E-Commerce Readiness in East Asian APEC Economies – A Precursor to Determine HRD Requirements and Capacity Building

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Foreword

The purpose of this report is to assess the abilities of East Asian members of APEC to compete in the new economy and to formulate a series of recommendations regarding human resource development to promote e-commerce in selected economies of the APEC community. We seek to answer the following key questions: What are the building blocks necessary to sustain e-commerce? Is it possible to calculate a composite e-readiness indicator that helps shape e-commerce policy? How can we devise a Human Resource Development (HRD) policy to promote e-commerce? The approach taken in this study departs from existing ones in that they have focused more on issues pertaining to technology infrastructure. Instead, we adopt here a wider set of measures that we deem important to the *new* economy. The report provides readers with a comprehensive collection of data and analyses to assess e-readiness in East Asia. Although e-commerce is still in an early phase, there is an increasingly strong national consciousness and interest – both from the public and private sectors – to look at e-commerce as a potential component of economic and social development. The rational of such an approach is twofold: (i) to identify national enablers and inhibitors, and (ii) to suggest areas for improvements, given the scarcity of resources.

This report is designed for use by legislators, the business community, researchers and all those interested in learning more about how a country is ready to compete in electronic markets, and what curricula should be explored to support the human resource element required for driving the new economy. Even with a reduced study set of APEC members, the disparity among the ten economies is such that it is not feasible or desirable to provide a thorough analysis. Instead, we would like to sketch some trends to underline the foundations for e-commerce capacity building. Despite an extensive review of literature and a thorough evaluation of primary and secondary data, this report should be at best seen as an effort to provide a concise set of key efforts and pointers to shape a HRD policy that is conducive to global competition.

As an assessment study using aggregate ranking, we probably raise more issues in this report than we can fully address due to the many aspects of e-commerce in diverse and complex economic and social contexts surrounding APEC. We invite comments on how the report is being used as well as suggestions for improvements. In particular, we strive to balance clarity versus complexity of the e-commerce reality.

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We are also indebted to many participants of the APEC-TEL workshop in Bangkok, Thailand (June 2002), and of the Asian Productivity Organization (APO) meeting in Honolulu (May 2001) for input on the status of e-readiness in their respected economies.

We also acknowledge comments from Jan Ondrus, University of Lausanne, Switzerland, who is currently an intern at PRIISM, and thank Professor Siva Sankaran, California State University, Northridge, USA for his constructive comments.

Needless to say, we assume the entire responsibility for the contents of this report.

Executive Summary

This study seeks to capture the current trends of e-readiness in East Asia, assesses its relative competitiveness against its peers, and proposes a set of policy recommendations to build human resources capacity to support e-commerce.

Ten economies of East Asia were selected for the study, as they are APEC members that represent emerging economies. With the exception of South Korea, Hong Kong, China (regarded in this report as being a separate economy from China), Singapore and Chinese Taipei, national information infrastructures are still in an early stage and the use of e-commerce has been minimal to moderate. Based on a thorough examination of 52 economic, business, social and technology variables that could impact the level of e-readiness, a key finding of this report is that East Asia as a whole remains as diverse as it always has been – this time in the digital market place.

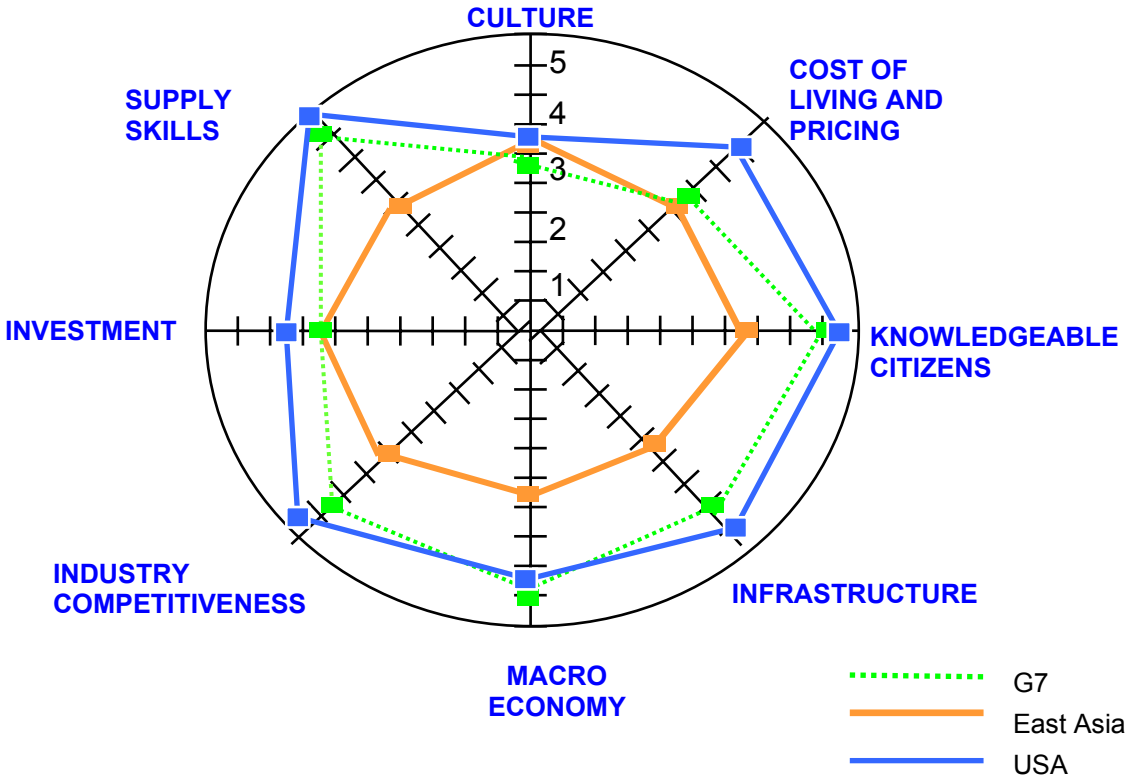
Findings

As expected Singapore; Hong Kong, China; Chinese Taipei and South Korea lead the region in their ability to capitalize on the information revolution to sustain their economic engine. The rest of East Asia, however, while recording significant progress in deploying national information and telecommunication infrastructures, appears to lag behind due to its lack of resources, principally drained by the vast size of its economically disadvantaged populations.

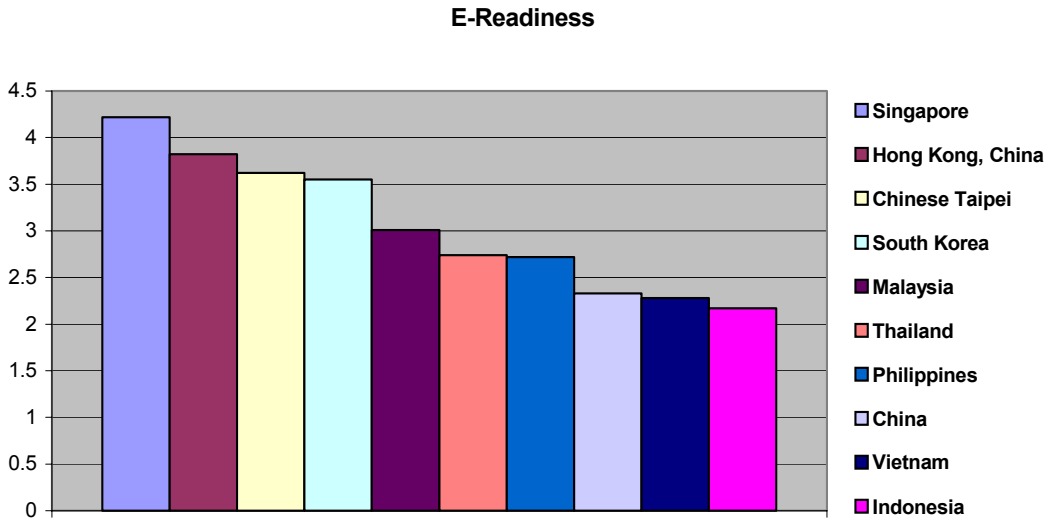
We acknowledge significant progress in a number of areas – in particular, the growth in national information infrastructure deployment. However, as a regional entity, East Asia significantly trails behind the United States and the world Group of Seven top economic powers. The data leading to the ranking confirm the inevitable economic legitimacy that for a country, there is a definite and positive correlation between its wealth and its readiness to use information technology to leverage competitiveness. As such, it appears that the digital divide phenomenon is real, and it will further deepen the gap between the "haves" and the "have nots."

Also, our data tend to substantiate the increasing role of information technology in promoting national wealth. East Asia has remarkably improved its national and communication infrastructures. There are reasons to believe the information revolution has been a crucial driver for improving economic, political and social conditions. In fact, improved and less costly use of information technology has facilitated information flow within and across national boundaries, accelerated participation in global trade and

increased press freedom. Promoters of information technology use should claim credit for this trend.



Benchmarking E-Readiness using a 5-point Scale



East Asia E-Readiness [1 (poor) to 5 (excellent)]

Last but not least, the most intriguing cue that emerges from the set of 52 e-commerce readiness indicators is that non-technology factors such as education, economic stability and attitude toward risk, are as important as technology factors for any economy to fully reap the benefits of digital progress.

