China's ICT: Progressing Toward Maturity From A Global Perspective

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Abstract

This paper assesses the information and communications technology (ICT) factors governing China's economic expansion and its ability to sustain this expansion in the context of competing nations with similar infrastructures. This assessment utilizes a variety of selected metrics that capture the status of ICT capability of China. It provides a glimpse into the country's ability to become a significant force in the global knowledge economy by highlighting the nation's overall competitiveness rankings, juxtaposed to the standings of other nations. The timeliness of this work is noteworthy, since the success of China's transition towards economic and societal advancement is underpinned, to a large extent, by its total ICT investment. If a positive outcome is achieved, Chinese manufacturers will be able to adroitly weave themselves into the global supply chain by leveraging the country's burgeoning ICT infrastructure.

1. Introduction

China is one of the fastest-growing economies in the world since it embarked on its path toward market socialism in the late 1970s. According to statistics from the World Bank, its gross domestic product grew during the period 1978 through 2001 at an average annual rate of 9.55% while the economies of Japan, Germany, and the United States grew at rates of 2.84, 1.98, and 3.06, respectively. Foreign multinational corporations (MNCs), attracted by the nation's vast pool of inexpensive labor and state sponsored special economic zones (SOEs), poured billions of dollars into the country to attain competitive advantage made possible by outsourcing labor-intensive production to lower-cost suppliers. China's ability to sustain large foreign direct investment (FDI) inflows has increased steadily and, from 1991 through 2001, averaged annual inflows in excess of $35 billion. This is an astonishing feat, considering that prior to 1982, that nation received no FDI inflows and, in the period 1993 through 1998, subsequently skyrocketed to the number two global position of FDI investment, topped only by the United States.

From the perspective of information and communication technologies (ICT), the number of Internet users in China, for example, has increased by more than six times from 1997 to 1999, reaching an estimated 8.9 million at the end of 1999; as of 2004, it rose ten more times to 80 million (Luo, pages 196 – 198; Layman, page 1). The success of China's intended transition towards economic parity with other developed nations depends on its investment in ICT. If executed correctly, Chinese manufacturers will be able to weave their firms into the global supply chain, thereby enhancing the nation's chances of realizing its goal of becoming the world's workshop (Spencer, pages 428 - 442).

From the economic and infrastructural perspectives, Asian and Western MNCs are eyeing China's progress from two perspectives: the first is concerned with the myriad of marketing opportunities to a massive consumer populous clamoring for world-class branded products; the second relates to the development of strategic partnerships that leverage China's vast labor pool (Lardy, pages 69 – 73, 122 – 126).

This feat of bringing China out of its fragile and decrepit past and into an era of a thriving and invigorated economy poses formidable challenges to the nation's leaders. From this purview, China is at a crossroads. If successful, it may indeed reclaim its former position as the world's largest and most extensive economy. It is not surprising, therefore, that China has thrown open the doors to foreign investment to exploit substantial knowledge transfer agreements and to leverage the continued expansion of the global economy. This assumes however, that China possesses the cumulative ability of maximizing technological absorption and the technical capacity to catch up with the knowledge-based economies in the West and in other Asian countries such as Japan and Singapore.

2. China in Historical Context

"Poverty is not socialism. It's glorious to get rich…Let some people get rich first" said Deng Xiaoping following the Historic visit to China by President Nixon in the mid-1970s.[1] Shortly thereafter, a series of negotiations opened the country up to Western trade, technology, influence (limited) and access to money that provided the nation with a path toward prosperity. Since 1979, China has been engaged in efforts to reform its economy. One of the ways the nation is accomplishing this task is through foreign business ventures. Characterized by limited liability agreements in which both partners are responsible for the day-to-day operations of the firm, at least 25 percent of the equity of any joint venture belongs to the foreign investor. In the case of high-tech ventures where corporate governance policies are less likely to give up any control to Chinese business leaders (owing to the sophistication of the product mix), China established a special classification of wholly foreign-owned enterprises (WFOEs), which, although they only account for a small percentage of Chinese business ventures, numbered 24,000 with a combined value of $39 billion in 1996 (Ho, pages 15 – 16; Grub & Lin, page 72; Weidenbaum & Hughes, pages 122 – 123).

