since the early 1990s.[15] This societal rigidity does not bode well for Japan's ability to respond effectively to future challenges posed by the information revolution.

On the other hand, some observers have noted a recent emergence of individualism and entrepreneurship in some sectors of the Japanese IT industry.[16] If this nascent trend persists and spreads, it could ensure the future vitality of that industry, in spite of the rigidities in the larger society.

China and India Are of Special Note as Rapidly Emerging IT Users and Producers

Clearly defined clusters of IT industry are already developing in China and India, although IT output is far from being a major component of either country's economy.[17,18] Both nations are following the early stages of the Japan model in the evolution of their IT production activities, starting low on the value-added chain. Both governments, especially China, have policies in place to encourage foreign companies to invest and produce locally, as well as incentives and allowances to foster homegrown IT companies. An assortment of lower-end hardware manufacturing dominates today in China, while back-office services and software outsourcing dominate in India.[19]

China will almost surely advance to later stages in IT industry development, in the process possibly leapfrogging many nations that today are more advanced but burdened by the inertia created by legacy infrastructures. The major driving forces in China are the size and potential of its local market and the almost endless availability of cheap labor, both of which attract foreign investment.[20] In recent years, China has become the IT manufacturing base of choice, with a number of Taiwanese and Hong Kong IT companies beginning to transfer their manufacturing operations there—a trend that is likely not only to continue but also to accelerate—and has rapidly attracted a large, increasingly advanced IT knowledge base, some of it from expatriate Chinese returning home after receiving technical training overseas.[21,22]

India shares some of China's potential; its software production has increased fiftyfold over the past 10 years.[23] However, experts assess the environment as not being sufficiently "ripe" yet for breakout IT development in India, pointing out that software created there has negligible copyright protection today, services are hard to scale, the domestic market is tiny, and IT manufacturing has not taken root. These experts see political instability and a discouraging venture formation environment as added hurdles.[24] As a result, India faces substantial talent outflow problems.[25]

Other Asian Nations Are Lagging Well Behind

Many other Asian nations are lagging well behind (e.g., Bhutan, Cambodia, Indonesia, Laos, Mongolia, Myanmar, Nepal, Pakistan, Sri Lanka, Vietnam, and the nations of Central Asia).[26] These nations have low levels of Internet penetration and usage, and little or no IT production activity. Not only are they lagging behind today; little is occurring to improve their future situations insofar as the information revolution is concerned.

THE IMPACT OF THE INFORMATION REVOLUTION ON POLITICS AND GOVERNANCE IN THE ASIA-PACIFIC REGION VARIES WIDELY FROM NATION TO NATION

The information revolution is affecting politics and governance in the Asia-Pacific region largely through two mechanisms:

- Bottom-up actions and initiatives of citizens, civil society, nongovernmental organizations, and political parties, facilitated and enabled by IT, ranging from organizing minor protests of government policies all the way to overthrowing sitting regimes.[27]
- Top-down initiatives of governments that use IT to deliver information and services, generally termed "electronic government," or "e-government."

Governments are having a major impact in both of these areas: in the latter as the initiator and driving force; in the former by their acceptance of or opposition to these bottom-up initiatives.[28]

Information Technology Has Had an Impact on Politics in Some Asian Nations Thus Far, but Not in Others

Asian nations are often classed as one-party states or liberal democracies insofar as their approach to politics is concerned.[29] All of the liberal democracies in Asia have virtually no restrictions on Internet access and online political use and content, whereas the one-party states have a range of restrictions, as summarized in Table 9.2.[30]

Table 9.2

Degree of Restrictions on Internet Political Use and Content, by Type of Government

States Having Restrictions of the Following Type (one-party states in *italics*; liberal democracies in Roman)			
Severe	**Significant**	**Moderate**	**Negligible**
Severe restrictions on online political content and usage through limits on access	Significant restrictions on Internet access or online political content and usage, or both	Promotion of public Internet access; moderate restrictions on political content and use	Promotion of Internet access, and few or no restrictions on online political content and use
Myanmar *North Korea*	*China* *Vietnam*	*Singapore*	Australia India Indonesia Japan *Malaysia* Philippines South Korea Thailand

One might think that IT would have a significant impact on politics in all of those Asian nations with few restrictions on Internet access, use, and content, but little or no impact in nations with significant restrictions. Thus far, this has not been the case. IT has had a significant impact on politics in some one-party states and liberal democracies but not in others, as indicated in Table 9.3.[31] The reasons for this impact, or lack thereof, are largely specific to each country.[32]