Policy recommendations

At the risk of outdating ourselves due to the rapidly changing pace of the digital economy and the economic and social conditions of the APEC member economies, one could derive the following policy recommendations regarding e-commerce in East Asia.

Policy considerations for East Asia economies

Given the diversity of the APEC members, it is presumptuous to propose a set of recommendations for improving e-readiness at the community level. In essence, the findings of this study support the position of the APEC community with regard to e-commerce – that is, improving national information infrastructures, putting into place a legal and regulatory framework for e-business, and preparing an able IT workforce.

E-commerce has begun to take shape in a number of countries, but at a speed that is less than desirable. There are a number of major areas of uncertainty that still cloud the climate of e-commerce in Asia. The relevance and evidence of productivity and return on IT investment have yet to be proved. Changing social needs and priorities are in the making in developing economies. With unpredictable outcomes, support for e-commerce has not been in the top agenda of many governments. It is important that East Asia continues to sustain its e-commerce development effort.

A strong telecommunication infrastructure must be provided in order to attract businesses that aim at the global market. Once the infrastructure is in place, it has to be sustained in the face of constant technology development.

A unique advantage of the telecommunication infrastructure in the developing economies of East Asia is that there is no legacy system (i.e., old land-based systems) to deal with, offering the opportunity to leapfrog directly into more flexible, powerful and scalable wireless technologies.

Without exception, each East Asian country has its own unique set of e-readiness characteristics. Yet, national policies regarding information infrastructure and e-commerce development are strikingly similar. It is important that each member economy find the most opportune pathway for its e-commerce development strategy.

One would normally expect that the higher the e-readiness score, the higher the ability of a country to compete in the new economy. What is actually more appropriate for an economy is to find e-readiness factors that would best align with its business strategies and national trade priorities. As such, it appears that East Asia needs to build a critical mass of "new economy" opportunities (i.e., new businesses, new dot-com workers, new business partnerships, new cooperation schemes) to foster an ambiance of innovation and entrepreneurship – and, building e-ready human resources is undoubtedly the foremost important capacity building effort. After all, it is the ability to innovate that matters most in the knowledge-driven economy.

The aspect of e-commerce that is of most immediate importance in Asia is not "pure" e-commerce, i.e. selling digital goods with digital delivery and digital money. Physical – not digital – goods and services remain Asia's most important trade. Since overhead costs related to selling physical goods are high; focusing on regional e-markets would help reduce these costs and provide a chance for e-commerce to find its raison d'être. As such, perhaps Asia's best option is to use information technology to foster regional cooperation.

Refocusing on regional e-commerce will not eliminate the challenges. On the contrary, e-commerce issues such as the lack of transaction security and technical support, weakness of market research, insufficient funding, inadequate infrastructure, costly bandwidth access and unclear business laws are more prevalent in Asia. Nonetheless, the cultural, social and economic disparities seem to be better understood regionally. And the notion of regional cross-border Internet-based cooperation seems to be, psychologically and politically, more practical than attempting to connect to the entire world.

Specific policy recommendations

Based on the examination of the 52 variables used to estimate the level of e-readiness, we list below some specific recommended actions items. It is important that policy-makers weigh the relative importance of the proposed actions based on their national priorities. It is important to consider the systemic aspect of policy making in that e-commerce would prosper only if all of its drivers are seamlessly integrated.

Actions to Increase Industry Competitiveness, Skilled Workforce, and Citizens' Knowledge:

1. Recognize shifts in comparative advantages from low labor cost to innovation and entrepreneurship.
2. Emphasize tertiary education in the technical and scientific areas to increase availability of knowledge workers and innovative capabilities.
3. Invest more in Research and Development and encourage private investments to increase innovative capabilities.

4. Intensify partnerships among government organizations, businesses, universities, local communities, and international counterparts in the ICT sector to facility technology deployment.

In particular, we suggest the following education strategies and actions:

1. Use public relations campaigns to make citizens aware of how information technology and e-commerce activities can be used to increase economic activities and raise the standard of living.
2. Design outreach programs to make the general population more IT-literate. Such programs should also address the special needs of introducing computer skills to older members of the adult population who may be more reticent to adjust to new and changing technologies.
3. Conduct workshops to introduce business leaders to the fundamentals of e-business. This is a necessary first step to persuading organizations of the potential profitability of e-commerce.
4. Set up specific training efforts for small- and medium-sized enterprises (SMEs). This is important since most workers in the global economy are not employed by large organizations and because SMEs are increasingly conducting business transactions across borders and need to be aware of the most recent developments that can facilitate their activities. Such businesses also tend to have fewer funds available to explore IT options on their own.
5. Encourage colleges and universities to turn out students from various disciplines (e.g., business, computer science, and engineering) that are knowledgeable in e-commerce. These graduates will become the backbone of the IT workforce in each economy.
6. Incorporate IT issues in MBA programs and business curricula. Attention should be given to important trends in other such programs, including the tendency to produce fast learners rather than specialists who can rapidly adjust their strategies to take advantage of emerging opportunities.
7. Design flexible curricula with various lengths of study to provide specializations related to state-of-the-art information science and e-commerce.
8. Promote and strengthen doctoral programs in information technology in order to train more trainers. Moreover, academics are needed to conduct research and help formulate policies in this area.
9. Conduct executive training and other specialized programs with topics relevant to the new economy (e.g., transaction security, mobile computing and mobile commerce, and new marketing strategies for online businesses).
10. Create regional centers of excellence to provide the impetus for organizations and individuals to adopt e-business technologies. These centers of support would be similar to the successful business incubator model, which includes the participation of various universities and various government agencies.

Actions to improve macro-economic conditions, economic investment, and digital infrastructure:

1. Follow a national vision and policy guidelines for the sectors of priority for the economy and put a high importance on ICT; communicate this vision to all players.
2. Find a fitting multi-sector strategy for improved Internet access in each individual country, not only in the sectors directly related to international trade; influence and encourage IT and telecommunications investment according to those strategies.
3. Expand the range of IT into rural areas - for example through mobile technology.
4. Create a macro-economic environment (legal, financial, political conditions) which is conducive to the implementation and use of IT. Appropriate laws, regulations, and service standards are critical factors for the improvement of investor and consumer confidence.
5. Enforce privacy and intellectual property rights.
6. Liberalize telecommunications and Internet services to improve service quality while reducing prices and attracting investment along with the newest technologies.
7. Implement safe mechanisms for electronic payments according to international standards.
8. Examine current strategy regarding freedom on the Internet and press freedom in general and its impacts on businesses and investment.
9. Create an efficient transportation system (improvements of basic infrastructure) to complement the physical aspect of e-commerce.
10. Through incubators, technology parks and zones:
    - Encourage FDI to increase technology transfer and spillover effects into internal economies, and simultaneously.
    - Reduce the administrative burden for start-ups.
    - Activities: grants, tax incentives, special credit options, other funding sources.
11. Improve features of existing businesses in all aspects along with the ICT.
12. Build brand image of the country strengths on the Internet to improve international awareness and investment.

Actions to promote a culture conducive to e-commerce

1. Expand the teaching of English, since it has become the world's number 1 business language in schools.
2. Expand and update local content in native language and the languages of important business partners

3. Use the inherent cultural diversity and intensify international exposure for e-commerce opportunities.

Recommendations for APEC

1. Continue to analyze the impacts of ICT on each member economy and on specific sectors. It is important to use APEC offices as a resource center for members to gain access to documentation (e.g., progress reports, case studies) on the use of e-commerce.
2. Support the developing countries within APEC by providing information regarding opportunities, and lessons learned. Stimulate the exchange of experiences between economies, and within countries (government, business, higher education), for example at conferences.
3. Act as a coordinator and facilitator of country partnerships.
4. Encourage regional cooperation in the expansion of ICT infrastructure.
5. Support public campaigns to raise awareness about potential business opportunities that the Internet offers.
6. Facilitate the adoption of ICT related standards (e.g. payment systems, intellectual property rights, privacy, encryption, and signatures).
7. Create another Internet presence or expand the current one to act as a meeting place for the countries and businesses to establish relations while attaining ICT-related developmental goals.
8. Act as an incubator for e-commerce-related innovative start-ups or refer to other non-profit organizations; possibly act as a reference or assurance for promising companies in their venture capital applications.
9. Offer training and education in relevant fields.

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The Foundation of E-Readiness

Definition of E-Readiness

E-readiness can be defined as the aptitude of an economy to use Internet-based computers and information technologies to migrate traditional businesses into the new economy, an economy that is characterized by the ability to perform business transactions in real-time – any form, anywhere, anytime, and at any price. E-readiness reaches its optimal level when the economy is able to create new business opportunities that could not be done otherwise.

Table 1 provides a synoptic view of various perspectives of e-readiness. This view is based on the necessity of having access to Internet technology, an economic, legal and social climate that is conducive to doing business, and the ability to create new business values.

Importance of E-Readiness

- The level of e-readiness can be a strong predictor of how well an economy can perform in the new economy.
- An e-readiness assessment provides policy makers with a detailed scorecard of their economy's competitiveness relative to its international counterparts.
- A breakdown of indicators allows policy analysts to pinpoint areas of strengths and weakness, thus providing a balanced perspective in guiding an economy through the digital revolution.