Further, China's "Golden Initiatives" ICT project, announced during the 16th national Congress of the Communist party of China in 2002, is proclaimed by the government to be the decisive factor that will move China into the set of knowledge economies of the 21st Century.[2] Continuing its preference for ten-year economic growth strategies, China's declared strategy is to build and deploy a manufacturing environment leveraging all that the knowledge-based economy has to offer, through (a) updating economic and institutional regimes, (b) upgrading education and learning, and (c) creating and deploying a sound information infrastructure.

The resulting rate of growth in China has also caused the largest human migration in recorded history. Workers from the hinterland stream toward the busy coastal cities, placing severe strains on an outdated and inefficient civilian infrastructure. Although historically at parity with other developing nations such as India, China's economic progression has doubled this comparative ratio in 2001 (to $878 compared with India's level of $477), as illustrated by Figure I.[3]

3. The Export Dependence of China

The magnitude of China's dependence on its exports is illustrated in Figure II, demonstrating in comparative context the bi-directional dependencies of the U.S. with two of its most important imbalanced trade partners, Japan and the U.S., each of whom maintains huge trade surpluses with the U.S.

From the Chinese perspective, China's marked increase of exports to the U.S. illustrates its trade reliance on the U.S.; especially since its exports to the U.S. are approximately 50% of its total exports. The view from the U.S. indicates that trade with China has also grown in significance and goods imports usually consisting of textiles, apparel, and personal computer components and represents around 10% of total U.S. imports.

In contrast, trade between the U.S. and Japan has eroded somewhat in recent years to less than 30% (from a high of 40%) of Japan's exports. Likewise, U.S. imports from Japan are 10% or one-quarter of the Chinese level. Clearly, Japan's reliance on its perpetual trade deficit with the U.S. virtually guarantees the dollar value of its

[1] Dela Rosa, Fred, "To get Rich is Glorious", The Manila Times, November 8, 2002, www.maniltimes.net.
[2] Dahlman, Carl J. and Jean-Eric Aubert, "China and the Knowledge Economy: Seizing the 21st Century", Washington, D.C.: World Bank, 2001.
[3] World Bank Economic Indicators, 1995 dollars.

exports to the American market will continue to be sizeable, but China nonetheless has a greater dependency level on the U.S. in terms of its total global trade to sustain its economic growth.

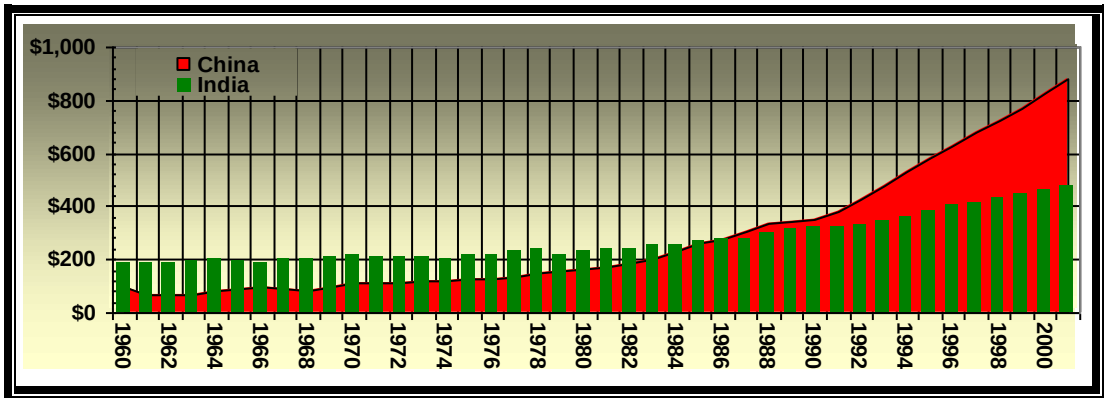

Figure I: Per Capita GDP of China and India (Constant 1995 US$)

Source: Table NY.GDP.PCAP.PP.CD World Development Indicators, Washington: World Bank

Recent calls by senior-level U.S. politicians and trade union representatives for the nation to devalue its currency while its trade surplus figure concomitantly exceeds $100 billion provides additional evidence that China's overarching dependence on continuance of its export-orientation trade policy is a reality. So, while Japan in the historical context shunned inward FDI, China has not only attracted but indeed become dependent on foreign investment.