IT Is Reshaping the Way Asia-Pacific Governments Conduct the Business of Governance: More in Some Nations Than in Others

Several Asian governments routinely place within the top 10 countries in the world in surveys of e-government activities; these include Australia, Singapore, Hong Kong, New Zealand, and Taiwan.[33] Other countries are devoting significant amounts of time and resources to e-government but have not yet reached a level of global sophistication; those include Thailand, the Philippines, and Malaysia. Coun-

Table 9.3

IT Influence on Politics Versus Government Type

	Type of Government	
Influence of Information Technology on Politics	One-Party States	Liberal Democracies
Visible influence	China Indonesia Malaysia	Philippines South Korea
No significant influence	Myanmar North Korea Singapore	Australia India Japan

tries such as India and China have remarkable pockets of innovation in local government but are in the early stages overall.[34] Other nations, including North Korea, Myanmar, Vietnam, and Indonesia, have not developed robust e-government programs.[35]

WHAT DOES THE FUTURE HOLD FOR THE ASIA-PACIFIC REGION?

Over Time, China Should Emerge as a Major IT Player in Asia and the World

As noted earlier, in recent years China has become the IT manufacturing base of choice, for Asian, North American, and even European companies. The major driving forces behind this trend are the size and potential of the local Chinese market and the almost endless availability of cheap labor, both of which foreign investors find very attractive. As a corollary, China is also beginning to attract a large knowledge base of increasingly advanced know-how, some of it from expatriate Chinese returning home after receiving technical training overseas.

These trends will almost certainly continue, and could even accelerate now that China has joined the World Trade Organization. China should continue advancing to later stages in IT industry development and, over time, become a major IT player not only in Asia but also in the world, in the process possibly leapfrogging many nations

that today are more advanced but burdened by the inertia created by legacy infrastructures.

This assumes continued peaceful relations between China and the United States and a continued peaceful, gradual liberalization of China's government. The impact of IT should further this liberalization, through its enabling of bottom-up political activity and top-down e-government initiatives.[36]

Other Asian Nations Currently Leading in IT Will Define Their Futures by Their Responses to China's Growing IT Role

South Korea, Taiwan, and the leading IT nations in Southeast Asia achieved their current positions initially by serving as low-cost manufacturing outposts for North American, European, and Japanese electronics and IT companies, beginning with the manufacture of components and gradually working up the IT value-added chain, beginning under foreign ownership and gradually transitioning (in some but not all of these nations) to domestic ownership. This process took several decades.[37]

The emergence of China as the new low-cost, mass-market manufacturing outpost of choice in Asia changes the IT playing field on which these other Asian nations must now operate. Already, many Taiwanese and Hong Kong IT companies have begun to transfer their manufacturing operations to China, at the component, subsystem, and even system level; Japanese companies are beginning to follow suit.[38] And nations such as Singapore, Malaysia, Thailand, and the Philippines have begun to lose contract manufacturing business to companies in China with lower-cost plants.[39]

This is not necessarily a zero-sum game, however; China's IT gains do not have to be losses for other Asian nations.[40] For these other nations to survive as viable players in the IT world, they must redefine their business models, carving out value-added niches that can withstand the Chinese onslaught. Some of them, such as South Korea and Taiwan, may succeed by retaining design and high-level engineering capabilities at home while outsourcing manufacturing operations to China.[41] Other Asian nations, however, that have not yet advanced to the design and high-level engineering level in their IT operations may have substantial difficulty.

Japan's Future Course Is Unclear: It Could Continue as a Leader in IT or Gradually Fall Behind

We mentioned earlier the societal rigidities that Japan has displayed in recent years and the resulting stagnation of the Japanese economy throughout the 1990s. If this condition persists, it could lead Japan gradually to fall behind the nations in the vanguard of the information revolution.

On the other hand, if the recent emergence of individualism and entrepreneurship in some sectors of the Japanese IT industry, also mentioned earlier, persists and spreads, it would offer hope for the near- to mid-term recovery and long-term vitality of the Japanese IT industry and the larger economy. In this case, Japan would continue as a world leader in IT, albeit with an ever-increasing fraction of its manufacturing operations "offshored" to Japanese-owned facilities in China.

It remains to be seen which of these forces—rigidities in the overall society or nascent individualism and entrepreneurship in the Japanese IT industry—proves stronger.