Benefits of E-Readiness for Emerging Countries

- Quickly complements market inefficiencies of existing structure with leapfrogging e-technologies.
- Provides a framework to monitor the productivity of investment in technology.

Table 1. E-Readiness Definitions

FOCUS	DEFINITIONS	SOURCE
Value creation	"Ability to pursue value creation opportunities facilitated by the use of the Internet."	Center for EBiz Talk, MIT
Network access and appropriate applications	"An 'e-ready' community has high-speed access in a competitive market; with constant access and application of ICTs in schools, government offices, businesses, healthcare facilities and homes; user privacy and online security; and government policies which are favorable to promoting connectedness and use of the network."	CSPP
ICT; Internet applications; e-government	"An 'e-ready' society is one that has the necessary physical infrastructure (high bandwidth, reliability, and affordable prices); integrated current ICTs throughout businesses (e-commerce, local ICT sector), communities (local content, many organizations online, ICTs used in everyday life, ICTs taught in schools), and the government (e-government); strong telecommunications competition; independent regulation with a commitment to universal access; and no limits on trade or foreign investment."	CID
Promotion of free trade, regionally and internationally	"A country that is 'ready' for e-commerce has free trade, industry self-regulation, ease of exports, and compliance with international standards and trade agreements."	APEC
e-society	"An 'e-ready' country has extensive usage of computers in schools, businesses, government, and homes; affordable reliable access in a competitive market; free trade; skilled workforces and training in schools; a culture of creativity; government-business partnerships; transparency and stability in government and an evenly enforced legal system; secure networks and personal privacy; and regulations allowing digital signatures and encryption."	McConnell International
Facilitation of e-commerce	"An 'e-ready' country requires consumer trust in e-commerce security and privacy; better security technology; more trained workers and lower training costs; less restrictive public policy; new business practices adapted to the information age; and lower costs for e-commerce technology."	WITSA

Research Methodology

Research Rationale, Subjects, and Benchmarks

We sought to measure how well East Asia is ready for e-commerce. Perhaps the most interesting and challenging effort of all was to devise a set of metrics to measure the new economy at both the macro-economic and micro-economic levels. We examined the measurement frameworks adopted by key institutions, their relevancy to our work, and assembled our own set of variables accordingly. We used a number of data sources to evaluate various economic factors, to include education, technology and labor components, and attempted to see how ready they are to support each selected APEC member's information economy. If anything, the proposed set of variables – 52 in all – is probably the most comprehensive set that covers all of the facets of a 21st century economy.

This report is a combination of data gathering techniques and analytical methods. Raw data were collected from a number of respected sources for the 52 variables adopted for this study. Individual control on the quality of data was performed using verification and validation procedures with experts. Individual face-to-face and phone interviews with business, technology and public leaders were conducted to depict some Internet trends of national economies and their impact on the economy's e-readiness. Research databases were extensively referenced to verify and validate statements voiced by interviewees. We used standard statistical tools to check the consistency of the rank ordering of the scores.

We chose ten East Asian economies in the APEC community. These are:

- People's Republic of China
- Chinese Taipei
- Hong Kong, China
- Indonesia
- South Korea
- Malaysia
- Philippines
- Singapore
- Thailand
- Vietnam

Our selection rationale is that e-commerce in most APEC member economies in East Asia – with the exception of Singapore which has gained a reputation as a high-tech city-state, can be at best seen as being in the infancy phase. There is an urgent need to define an e-commerce strategy to catch up with other APEC members. For this purpose, we are

interested in comparing East Asia with seven of the world's most industrialized nations (G7), and the U.S.A. as benchmarks for e-readiness.

A Framework of Measuring E-Readiness

We propose a framework that embraces both macro-economic and micro-economic factors that mirror the ability of an economy to compete in the new economy.

From an e-business perspective, we define the new economy as a global market in which business transactions are (close to) being conducted in real time, around the clock, with (digital) goods that can be mass customized to individualized customer's needs, and delivered instantaneously to the customer regardless of his/her location. An example of a business in the context of the real-time economy is the ability of a music store to sell music songs via the Internet. A customer who has access to the global Internet could custom-order a collection of songs from a music store, make a payment via electronic means, and instantaneously download the digital music to his or her computer. In the new economy, transactions can be conducted in a 24/7 mode, with a cyber market that is not restricted to physical boundaries, and where technology can be leveraged to allow one-to-one customization of products and services. Another example of a business in the real-time economy is e-learning, where students can be anywhere while having access to interactive learning any time, pay tuition based on their learning objectives and the market demand for education, and customize their learning program.

The six dimensions of the new economy

We consider the advent of e-commerce as part of an inevitable global trend toward the shaping of a new world economic structure that is casually termed the *new* or *real-time* economy

We characterize the new economy by six drivers:

1. **Immediacy**

   Immediacy refers to a market driven by fast – if not immediate – supply and demand reactions. On the production side, technology enables enterprises to achieve real-time strategies, such as reducing production cycle time, increasing delivery speed via digital highways and one-to-one product customization.

   On the demand size, sophisticated customers expect to get goods and services to clients anytime, anywhere, at any price, and in any form and content. They think of buying *activities* not *products*.

2. Re-intermediation

The use of the Internet to conduct trade reduces or, in certain circumstances, eliminates, the needs for intermediation. Middlemen are for example no longer needed when producers are able to retail to the buyers directly. With the one-stop-shop-all concept, many vendors could conceivably link up online to provide buyers with convenient shopping. However, e-commerce also requires a new class of intermediaries. The latter includes Internet-related professionals to support online business transactions – these consist of, but are not limited to, IT consultants, e-market research specialists and e-bankers.

With new ways of online selling – such as e-stores with "one-stop-shop-all" and "infotainment" abilities – system integrators and e-marketing research are examples of new intermediaries.

3. Knowledge and innovation

The new economy is driven by knowledge in which only enterprises with innovative capabilities can remain competitive. Human capital is becoming an ever more important asset. For example, Nortel Networks – a world leader in computer networks – only hires employees with university educations. Even for countries with an emphasis on industrialization, most productive factories are driven by robots which in turn need computer-literate blue collar workers to operate them.

From a marketing perspective, e-businesses would use information technology as a real-time interactive marketing research platform to capture the changing needs of customers and to satisfy these needs even by precipitating the retirement of their own existing products. One expects that mass marketing (e.g., the same advertisement sent to millions of potential customers) is being slowly replaced by molecular marketing to specific customer groups (e.g., one-to-one customer service via personal email notification).

4. Integration and internetworking

Internet technologies allow companies to extend the supply chain beyond its traditional physical borders. Web-servers serve as the corporate electronic windows. They can be linked to conventional management information systems, such as customer management databases, production and inventory applications, and accounting systems, to provide seamless and personalized service to the online customer. Technology can also help link systems of business partners to add value for their customers, thus breaking down the walls that traditionally slow down the interaction between companies and their suppliers, customers, affinity groups, and even competitors.

E-commerce also makes it possible for companies to become transnational reaching global markets.

5. Virtualization

Although goods and services remain "real" serving "real" customers, businesses that offer these goods and services can be virtual. A virtual organization can be defined as a task-driven, ad-hoc set up to accomplish a particular task that disappears once the task is accomplished. Benefits of such an organization include the ability to be put together quickly to respond to sudden market opportunities, thus avoiding the typical inertia of large-scale and long-established institutions.

6. Convergent and diverging forces of the new economy

While technologies are helping businesses to team up as partners providing fast, efficient, and integrated services to their clients (e.g., in the tourism sector, computers link airliners, hotels, car rental companies, and event organizers together), they also reshape the basic structure of societies affecting the lifestyle of global citizens. Technologies promote online communities (for example, "usergroups" exist in all business and social activities). Also, technologies alter the distribution of power (i.e., digital divides), privacy, quality of work life (e.g., telework), and ultimately, create new social dialectics affecting the landscape of demographic processes.

To be ready for the new economy, APEC member economies should examine their strategies along these six dimensions: immediacy, re-intermediation, knowledge and innovation-based economy, integration/Internetworking, virtualization, convergence and discordance.

Barriers to entry in the new economy

As described earlier, the ultimate form of e-commerce is to achieve the real-time economy with the ability to deliver digital goods and services anytime, reaching global customers in a format they desire and with a competitive price.

In reality, not all goods are digital or can be digitized; not all goods can be swiftly shipped to customers via a fast telecommunications network; not all goods can be easily customized to individual specifications. As such, transportation costs, delivery time, local taxation, the perishable nature of certain goods, and the unreliability and slowness of the Internet infrastructure represent serious frictions that hinder the realization of the real-time economy.

Other sources of potential friction include, but are not limited to:

- National Information Infrastructures,
- Poor accessibility,
- Lack of computer literacy,
- English proficiency,
- Limited business logistics (transportation and banking),

- Certain cultures are not ready for e-business,
- Uneven resources among business partners,
- Capacity of innovation and entrepreneurship at the firm level,
- National e-commerce laws are still confusing, not to mention those at the international level.

A major effort for APEC policy makers is to reduce these frictions as much as possible at the individual, corporate, national, regional and global levels.