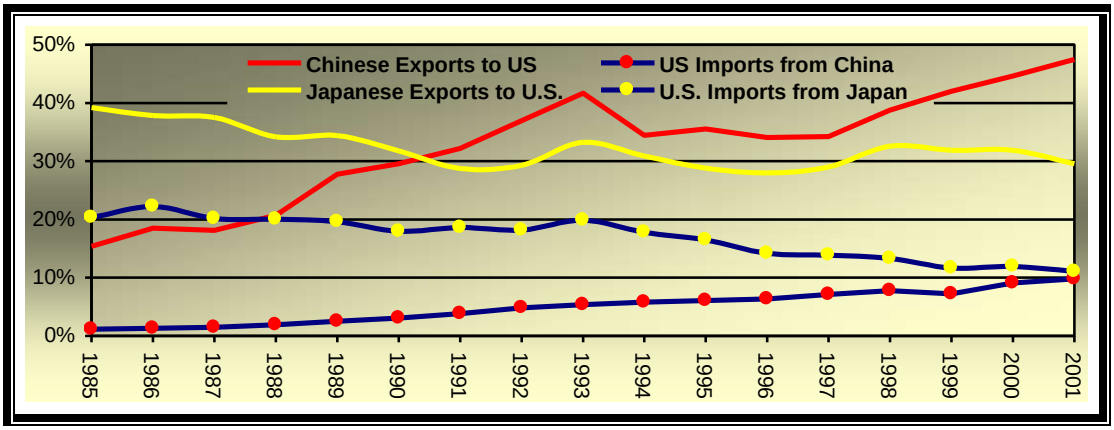

Figure II: Bi-Directional Share of Chinese vs. U.S. Goods Exports & Imports

Source: U.S. Census Bureau at *http://www.census.gov/foreign-trade/balance* and *http://www.bea.doc.gov/bea/newsrel/trad1302.pdf; Table No. 1328 from Statistical Abstract of The United States 2000, Table No. 1328, and Tables BX.GSR.MRCH.CD, BM.GSR.MRCH.CD, World Development Indicators, Washington: World Bank*

4. China's Need to Innovate

The rapid technological change witnessed during the 1990s helped bring about the enormous leap in output by Western nations, notably the United States. Technological leaps in telecommunications (email, networked systems, the Internet), hardware (personal computers, client-server architectures), software (distributed databases, middleware) have made it possible for domestically-based U.S. manufacturers to spread their production assets globally, leveraging the inherent value of globally-dispersed network linkages that underpin corporate expansion, contraction, and relocation of worldwide production and R&D centers that helped the U.S. maintain competitive advantage and gain sustainable competitive advantage.

China, in contrast, did not evolve technologically after 1960. However, in the 1950s, the Soviet Union maintained an advisor residency in the new People's Republic of China, and computer science technology was transferred into the compounds maintained by the Soviets. As a result of these investment programs, the Soviet Union left China with what was then state of the art computer technology. When the Soviet advisors left in 1960, advances in computer science ended as well. For the next 30 years or so, China's ICT advances were few.

With more than $6 trillion in assets divested globally (see Figure III), the U.S. stands alone as the unchallenged world leader in terms of magnitude of its domestically-produced ICT assets as competition increases. China, having witnessed the capabilities that ICT infrastructures are capable of delivering, is bent on building out its infrastructure to mimic the successful MNCs multinationals so as to leverage its labor resources and advance its economy.