India's Software and Back-Office Service Industries Should Prosper; However, a Broader Role in the Information Revolution May Be Beyond India's Reach

India has three important advantages in the global IT competition: a plentiful supply of talented IT-trained people; copious numbers of educated, low-cost workers proficient in English; and close ties to the many Indian entrepreneurs in Silicon Valley.[42] These factors should ensure the continued prosperity and growth of the Indian software and back-office service industries, at least over the near- to mid-term.[43] However, going beyond software into IT hardware activities may be difficult, particularly in view of China's growing role in this area.[44] Also, the entire Indian high-tech industry is a small veneer on top of the Indian economy.[45] Much of the nation is still in the agricultural age, not yet having reached the industrial age, let alone the information age. These factors may place any broader role in the information revolution beyond India's reach.

Most of Today's Laggards Will Continue to Lag

Most of these lagging nations (e.g., Bhutan, Cambodia, Indonesia, Laos, Mongolia, Myanmar, Nepal, Pakistan, Sri Lanka, Vietnam, and the nations of Central Asia) lack one or more essential elements required to do well in the information revolution.[46] Accordingly, they will continue to lag behind.

NOTES

[1]By the "Asia-Pacific region" we mean Asia, in its entirety, plus Oceania (i.e., Australia, New Zealand, and most of the smaller islands of the Pacific Ocean). Throughout this chapter, we will sometimes use "Asia" or "Asian" as a short form to refer to the entire Asia-Pacific region.

[2]We take this figure from Hachigian and Wu (2003). This entire chapter draws heavily on the data, analysis, and findings presented in that report.

[3]In making these statements, we take as a basic measure of IT use the number of Internet users per 1,000 people. For IT production, we use the value of a nation's IT exports in absolute terms (i.e., in U.S. dollars) and also relative to the size of the nation's economy (i.e., IT exports as a fraction of a nation's total exports and a fraction of its GDP). (See Hachigian and Wu, 2003, for a compilation of such data for nations across the Asia-Pacific region and a detailed discussion of their significance.)

[4]Hachigian and Wu (2003) present the following figures on Internet usage per 1,000 people in Asia in 2000 (compared with that in the United States):

Advanced Nations	Users/ 1K	Emerging Nations	Users/ 1K	Lagging Nations	Users/ 1K
S. Korea	402.7	Brunei	88.8	Kazakhstan	6.7
Hong Kong	382.5	Thailand	37.9	Sri Lanka	6.3
Japan	371.1	Micronesia	33.9	India	4.9
Australia	344.1	Philippines	26.5	Uzbekistan	4.8
U.S.	338.7	PNG[a]	26.3	Solomon Is.	4.5
Singapore	298.7	China	17.8	Vietnam	2.5
Taiwan	255.0	Mongolia	12.5	Nepal	2.2
New Zealand	216.7	Kyrgyzstan	10.5	Bhutan	1.9
Malaysia	159.0	Marshall Is.	9.6	Turkmenistan	1.2
New Caledonia	112.8	Indonesia	9.5	Laos	1.1

NOTE: Asian countries with one Internet user or less per 1,000 people in 2000 are Pakistan, Bangladesh, Cambodia, Tajikistan, and Myanmar.

[a]PNG = Papua New Guinea.

[5]Also relevant, as a rough measure of the overall size of a nation's IT market, is the absolute number of Internet users in a nation. Hachigian and Wu (2003) provide the following figures for this quantity in 2000:

Large	Millions of Users	Medium	Millions of Users	Small	Thousands of Users
U.S.	95.4	Indonesia	2.0	Kazakhstan	100.0
Japan	47.1	Philippines	2.0	Kyrgyzstan	51.6
China	22.5	Singapore	1.2	Nepal	50.0
S. Korea	19.0	New Zealand	0.8	Mongolia	30.0
Australia	6.6	Vietnam	0.2	Brunei	30.0
Taiwan	5.7	PNG[a]	0.1	New Caledonia	24.0
India	6.0	Pakistan	0.1	Myanmar	7.0
Malaysia	3.7	Sri Lanka	0.1	Laos	6.0
Hong Kong	2.6	Bangladesh	0.1	Cambodia	6.0
Thailand	2.3	Uzbekistan	0.1	Turkmenistan	6.0

NOTE: Countries with 4,000 users or less are Micronesia, Tajikistan, Solomon Is., and Marshall Is.
[a]PNG = Papua New Guinea.

[6]Only in Japan and South Korea does home usage top business usage today. Hachigian and Wu (2003) discuss the factors limiting home usage in Asia.