Measuring E-Readiness

Attempting to measure e-readiness at the national level involves a rather complex macro-economic and micro-economic framework. The difficulty is to strike a balance between a comprehensive model that would embrace all the major driving forces of an economy and a particular set of drivers that would directly impact the progress of electronic commerce. Another difficulty lies in the fact that with a wide set of potential economic, political and social factors, it is rather easy to lose sight of the most influential forces. The framework that we have adopted for this report is to anchor our analysis in basic fundamentals of a sound economy, (e.g., macro-economic factors, the level of productivity of a particular economy and regulations) yet with a conscientious attempt to look for variables that directly influence e-readiness. We have defined our e-readiness framework as being comprised of eight global factors, each of which can be measured by a set of specific variables. We contend that the 52 variables used for this study should provide a rather representative assessment of the e-readiness status of the APEC members.

Based on the characteristics of the *new* economy, and the requirements of a country and its businesses to join the e-market place, there are three basic building blocks that need to be put into place:

- Basic Infrastructure - technological, financial, legal, and regulatory framework,
- Supply – ability of an economy to produce innovative products that meet the constantly changing, increasingly demanding needs of the global customers,
- Demand – ability of an economy to possess a strong consumer base.

The evaluation framework is based on multiple sets of indicators. For each of the eight dimensions, a number of indicators are used to provide some cues on the quality or performance of the member economies. As measurements are specific and not comparable, they are aggregated using the Figure of Merit.

The Figure of Merit Technique is appropriate in an evaluation problem in which analysts must consider a large set of evaluation factors, and yet there is no satisfactory and simple algorithm to aggregate the factors using the raw data.

The Figure of Merit technique converts incomparable measurements (quantitative, qualitative with different dimensions) into a composite dimensionless figure:

$$\text{e-readiness}_i = \Sigma_{j=1,n}\, w_{ij}\, e_{ij} / n$$

Where:

e-readiness: the overall e-readiness indicator
i: member economy
j: number of indicators considered to evaluate the readiness dimension (j=1 to 52).
w_{ij}: relative weights to the indicators j
e_{ij} : individual performance score for each of the 52 measures (j) for each of the ten economies (i), [1,5]
n: total number of measures (52)

Using an ordinal scale, the Figure of Merit is strictly an indicator of effectiveness. In this report we use the following scale:

Table 2. Scale of Effectiveness

Effectiveness Assessment	Numeric Value
Excellent	5
Very good	4
Average	3
Below average	2
Poor	1

The Limitations of E-Readiness Measurement

While the Figure of Merit has been widely adopted, it is important to be cognizant of certain weaknesses associated with its use.

First, researchers could use an inappropriate and/or incomplete set of evaluation factors. We have addressed this issue by conducting an extensive literature review and cross-examining the selection of our 52 evaluation variables with that of other well-cited studies.

Second, the weight assigned to each criterion reflects the analyst's view of how important or influential that criterion is, relative to the entire set of factors. By the very nature of the methodology, assigning weights is a subjective process, as one expects that national experts or policy makers should be the best qualified people to underline the priority

given to each of these performance factors. Given the high number of the variables (52 in this study), we assigned the same weight to all of them.

Last but not least, the additive functions might not reflect the composite effect of the factors. Other non-linear techniques for aggregation could be used. However, the additive function is easy to understand and seems adequate for the purpose of this report.

When applied the Figure of Merit to e-readiness, one should take into consideration the following cautions:

- Lack of a standard set of measurements,
- Collected data tend to be outdated, due to the rapid pace of change,
- Data are more available on the supply side (e.g., number of installed Internet servers) but less in the application side (e.g., what business applications were put on these servers),
- The interaction between different measurement factors,
- Interpretation of the measures (e.g., what does it really mean to economic development if the number of computers per 100 people is 25?),
- Evaluation of performance variables is averaged out at the national level, thus obscuring possible spots of excellence in e-commerce.

Based on the building blocks that we have put forth in this section for the development of e-commerce, we propose herewith an e-readiness measurement framework that comprises a comprehensive set of evaluation factors. These factors are organized in eight categories (See Figure 1). Table 3 provides the listing of the 52 measures, and Appendix A gives a brief definition of each of these measures.

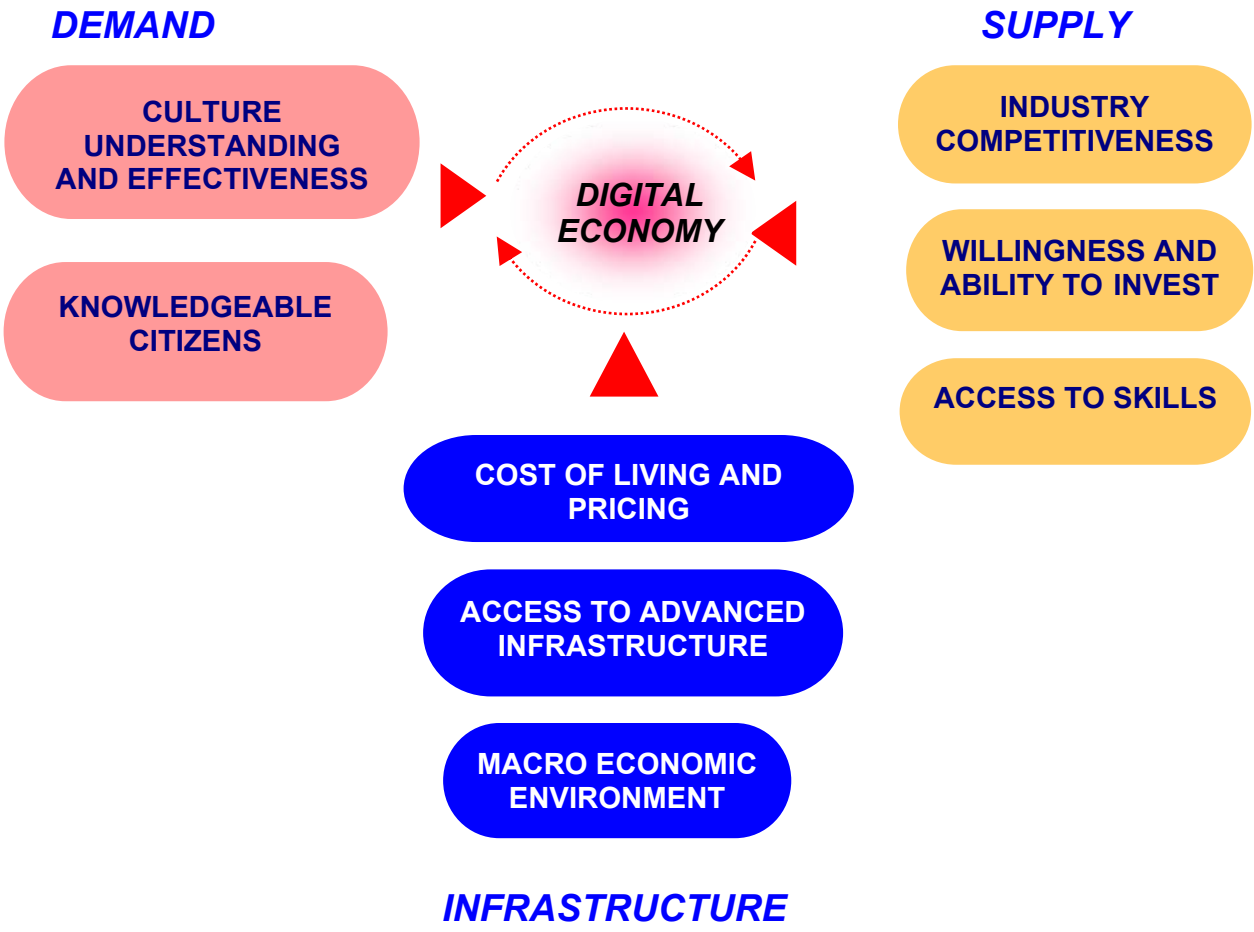
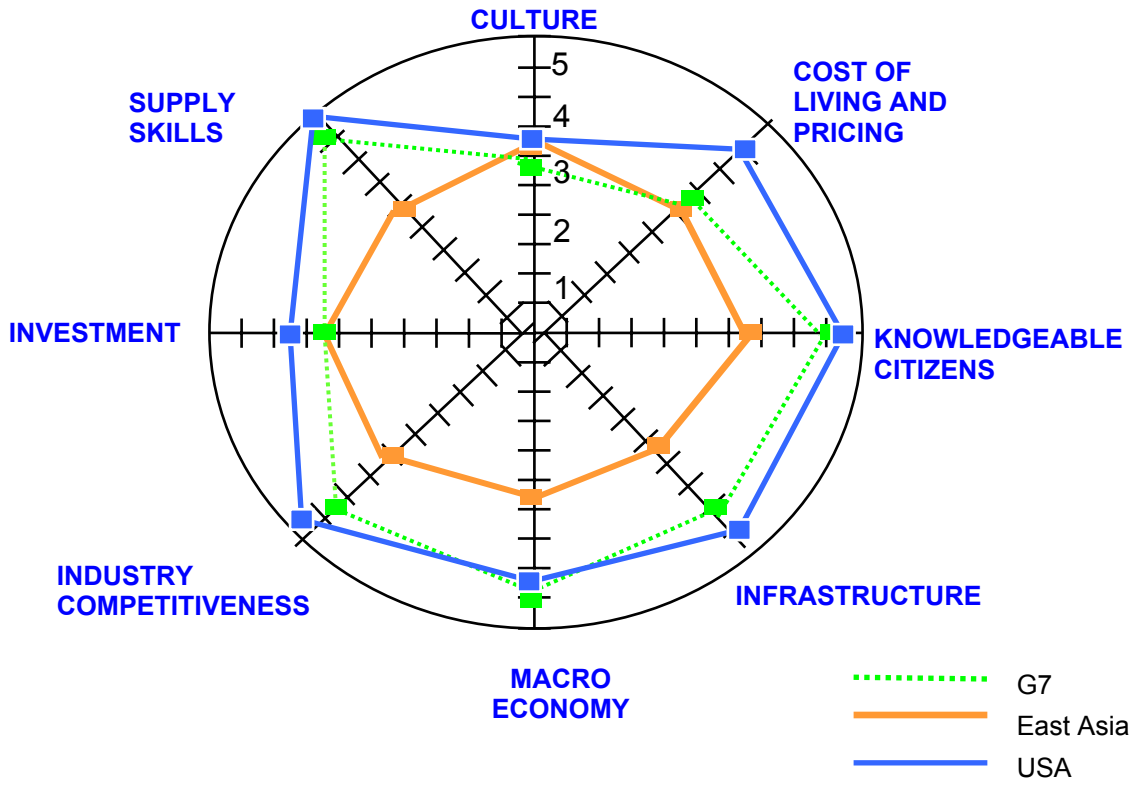