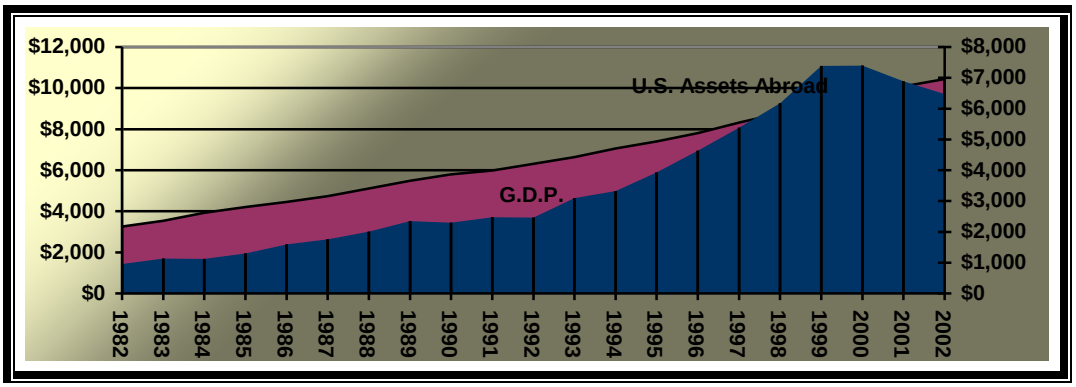

Figure III: U.S.-Owned Assets Abroad

Source: *U.S. Bureau of Economic Analysis, Table 2 – International Investment Position of the United States at Yearend, U.S. Commerce Department, Washington: World Bank*

As innovation has become a major determinant of the competitiveness of a nation such as China, or its domestic producers seek to leverage the global workforce through ICT strategies, firm-level endeavors that seek to exploit the systemic characteristics of new technologies and products increase. Multinational corporations, by virtue of their ability to extend their competitive advantage beyond borders and compete in foreign markets with domestic firms, carry with them a sophisticated array of skills, technological knowledge and organizational structures to operate ICT efficiently and effectively and carry out required processes of technological change. Infrastructural technologies, in particular, offer far more value when shared than in isolation (Carr, page 6).

From the national perspective, China's need to innovate resonates with the tenets of competitiveness espoused by Harvard's Michael Porter, who, besides serving on the U.S. Council on Competitiveness, is co-chair of the *Global Competitiveness Report*, an annual ranking of the competitiveness and growth prospects of 80 countries. He posits that a nation's prosperity is created, not inherited, and that a nation's competitiveness depends on the

capacity of its industry to innovate and upgrade. Further, he argues that countries also gain competitive advantage because of pressure and challenge. They benefit from having strong domestic rivals, aggressive home-based suppliers, and demanding local customers. As international trade flourishes, the innovation becomes paramount. Porter believes that innovation is what drives and sustains competitiveness. A firm must avail itself of all dimensions of competition (Porter, 10 - 12).

5. Is China's Strategy Working?

Although China's move toward matching information and communications technology (ICT) parity with Western nations is not yet a reality, the nation achieves high marks in various quantitative and qualitative scores that place its ICT maturation development on an upward trajectory. This section demonstrates that, in terms of similar export-driven countries, China is better poised in some areas to take advantage of ICT maturity to help sustain economic growth and lagging in other areas.

The findings and prescripts for China's policy initiatives offered in this section are based on juxtaposing data that captures China's rankings in the contexts of both the 75 nations global competitiveness survey results from the World Economic Forum (WEF) and the 41 export-oriented countries ratings from the National Asia Pacific Economic and Scientific Database (NAPES) database. NAPES is a comprehensive database of long-term economic indicators for the Asia-Pacific region covering bilateral trade, economic and industrial research and development and patents. The country selection criteria are simply those nations that have embarked on a path of economic development through trade and are shown in Table I.