[7]See Hachigian and Wu (2003) for further discussion of Internet usage in the Asia-Pacific region, including the factors limiting the sophistication of current business usage.

[8]Hachigian and Wu (2003) provide the following data on high-technology exports from Asia-Pacific nations in 2000:

Country	High-Tech Exports in US$M	High-Tech as a % of Total Exports	High-Tech Exports as a % of GDP
United States	367,919	34.0	3.7
Japan	135,564	28.0	2.8
Singapore	104,614	63.0	113.4
Taiwan	80,837	52.8	26.8
S. Korea	72,012	35.0	15.8
Malaysia	57,494	51.3	64.1
Hong Kong	56,111	23.0	34.5
China	53,349	19.0	4.9
Thailand	49,684	60.7	40.7
Philippines	24,692	59.0	33.0
Australia	22,965	15.0	5.9
Indonesia	9,563	16.0	6.2
New Zealand	1,597	10.0	3.2
India	1,408	2.2	0.3

To avoid misinterpreting these data, Hachigian and Wu (2003) note the following two points:

> (1) A large proportion of Hong Kong's IT exports actually involves production in China by Taiwan-owned companies. Taiwanese companies typically hold their Chinese manufacturing subsidiaries under Hong Kong–based overseas entities to circumvent Taiwanese government restrictions on direct investment in China or ownership of China-based entities. (2) In Singapore's and Malaysia's data, exports are reported in total value, including the value of parts that were imported to, but not produced in, Singapore or Malaysia. For example, a $75 hard-disk drive is exported, but local value-added may have been only $35, because $40 in unassembled components was imported. That explains the unusually high IT export value as a percent of GDP [in Singapore's case, over 100 percent].

[9]See Hachigian and Wu (2003).

[10]See Hachigian and Wu (2003).

[11]According to Hachigian and Wu (2003):

> Applied Materials, the leading world maker of semiconductor manufacturing equipment, notes that in the first quarter of 2002, 71% of its equipment was sold to Asia, compared to 41% in 1996. This is a leading indicator that Asia's semiconductor output will as much as double in the years to come.

[12]This "Japan model" of the evolution of IT production was developed by Hachigian and Wu (2003), from which we take Figure 9.2 and much of the accompanying discussion.

[13]See Hachigian and Wu (2003) for further discussion of these issues.

[14]For example, Hachigian and Wu (2003) list the following Japanese companies that today lead in world market share or product excellence in the areas indicated:

Company	Areas of Excellence
Alps	Magnetic disk drive heads
Canon	Cameras, IC manufacturing equipment, office equipment, optic components
Fujitsu	Servers, mainframes, enterprise systems, office equipment, hardware, and ICs
Hitachi	Enterprise storage, enterprise software, advanced ICs
Kyocera	Advanced chemicals and materials, electronic components
Matsushita	Stereos, TVs, VCRs, DVD players, office equipment
NEC	Advanced ICs, PCs, servers, LCD panels, office equipment
Nintendo	Game boxes
NTT Docomo	Mobile services
Shinkawa	IC manufacturing equipment
Sony	Walkman, cameras, game boxes, notebook PCs, stereos, TVs

Table—continued

Company	Areas of Excellence
Sumitomo	Advanced chemicals and materials for aerospace and electronics, power plants
Tokyo Electron	IC manufacturing equipment
Toppan Printing	Printed circuit boards, IC substrate materials
Toshiba	Notebook PCs, advanced ICs, LCD panels, consumer electronics

[15]Grimond (2002) takes a detailed look at "what ails" the Japanese economy, government, and society today. Iritani (2000) provides a briefer version. Miyashita (1999) specifically discusses how cultural obstacles to individualism, risk-taking, and entrepreneurship in Japan impede the nation's ability to meet the challenges posed by the information revolution.

[16]Lily Wu (private communication, 2002) reports a noticeable emergence of entrepreneurship in the Japanese IT industry since 2000. Also see Ono and Spindle (2000), who describe a recent stirring of individualism in Japan, depicting it as a response to the nation's long slump during the 1990s, and Grimond (2002), who mentions stirrings of individualism among the youth in Japan.

[17]In 2000, IT business clusters satisfying criteria established by Hillner (and adopted by the United Nations Development Programme) existed at Hong Kong (now a Special Administrative Area) in China and at Bangalore in India. (See Hillner, 2000, and UNDP, 2001.) Additional IT clusters have begun emerging in both of these nations since then. *BusinessWeek* (2002b) discusses IT clusters emerging in China, including, in particular, the Zhangiang district of Shanghai. Arunachalam (1999) identifies emerging Indian IT clusters at Mumbai (Bombay) and New Delhi; Bradsher (2002b) describes the IT cluster emerging at Hyderabad.