Figure 1. A Framework for Measuring E-Readiness

Table 3. List of Measurement Variables for E-Readiness

Knowledgeable Citizen	Access to Skilled Workforce (Supply Skills)
Adult Literacy Rate	Public Spending on Education as % of GDP
Secondary Enrollment	University Education Meets the Needs of Economy
Tertiary Enrollment	Well Educated People Do not Emigrate Abroad
8th Grade Achievement in Science	Extent of Staff Training
MGMT Education Available in first-class Business Schools	Research Collaboration Companies/Universities
Flexibility of People to Adapt to New Challenges	Number of Technical Papers per Million People
Macro Economy	**Digital Infrastructure**
Trade as % of GDP	Telephone per 1,000 People
Adequate Regulations & Supervision Financial Institutions	Mobile Phones per 1,000 People
Protection of Property Rights	Computers per 1,000 People
Tariff & Non-tariff Barriers	Internet Hosts per 10,000 People
Soundness of Banks	International Telecom, Cost of Call to US
Local Competition	Investment in Telecom as % of GDP
Regulatory Framework	Computer Processing Power (% Worldwide MIPS)
Government Effectiveness	E-Government
Political Stability	ICT Expenditure as % of GDP
Press Freedom	Freedom on the Internet
Rule of Law	
Control of Corruption	
Industry Competitiveness	**Culture**
Technology Achievement Index	National Culture is Open to Foreign Influence
Gross Tertiary Science & Engineering Enrollment Ratio	English Language
Admin. Burden for Start-Ups	Percentage of Urban Population
Patent Applications Granted by USPTO	Percentage of Population 65 Years or Older
Private Sector Spending on R&D	
Total Expenditure for R&D as % of GNI	
High-Tech Exports (% of Manufactured Exports)	
Ability, Willingness to Invest	**Cost of Living and Pricing**
Composite ICRG Risk Rating	International Cost of Living based on $100 US
Availability of Venture Capital	Inflation Rate-CPI in %
Entrepreneurship among Managers	GDP per Capita (PPP) in US$
FDI as % of GDP	

Figure 2. Benchmarking E-Readiness using a 5-point Scale



Interpretations of E-Readiness Measurement

For e-commerce to prosper, there are a number of conditions that need to be met. Economists tend to agree that the elements shown in Figure 2 should be conducive to e-commerce.

- For an e-commerce system to operate successfully, there must be a minimum level of achievements in infrastructure, supply and demand forces. There should also be a minimum perceived level of Internet reliability for people to adopt the Internet, as well as a minimum level of computer literacy for people to appreciate the potential of e-commerce.

- One might expect that each country should strive to improve the score – if not to push to the world's top performance – of all the variables suggested in this study. Indeed, the more Internet servers that are deployed for an economy, the more one would expect that Internet use would increase. In the same vein, the more reliable

the banking system, the higher the number of Internet business transactions that should occur.

Search for Appropriate E-Readiness Strategies

Given the diversity and disparity of Asian economies, it would be impossible to conceive an economic region (say, East Asia, South-East Asia, or Greater Sub-Mekong region) that could improve its e-readiness in all of the eight dimensions that we use in this report. First, it takes a substantial resources to improve every single dimension of the 52 indicators that we use to get a grasp on the ability of an economy to compete in the new economy. For many developing economies, scarce resources must be allocated to certain urgent needs. Second, it takes time to ameliorate the competitiveness of an economy. Last but not least, as conditions of the global markets tend to change rapidly, there is always an adjustment lag that would make it difficult for certain countries to reach a desired condition.

It is important to note, however, that a country does not need to achieve a high overall score in e-readiness in order to be successful in e-commerce. There are e-commerce applications that do not require a complete set of frictionless market conditions. E-mail should be sufficient for a travel agency in Vietnam to team up with its partners in Thailand. Thirty-year old EDI (electronic data interchange) technology is still being used successfully in certain manufacturing sectors around the world. The lack of banks using credit cards could be remedied with the use of e-cash or debit cards.

This study provides a snapshot of the current infrastructure and economic, legal and social conditions of East Asian countries. It is important however, that policy makers and businesses interpret the findings of this study carefully. The success of e-commerce is based on knowledge, innovation and creativity.

There must be an appropriate pathway (i.e., combination of factors) that would provide the necessary and sufficient (although not ideal) elements to allow certain e-business to operate cost-effectively and successfully.

Although there is a minimum set of conditions that must be met in order to develop e-commerce applications, certain types of e-commerce might not require advanced Internet technologies to succeed. Likewise, the short history of e-commerce has shown that certain e-business applications were extremely successful before the implementation of a regulatory framework to support it (e.g., transnational partnerships bypassing national laws or bilateral agreements).

Findings

General Findings for East Asia

Compared with the seven most industrialized nations, East Asia as a single entity seems to fare competitively in the *culture* dimension. East Asia, thanks to its inherent cultural diversity and its international exposure seems to be able to intensify its international trade via Internet technologies.

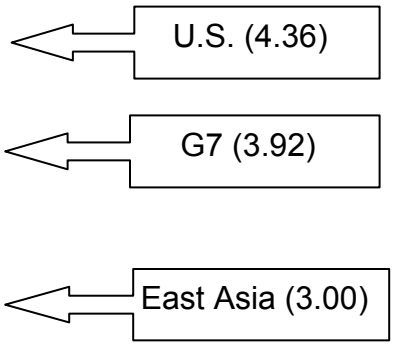
Also, East Asia appears to have done relatively well in building up investments for economic development (with the exception of the recent financial crises). It continues to enjoy comparative advantage in the area of labor cost.

Not surprisingly, East Asia needs to catch up with the leading nations in terms of *industry competitiveness, macro-economic factors* and *supply skills and knowledgeable citizens.* The level of competitiveness within East Asia is also uneven.

The overall ranking of the examined economies is shown in Table 4. It is important to note the wide disparity of the scores within the economy members. Table 5 provides some statistics highlighting this disparity.

Table 4. E-Readiness Ranking in East Asia

Economy	Ranking	Total Average Score
Singapore	1	4.22
Hong Kong, China	2	3.82
Chinese Taipei	3	3.62
South Korea	4	3.55
Malaysia	5	3.01
Thailand	6	2.74
Philippines	7	2.72
China	8	2.33
Vietnam	9	2.28
Indonesia	10	2.17



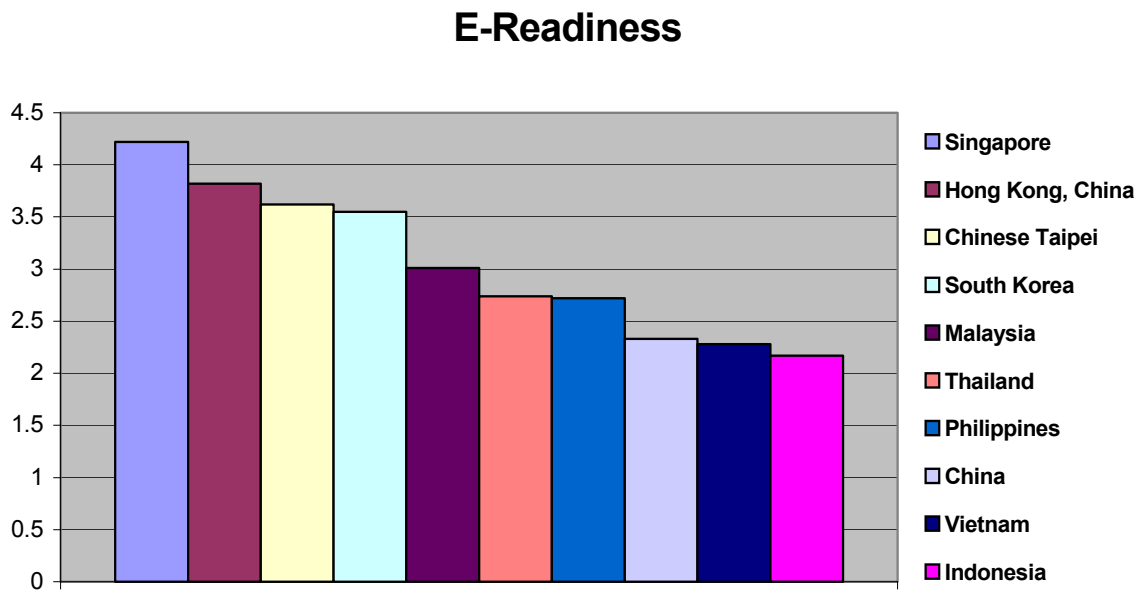


Figure 3. E-Readiness of Selected APEC Countries (Average Overall Scores)