Table I: ***Select NAPES Countries***

Australia	***Germany***	***Korea***	***Spain***
Austria	***Greece***	***Malaysia***	***Sri Lanka***
Bangladesh	***Hong Kong***	***Mexico***	***Sweden***
Belgium-Luxembourg	***Hungary***	***Netherlands***	***Switzerland***
Canada	***Iceland***	***New Zealand***	***Thailand***
Chile	***India***	***Norway***	***Taiwan***
China	***Indonesia***	***Philippines***	***Turkey***
Denmark	***Ireland***	***Poland***	***UK***
Finland	***Italy***	***Portugal***	***US***
France	***Japan***	***Singapore***	***Vietnam***

Part of the data analysis used to test the relative maturity of China's ICT is based on the World Economic Forum's Global Competitiveness Report for 2001-2002. A component of this report is the Executive Opinion Survey,[4] the results of which are derived from the responses of key executives surveyed from each country. These responses are organized into the ten categories illustrated in Table II.

Executive expert opinion is used in these and similar rankings to assess the relative capabilities of countries to compete in global markets and are considered as harbingers of executive actions. Without appropriate executive direction ICT expenditures continue to remain money spent rather than productivity gained. ICT investments create productivity when they are implemented in the context of other, complimentary investments such as new work systems, organizational redesign and business process reengineering (2003)[5].

[4] For a complete list of factors rated for all 75 countries, please refer to the references in the bibliography for the Global Competitiveness Report 2001–2002 (GCR)

[5] Milgrom and Robetts (1990), Malone and Rockart (1991), Bresnahan and Trajtenberg (1995), Greenwood and Jovanovic (1997), and Bresnahan, Brynjolfsson and Hitt (2002).

Forty-eight metrics that specifically characterize aspects of ICT capability were isolated from the Global competitive Index of the World Economic Forum (WEF)[6]. To clarify the differences of executive opinion on the set of components selected, the ratings scores for all 75 countries from the WEF dataset were ranked and the rating scores for the 41 country from the NAPS/WEF subset were also ranked. China's rankings among the NAPES countries highlight expert opinion about ICT capabilities relative to the set of economies that will compete with China for knowledge-based trade. China's rankings among the complete WEF set of countries shows the opinion scores relative to a larger and more diverse set of countries. A juxtaposition of these two set of data servers to demonstrate differences in the importance of these components in the contexts of the different sets of countries.

Table II: ***Executive Opinion Survey Responses***

Macroeconomic environment
Technological innovation and diffusion
Information and communications technology
General infrastructure
Public institutions: contracts and law
Public institutions: corruption
Domestic competition
Cluster development
Company operations and strategy
Environmental policy

Survey data is inherently ordinal and differences in the minds of the respondents might exist among likert values. To normalize these rating scores we computed the means and standard deviations for each component relative to each country set. We devised the following method whereby the data has a coarser granularity, but is more likely to reflect actual differences among the various country rating scores for a component: The standard deviation for the country sets was added to or subtracted from each rating score. If this modified score was greater than the mean value of the set plus one standard deviation, it was assigned a score of 3. If it was less than the average value minus one standard deviation, it was assigned a score of 1. Otherwise, it was assigned a default score of 2 (see Table III).

Table III: ***Rating Assignment Methodology***

Component Mean + Standard Deviation > = rating score, assign a 3
Component Mean – Standard Deviation < = rating score, assign a 1
Otherwise, assign a 2.

Appendix A is a list of the component metrics selected to represent ICT capability.[7] A comparative analysis of these data identifies factors that may put China at greater risk than previously identified in its efforts to move from an export-driven manufacturing economy into a knowledge-based economy. The majority of the normalized rating for both WEF and NAPES data were assigned a 2, indicating that the rating score for that country is within one standard deviation of the mean. Of the 48 factors selected to represent ICT capability, fifteen factors had rating scores of 2 for the WEF set and 1 for the NAPES set. A value of 1 indicates that the score is more than one standard deviation below the mean. If the relative rankings were less than 10% apart, the data was considered spurious. Some factor ratings were the same for more than one country and some factor ratings were close to the boundary

[6] For a complete list of factors rated for all 75 countries, please refer to the references in the bibliography for the *Global Competitiveness Report 2001–2002 (GCR*).
[7] For the complete set of factors used in the Global Competitive Index see the WEF 2001-2002 report.