[18]As shown in note 8 above, in 2000, high-tech exports were 4.9 percent of China's GDP and 0.3 percent of India's. (These numbers have increased significantly since then in both nations.)

[19]See Filkins (2000) for a discussion of India's back-office service industry, in which India is one of the world's leaders.

[20]See Hachigian and Wu (2003) for further discussion of China's IT potential.

[21]According to Hachigian and Wu (2003), semiconductor manufacturers believe China will be the next great center of IT production and consumption. *BusinessWeek* (2002b) gives examples of Taiwan and Hong Kong IT companies that are transferring their manufacturing operations to mainland China. Goodman (2002) explores the broader implications of this trend.

[22]Tempest (2002) describes the Chinese government's recent efforts to lure back Chinese IT expatriates from Silicon Valley; Kaufman (2003) recounts the return of one such expatriate.

[23]According to Hachigian and Wu (2003), India's software exports have risen from $150 million per year 10 years ago to $7.6 billion in the 12 months ending March 2002 (two-thirds of which were bound for the United States).

[24]See Hachigian and Wu (2003).

[25]Noteworthy Indian entrepreneurs are numerous in the United States and responsible for many well-known corporate successes. In 2001, 60 percent of all H-1 visa holders in Silicon Valley were software engineers, with India citizens making up 43 percent of the total. (See Hachigian and Wu, 2003.)

[26]UNDP (2001) presents IT-related data on these and other nations throughout the world, including the Asia-Pacific region.

[27]The most dramatic example of IT's political impact on an Asian nation is Indonesia, where it contributed to the downfall of President Suharto. Hachigian and Wu (2003) discuss this further.

[28]We follow Hachigian and Wu (2003) in using this two-mechanism approach to discuss the effect of IT on politics and governance in the Asia-Pacific region.

[29]We take our definition of these two categories from Hachigian and Wu (2003), who distinguish between

> liberal democracies (that is, those democracies that guarantee individual rights for citizens, particularly freedom of expression and assembly) on the one hand and "one-party" states on the other. The latter category includes a range of countries from "electoral" or illiberal democracies, such as Singapore, to true dictatorships, such as North Korea.

[30]We take this table from Hachigian and Wu (2003), which contains a detailed discussion of the type and degree of restrictions on Internet access, use, and content in each of these nations.

[31]We take this table from Hachigian and Wu (2003).

[32]See Hachigian and Wu (2003) for a detailed discussion of the impact, or lack thereof, of IT on politics in each of these nations, and the reasons why.

[33]Australia and Singapore consistently rank among the most advanced e-government leaders in the world. (See Hachigian and Wu, 2003.)

[34]In China, the real energy for e-government is at the provincial and local levels, where, according to Hachigian and Wu (2003), some Chinese officials are enthusiastically embracing e-government.

[35]Hachigian and Wu (2003) discuss e-government efforts in all the nations mentioned here at length.

[36]Miles (2002) provides a much less sanguine view of China's near-term prospects for continued political liberalization and economic development, emphasizing the many obstacles China must overcome on the way. *Red Herring* (2002) provides a range of both positive and negative views.

[37]For one top-level view of this process, as it occurred in Singapore over several decades, see Lee (2000).

[38]See *BusinessWeek* (2002b).

[39]See Hachigian and Wu (2003).

[40]Recent studies by the Asian Development Bank (Roland-Holst, 2002) and Deutsche Bank (Bhaskaran, 2003) make this point.

[41]Already, their Chinese manufacturing sites are beginning to increase the market share, profitability, and technology investment of Taiwanese and South Korean companies. (Private communication, William Overholt, RAND.)

[42]According to Arunachalam (1999), about 170,000 engineers graduate every year from Indian universities, more than in the United States. There are about 250,000 software professionals in India today, and the several hundred IT companies they work for are well coupled to the Internet.

[43]Rai (2002) describes the current state and near-term prospects of India's software and back-office service industries.

[44]Bradsher (2002a) compares the near-term growth potentials of China and India, and finds India lagging.

[45]According to Arunachalam (1999), less than 1 percent of Indian society is in the information age/high-tech veneer today.

[46]We discuss these essential elements in Chapter Six of this report.