Table 5. Diversity of E-Readiness in East Asia

	Knowledge-able Citizen	Macro Economy	Competitive-ness	Investment	Skilled Workforce	Digital Infra-structure	Cost of Living and Pricing	Culture
Average	3.17	2.80	3.00	3.25	3.00	2.85	3.00	3.25
Median	3.50	2.54	2.50	3.00	2.92	2.60	3.00	3.25
Highest	4.50 (South Korea)	4.67 (Singapore; Hong Kong, China)	4.29 (Singapore)	4.50 (Singapore)	4.00 (Singapore; Chinese Taipei)	4.20 (Chinese Taipei)	3.67 (S.Korea; Hong Kong, China Singapore)	4.50 (Singapore)
Lowest	2.33 (China)	1.75 (China)	1.57 (Indonesia)	1.75 (Indonesia)	2.17 (Vietnam; Indonesia)	1.50 (Indonesia)	2.67 (Vietnam; Philippines)	2.00 (China)
Standard Deviation	0.758	1.080	1.003	0.791	0.720	1.053	0.393	0.773

The following summarizes some of the main findings regarding the eight "pillars" of the new economy:

Knowledgeable Citizen

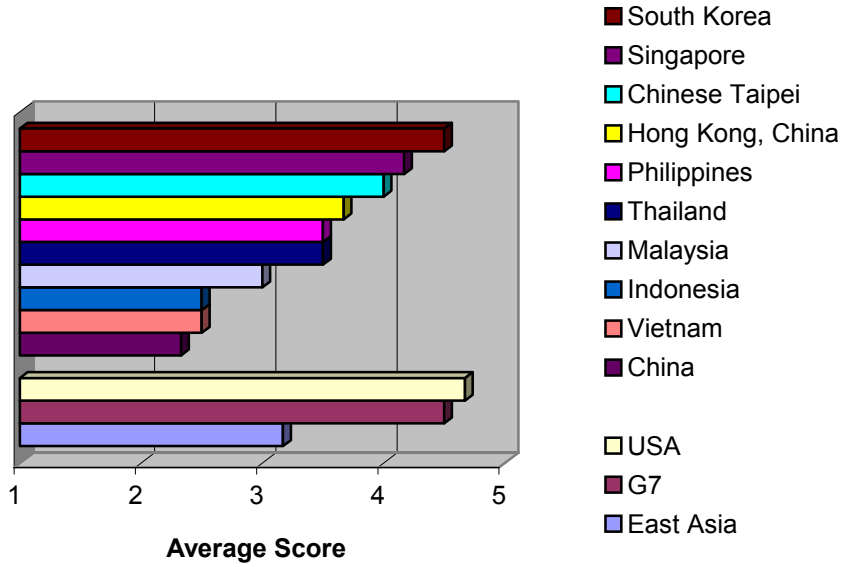


Figure 4. Knowledgeable Citizen

"Knowledgeable Citizen" refers to the ability of an economy to possess citizens who can live and work effectively in a knowledge-based economy. Six variables were used to depict this factor. The evaluation results are shown in Figure 1.
South Korea is a good example of an APEC economy in East Asia that has achieved a respected accomplishment in all of the considered variables, with the exception of the level of locally available education in management. South Korea's literacy rate is 97.6% in the age group 15 and above (UNDP, 1999), a figure higher than in the other nine Asian APEC economies examined in the study and close to the USA and G7 numbers (99%). This indicator is important for predicting the willingness and ability of a society to adopt the Internet.

Beyond the literacy requirement, education is critical for an understanding of the concepts and utilization of the electronic media. In the case of South Korea, secondary and tertiary enrollment are very high, with 100% and 66% in 1998 respectively (WDI, 2001). Moreover, students achieved high scores in educational tests at the secondary level, here in the field of science.

The overall top ranking of South Korea occurs because of the above indicators, despite the mediocre score in locally available management education in comparison to countries

like Singapore, Chinese Taipei, the Philippines (4th), and the USA as a benchmark (5th). While the other indicators depict general conditions for e-readiness, this is a somewhat more e-commerce-oriented criterion, relating to the capability to successfully implement new business concepts.

Macro Economy

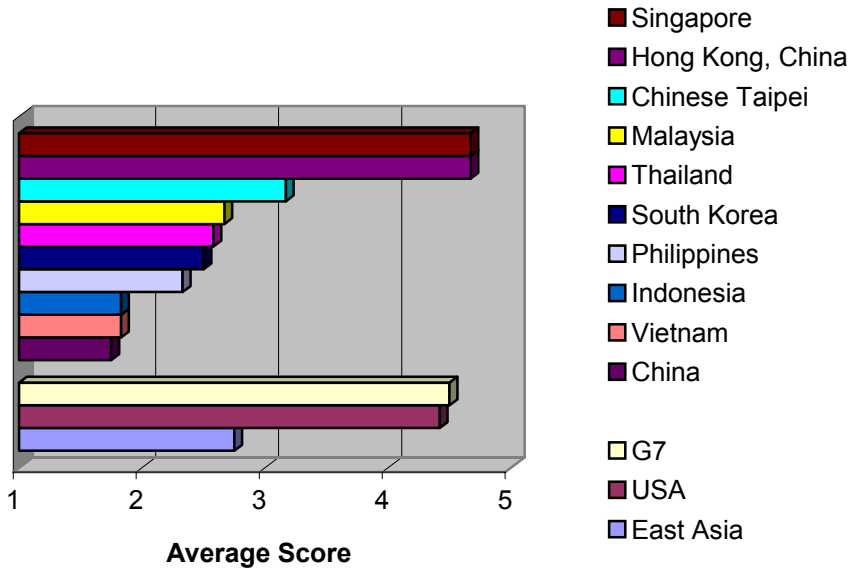


Figure 5. Macro Economy

In this category, we used twelve factors to measure the economic climate and business environment that are favorable to trade development. In particular, we paid attention to legal, financial and political conditions of the APEC economies.

Singapore and Hong Kong, China are examples of successful economies in providing a macro-economic environment that is conducive to e-business, scoring well in the areas of regulatory environment, government effectiveness, and trade and barriers.

To maintain its position as a regional hub and through its long-term ICT oriented strategy, Singapore has adjusted its regulatory environment and liberalized the market very early. The government has taken a strong role in implementing its National Information Infrastructure in all facets of life. Aside from extensive government online services, there are a range of business incentives and steadily adapted laws and regulations. Censorship issues do not seem to influence e-commerce adversely at this point, but are generally negative for e-readiness.

Political stability and an effective government generally attract investors into the country, which can be verified through the number 1 position in the criterion of "Ability and Willingness to Invest" as well. Interestingly enough, China and Vietnam score well in this category.

The increased volume of trade reinforces the high level of e-readiness, because the Internet has proven to be a helpful medium in this area. Moreover, the orientation on trade has also resulted in a very efficient transportation system using sea and air, which is critical for the execution of physical good transactions based on electronic commerce. After all, it is important to remember that e-commerce should be considered as a business strategy to reduce market frictions such as transportation costs and time.