Category	Title		Difference in rank: WEF/NAPES	WEF category	WEF % rank of 75	NAPES category	NAPES % of 41rank	APEC % rank of 10	Description
Technological innovation and diffusion	Availability of Scientists and Engineers 3.11	*	16%	2	79	1	95	80 +-10	Scientists and engineers in your country are (1=non-existent or rare, 7=widely available)
Information and communications technology	Speed and Cost of Internet Access 4.01	*	13%	2	77	1	90	80 +-10	Lease-line or dial-up access to the Internet in your country is (1=slow and expensive, 7=as fast and cheap as anywhere in the world)
	Quality of Competition in Telecommunication Sector 4.04	*	16%	2	77	1	93	90	Is competition in your country's telecommunications sector sufficient to ensure high quality, infrequent interruptions and low prices? (1=no, 7=yes, equal to world's best)
	IT Training and Education 4.06	*	11%	2	84	1	95	90	Your country's IT training and educational programs (1=lag far behind most countries, 7=are among the world's best)
	Laws Relating to ICT Use 4.11	*	12%	2	71	1	83	80	Laws relating to electronic commerce, digital signatures, and consumer protection are (1=non-existent, 7=well-developed and enforced)
	Quality of Public Schools 5.12	*	14%	2	66	1	80	70 +-10	Public (free) schools in your country are (1=of poor quality, 7=equal to the best in the world)
Public institutions: contracts and law	Intellectual Property Protection 6.03	*	10%	2	80	1	90	70 +-20	Intellectual property protection in your country is (1=weak or non-existent, 7=equal to the world's most stringent)
Cluster development	Buyer Sophistication 9.01	*	23%	2	65	1	88	90	
	Production Process Sophistication 10.06	*	19%	2	56	1	75	70 +-10	Production processes generally (1=use obsolete technology, 7=employ the world's best and most efficient technology)
	Extent of Staff Training 10.12	*	12%	2	78	1	90	90	In your country, companies general approach to human resources is to invest (1=little in training and development, 7=heavily to attract, train and retain staff)
	Quality of Management Schools 10.16		18%	2	72	1	90	90	Management schools in your country are (1=limited and of poor quality, 7=among the world's best)
	Internet Effects on Business 10.18	*	10%	2	80	1	90	90	To what extent has the Internet improved your firm's ability to coordinate with customers and suppliers to reduce inventory costs (1=no change, 7=huge improvement)

Table IV: ***Extant Components with Rating Scores and Relative Rankings***

between standard deviations making differences specious. The surviving twelve components along with their rating scores and relative rankings are presented in Table IV.

These twelve factors emerge as those where China is at significant risk of misjudging what action is required to develop future ICT capability and continue the ascent into the information driven global economy. China's ranks for every one of these twelve components are universally low when the focus is framed by the export driven economies. Most are in the lowest 15th percentile. More importantly, the extent of these component disadvantages were hidden when framed within the larger WEF country set.

As a cursory validation measure we performed the same ranking computations for the set of 10 countries in the Asia Pacific Economic Cooperation group used by Bui, Sebastian, Jones and Naklada to rate e-commerce readiness in East Asian economies[8]. In the APEC study, China ranked 8th among the 10 countries for overall e-readiness (2002). China's average rank using the current WEF/NAPES method for the APEC country set also put China in the 80th percentile.

6. Conclusion and Suggestions for Further Study

From an economic and infrastructural perspective, both Asian and Western MNCs eye China's progress from a bifurcated perspective: the first concerned with marketing to a nation having a massive consumer market that is beginning to accumulate discretionary cash and the second relating to the development of strategic partnerships to leverage the labor pool that China has to offer. This feat of bringing China out of its fragile and decrepit past and into an era of revitalization poses a formidable challenge to its leaders. From this purview, China stands at a crossroads in its history and is poised to reclaim its former position of being the world's largest economy.

Our study provides a launch point for subsequent development of a body of work that could complement Kraemer's earlier and current work, the seminal firm-level work of Brynjolfsson and Hitt (1994), and the regional level studies suggesting a "marked spatial distribution" benefit of IT investment by Hicks and Nivin. Here are some possible approaches:

1. China's leaders recognize that IT has a positive correlation with that nation's policy towards economic expansion. Subsequent development fostering the notion that builds on the developed work of Kraemer et al. and Bassanini, for example, may find that IT investment has the biggest bang for buck in developing economies. Coupling this research with the income and development disparity work (e.g., Chang 2003 and Wang 2003), it may be possible to use the data presented herein to determine whether the same situation is playing out in the Coastal vs. Hinterland (i.e., low performing) Provinces in China.

2. It can be posited that the regional-based spatial-distribution studies of Hicks and Nivin could provide a basis for understanding the economic issues in coastal vs. provincial China.

3. It may be possible to predict or assert which segments of China develop fastest or slowest and the extent to which this development may advance based on how the current data for China fits with existing research profiles.

4. As a follow-up to this paper, perhaps an introduction advocating development a method for measuring GDP growth (export-driven) juxtaposed with IT infrastructure to guesstimate which critical points along the IT maturation path China ought to pursue to minimize the negative impacts that IT poses to that nation while concomitantly maximizing those aspects of IT which generate higher overall returns on investment. By doing so, a theoretical model may be constructed that helps academics, strategic planners, and political leaders to examine and appraise the monumental effort of bringing China up to the economic standards of the West over the next 50 years. 🕮

[8] The ten APEC countries are, Chinese Taipei, Hong Kong, Indonesia, Malaysia, and Peoples Republic of China, Philippines, Singapore, South Korea, Thailand and Vietnam.

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Notes

Appendix A: Select ICT Components that Influence National Export Competitiveness

Category	Title	Description
Technological innovation and diffusion	Technological Sophistication	Your country's position in technology (1=generally lags behind most countries, 7= is among the world's leaders)
	Firm-Level Innovation	In your business, continuous innovation plays a major role in generating revenue (1=not true, 7=true)
	Firm-Level Technology Absorption	Companies in your country are (1=not interested in absorbing new technology, 7=aggressive in absorbing new technology)
	FDI and Technology Transfer	Foreign direct investment in your country (1=brings little new technology, 7=is an important source of new technology)
	Company Spending on Research and Development	Companies' spending on research and development in your country (1=is non-existent, 7=is heavy relative to international peers)
	Subsidies for Firm-Level Research and Development	Direct government subsidies for firms conducting research and development in your country (1=never occur, 7=are widespread and large)
	Tax Credits for Firm-Level Research and Development	Government tax credits for firms conducting research and development in your country (1=never occur, 7=are widespread and large)
	University/Industry Research Collaboration	In its R&D activity, business collaboration with local universities is (1=minimal or non-existent, 7=intensive and ongoing)
	Government Procurement of Advanced Technology Products	Government decisions on the procurement of advanced technology products are based on (1=price alone, 7=technology and encouraging innovation)
	Availability of Scientists and Engineers	Scientists and engineers in your country are (1=non-existent or rare, 7=widely available)
	Brain Drain	Scientists and engineers in your country (1=normally leave to pursue opportunities elsewhere, 7=almost always remain in the country)
Information and communications technology	Speed and Cost of Internet Access	Lease-line or dial-up access to the Internet in your country is (1=slow and expensive, 7=as fast and cheap as anywhere in the world)
	Public Access to Internet	Public access to the Internet through libraries, post offices etc is (1=very limited, 7=pervasive -- most people have frequent access)
	Internet Access in Schools	Internet access in schools is (1=very limited, 7=pervasive -- most children have frequent access)
	Quality of Competition in Telecommunication Sector	Is competition in your country's telecommunications sector sufficient to ensure high quality, infrequent interruptions and low prices? (1=no, 7=yes, equal to world's best)
	High Skilled IT Job Market	Highly skilled information technology workers in your industry (1=must leave the country to find good jobs, 7=have their pick of well-paid, desirable jobs within the country)
	IT Training and Education	Your country's IT training and educational programs (1=lag far behind most countries, 7=are among the world's best)
	Quality of Competition in ISP Sector	Is competition among your country's Internet Service Providers sufficient to ensure high quality, infrequent interruptions and low prices? (1=no, 7=yes, equal to world's best)
	Government Prioritization of ICT	Information and communications technologies are an overall government priority (1=strongly disagree, 7=strongly agree)
	Government Success in ICT Promotion	Government programs promoting the use of ICT are (1=not very successful, 7=highly successful)
	Government On-line Services	On-line government services -- e.g. downloadable permit applications, tax payments -- in your country are (1=not available, 7=commonly available)
	Laws Relating to ICT Use	Laws relating to electronic commerce, digital signatures, and consumer protection are (1=non-existent, 7=well-developed and enforced)