Competitiveness

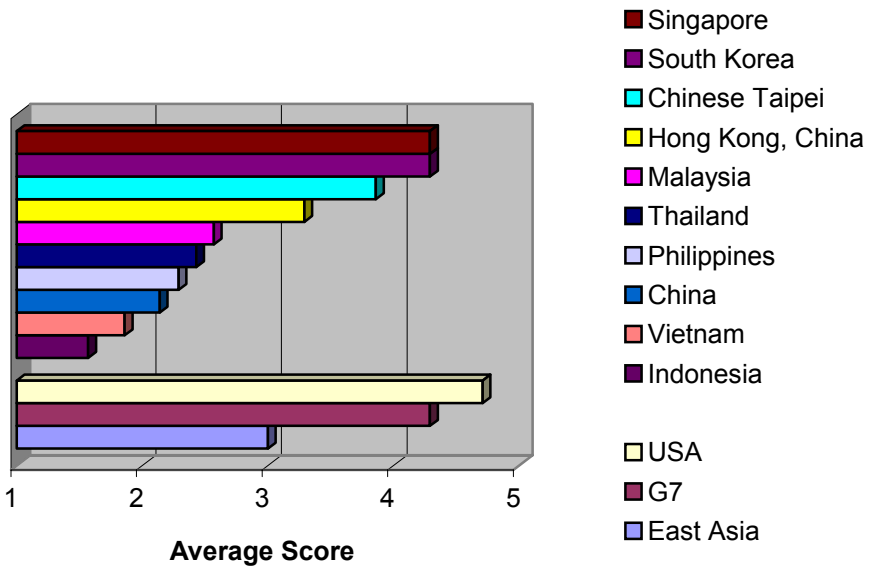


Figure 6. Competitiveness

In a knowledge-based economy, innovation and creativity via Research & Development and higher education are critical for global competitiveness. Singapore and South Korea lead the ranking in this category, which is composed of seven variables.
These two economies both achieve an average score of 4.29. Singapore receives top scores for the low administrative burden for starting companies, private sector spending on Research & Development, and the share of high-technology exports. South Korea shows special capabilities with its Technology Achievement Index, tertiary enrollment in the areas of science and engineering, and the total Research & Development expenditure.

The indicators attempt to capture a country's capability for innovations and internal improvement. Investment in Research & Development is a critical component, strengthened by sufficient human resources in the "right areas", focusing on technology and innovation. The share of high-tech exports is interesting because it indicates technological competitiveness at higher stages of country development, and at the least, technology transfer at lower stages. This is particularly true if production is not isolated for other domestic industries. Furthermore, electronic commerce utilizes and often deals with high-tech products. Reducing the administrative burden for start-ups is critical for competitiveness allowing them to dedicate their full potential on innovation, and to eliminate inefficiencies arising from lack of competition.

Ability and Willingness to Invest

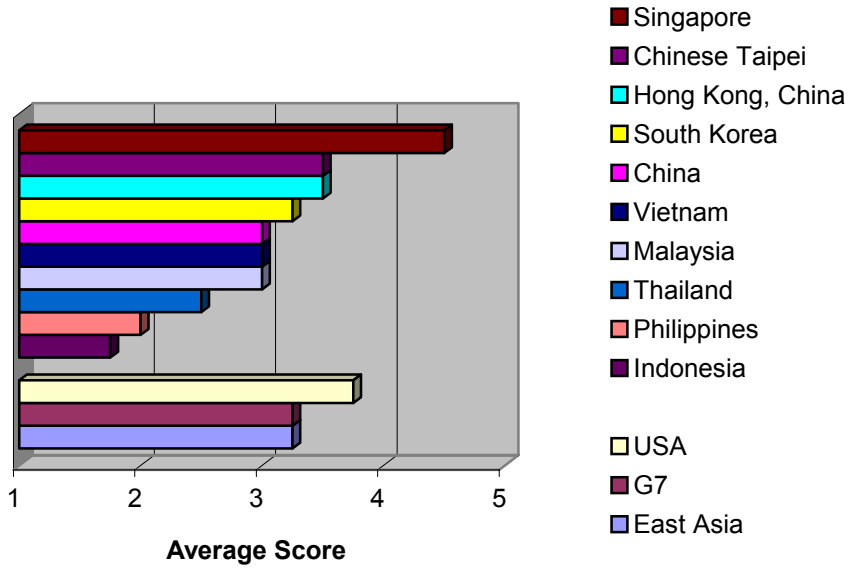


Figure 7. Ability and Willingness to Invest

Singapore is a strong economy according to our indicators in the evaluation category "Ability and Willingness to Invest". As stated in the "Macro Economy"-section, Singapore has shaped a business environment, which is very conducive to foreign investment, especially in the ICT sector. This accomplishment is also reflected in Singapore's top ICRG risk rating, which is an important decision criterion to foreign investors regarding political, financial, and economic risk for an economy. As a result of the high ratings and the key location in the region, Foreign Direct Investment is high.

It should be noted that FDI seems to be important for developing economies to significantly increase the level of IT use. Hong Kong, China and Chinese Taipei are two

good examples of entrepreneurial economies with a high number of new business start-ups. Top ratings in the availability of venture capital and entrepreneurship among managers indicate high innovational potential regarding capital and human resources.

Access to Skilled Workforce

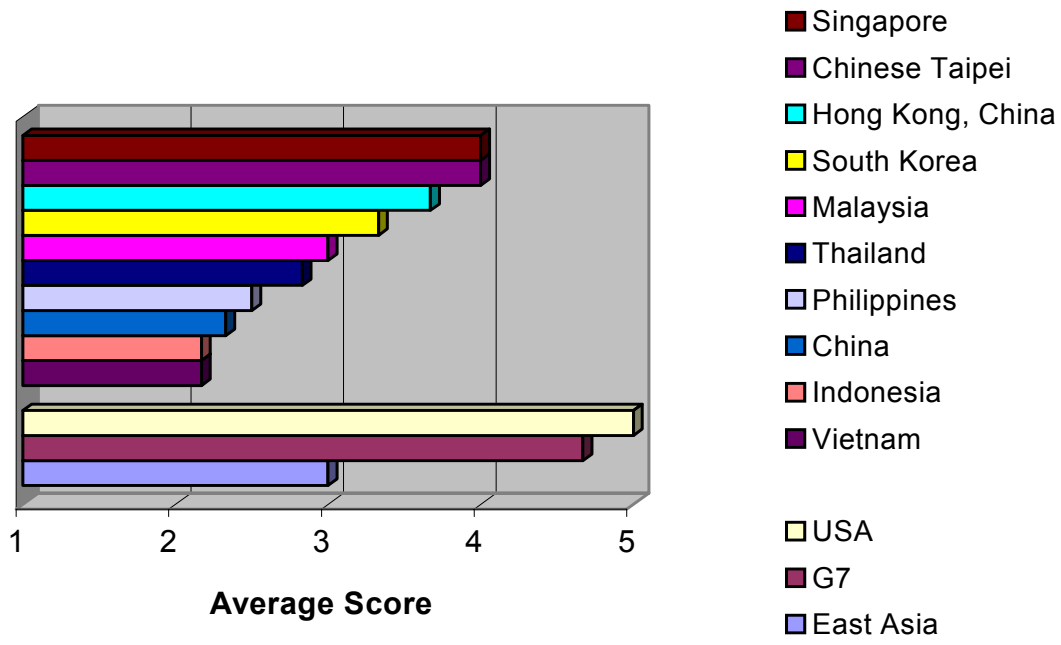


Figure 8. Access to Skilled Workforce

Creating and nurturing a trained workforce is essential for expanding enterprises and governments seeking to attract high-technology and information technology companies. Computer literacy and knowledge of business basics are often recognized as two of the most important required skills.

A general perception about the labor market place in East Asia is that this region does not have enough skilled labor to support the new economy. This observation varies, however, quite drastically across East Asia.

Quality human resources remain the primary driver for any economy that seeks to compete in the new economy. South Korea leads the survey group with its spending on education (4.4% of GDP in 1999 comparing to an average of 4.99% of the G7). Singapore, Chinese Taipei, and Hong Kong, China are among the economies that produce a sufficiently high quality university-educated workforce to meet the needs of the new economy. Singapore recognizes the importance of continuing education and training in a

changing economy, with a perfect score of 5. The extent of research cooperation between universities and the private sector is quite variable within East Asian economies, with Singapore and Chinese Taipei exceeding the G7, while the rest of the economies sustain a reasonable level of interaction.

Digital Infrastructure

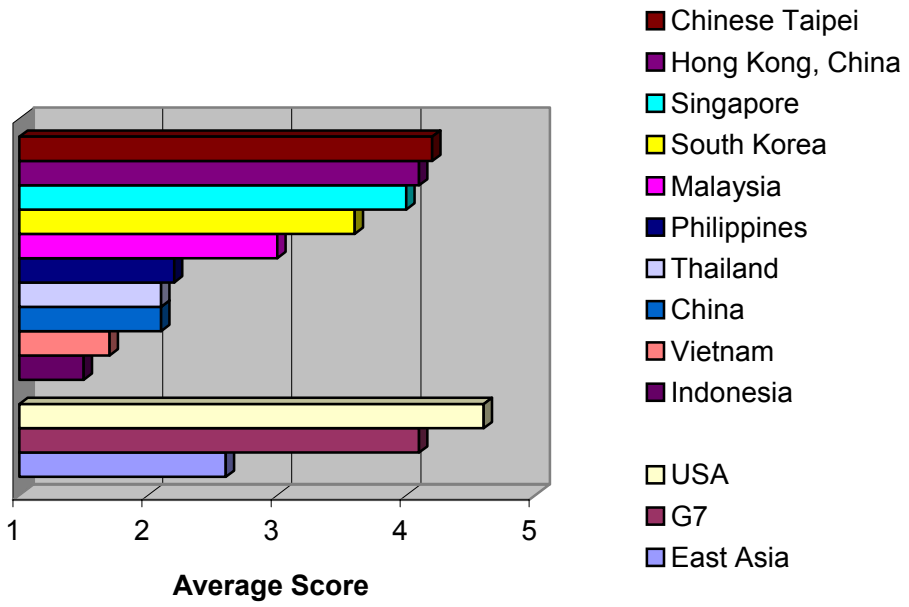


Figure 9. Digital Infrastructure

Perhaps the divergence in national information infrastructure is the most noticeable within East Asia. Despite a significant improvement in the building of computer and telecommunications infrastructure, East Asia – with the exception of Chinese Taipei, Singapore, South Korea, and Hong Kong, China – still trails behind developed economies. We notice here the important role of the government as a leading consumer of technology and as a catalyst for infrastructure development. We also include in this ten-variable criterion "freedom on the Internet" as an indicator that could contribute to the speed of promoting digital infrastructure. Mobile telephony and computing seems to be an important development factor given the dispersed geographical nature of several APEC member economies (e.g., the Philippines) and the insufficient infrastructure of wired telecommunications. Overall, this appears to be the weakest performance of East Asia in e-readiness (an average of 2.85, while the U.S.A. and the G7 scores are 4.6 and 4.1, respectively).