Category	Title	Description
	Legal Framework for ICT Development	The legal framework in your country supports the development of IT businesses (1=no, strongly impedes, 7=yes, significantly promotes)
General infrastructure	Overall Infrastructure Quality	General infrastructure in your country is (1=poorly developed and inefficient, 7=among the best in the world)
	Telephone/Fax Infrastructure Quality	New telephone lines for your business are (1=scarce and difficult to obtain, 7=widely available and highly reliable)
	Electricity Prices	The price of electricity per kilowatt-hour in your country compared to international standards is (1=much higher, 7=among the world's lowest)
Public institutions: contracts and law	Intellectual Property Protection	Intellectual property protection in your country is (1=weak or non-existent, 7=equal to the world's most stringent)
	Burden of Regulation	Administrative regulations in your country are (1=burdensome, 7=not burdensome)
Domestic competition	Intensity of Local Competition	In most industries, competition in the local market is (1=limited and price-cutting is rare, 7=intense and market leadership changes over time)
	Extent of Locally Based Competitors	Competition in the local market comes primarily from (1=imports, 7=local firms or local subsidiaries of multinationals)
	Entry into Local Markets	Entry of new competitors (1=almost never occurs in the local market, 7=is common in the local market)
Cluster development	Buyer Sophistication	Buyers in your country are (1=unsophisticated and choose based on the lowest price, 7=knowledgeable and demanding and buy innovative products)
	Local Supplier Quantity	Local suppliers in your country are (1=largely non-existent, 7=numerous and include the most important materials, components, equipment and services)
	State of Cluster Development	How common are clusters in your country? (1=clusters are limited and shallow, 7=clusters are common and deep)
	Extent of Product and Process Collaboration	Product and process development in your country is conducted (1=within companies or with foreign suppliers, 7=in collaboration with local suppliers, customers & research institutions)
	Local Availability of Components and Parts	In your industry, components and parts are (1=almost always imported, 7=almost always sourced locally)
	Local Availability of Specialized Research and Training Services	In your industry, specialized research and training services are (1=not available in the country, 7=available from world-class local institutions)
	Local Availability of Information Technology Services	In your industry, specialized IT services are (1=not available in the country, 7=available from world-class local institutions)
Company operations and strategy	Value Chain Presence	Exporting companies in your country (1=are involved primarily in production, 7=conduct not just in production but also product development, distribution and marketing)
	Capacity for Innovation	Companies obtain technology (1=exclusively from foreign companies, 7=by pioneering their own new products or processes)
	Uniqueness of Product Designs	Product designs are (1=copied or licensed from abroad, 7=developed locally)
	Production Process Sophistication	Production processes generally (1=use obsolete technology, 7=employ the world's best and most efficient technology)
	Breadth of International Markets	Exporting companies from your country sell (1=primarily in a few foreign markets, 7= in virtually all international markets)
	Internet Effects on Business	To what extent has the Internet improved your firm's ability to coordinate with customers and suppliers to reduce inventory costs (1=no change, 7=huge improvement)