Cost of Living and Pricing

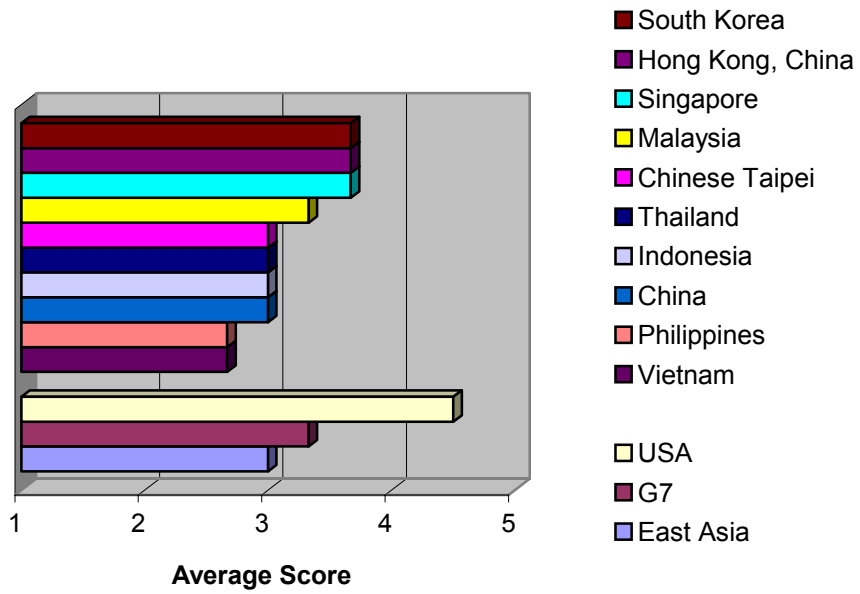


Figure 10. Cost of Living and Pricing

The underlying assumption in this category is that the wealthier the citizen, the more inclined he/she is to engage in e-commerce transactions. GDP per capita is taken as one of the indicators for wealth. There is a wide disparity in the purchasing powers across East Asian economies. The impacts of the cost of living on improving e-readiness is, however, not very clear. On the one hand, one would expect that when the standard of living is high, e-commerce should prosper to satisfy the needs of sophisticated consumers. On the other hand, one could also argue that an economy with a high cost of living would be an impediment to new business start-ups, unless there are governmental incentives to offset this disadvantage. Singapore, South Korea, and Hong Kong, China fare well in this category, despite their high costs of living.

Culture

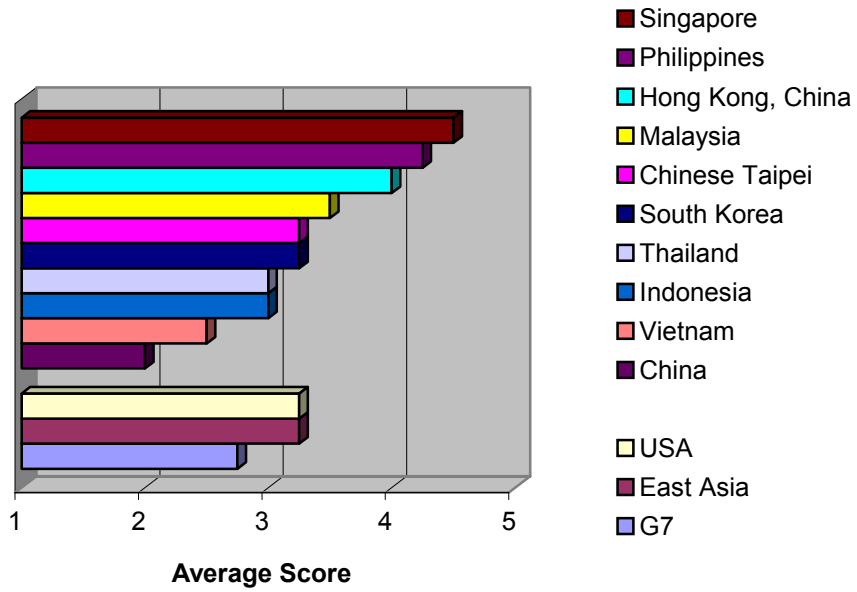


Figure 11. Culture

Having a culture that is open or familiar with foreign influence could facilitate international trade using e-technology. A young urban population with fluency in English should provide a culture that is sufficiently international to deal with cross-border electronic commerce. Singapore and the Philippines score well in this four-variable category, primarily due to the ability of their citizens to speak English, and a young labor force. It is important to note that many economies in the survey group have recently enforced the teaching of English as a second language in their education curricula.

Findings at the member economy's level

We report in this section, our e-readiness evaluation of the ten APEC member economies in East Asia, according to alphabetical order. For each member, we provide a scorecard with an ordinal ranking that expresses the relative rank order among the sample subjects with 5 being the highest achievement and 1 being the lowest. Definitions of the variables are given in Appendix A. Data used to perform ordinal ranking cover the period 1992-2002.

Again, it is important to underscore the research assumption here. While "more is better than less", less does not necessarily mean that it is insufficient to support e-commerce applications.

It is important for policy makers to examine the strengths and weaknesses, the achievements and the areas that need improvement, in a global context in which the level of interaction among factors might be more important than the accomplishment realized in a set of individual performances.

It is not less important to balance the need for looking strategically at the global level and requirement to take into consideration the national context in which businesses operate.

PEOPLE'S REPUBLIC OF CHINA

Table 6. People's Republic of China Scorecard

Knowledgeable Citizen	CHINA	Access to Skilled Workforce	CHINA
Adult Literacy Rate 1999	3	Public Spending on Education as % of GDP, 1999	2
Secondary Enrollment 1998	3	University Education Meets the Needs of Economy	2
Tertiary Enrollment 1998	1	Well Educated People Do not Emigrate Abroad	1
8th Grade Achievement in Science	3	Extent of Staff Training 2001	3
MGMT Education Available in first-class Business Schools	2	Research Collaboration Companies/Universities	4
Flexibility of People to Adapt to New Challenges	2	Number of Technical Papers per Million People 1997	2
Average Score	**2.33**	**Average Score**	**2.33**
Ranking	**8**	**Ranking**	**7**
Macro Economy		**Digital Infrastructure**	
Trade as % of GDP, 1999	2	Telephone per 1,000 People, 1999	3
Adequate Regulations & Supervision Financial Institutions	2	Mobile Phones per 1,000 People, 1999	1
Protection of Property Rights	2	Computers per 1,000 People 1999	1
Tariff & Non-tariff Barriers 2001	1	Internet Hosts per 10,000 People, 2000	1
Soundness of Banks	2	International Telecom, Cost of Call to US 1999	2
Local Competition	4	Investment in Telecom as % of GDP 1998	5
Regulatory Framework	1	Computer Processing Power (% Worldwide MIPS 1998)	1
Government Effectiveness	1	E-Government	2
Political Stability	3	ICT Expenditure as % of GDP 1999	3
Press Freedom 2002	1	Freedom on the Internet	2
Rule of Law	1		
Control of Corruption	1		
Average Score	**1.75**	**Average Score**	**2.10**
Ranking	**9**	**Ranking**	**7**
Competitiveness		**Culture**	
Technology Achievement Index	2	National Culture is Open to Foreign Influence	3
Gross Tertiary Science & Engineering Enrollment Ratio	1	English Language	1
Admin. Burden for Start-Ups	4	Percentage of Urban Population	1
Patent Applications Granted by USPTO 1999	1	Percent of Population 65 Years or Older	3
Private Sector Spending on R&D	3		
Total Expenditure for R&D as % of GNI, 1987-1997	2		
High-Tech Exports (% of Manufactured Exports 1999)	2		
Average	**2.14**	**Average Score**	**2.00**
Ranking	**7**	**Ranking**	**8**
Ability, Willingness to Invest		**Cost of Living and Pricing**	
Composite ICRG Risk Rating 2000	3	International Cost of Living based on $100 US	2
Availability of Venture Capital	2	Inflation Rate-CPI in %	5
Entrepreneurship among Managers	4	GDP per Capita (PPP) in US$	2
FDI as % of GDP 1990-1999	3	**Average Score**	**3.00**
Average Score	**3.00**	**Ranking**	**3**
Ranking	**4**	**Overall Ranking**	**8**

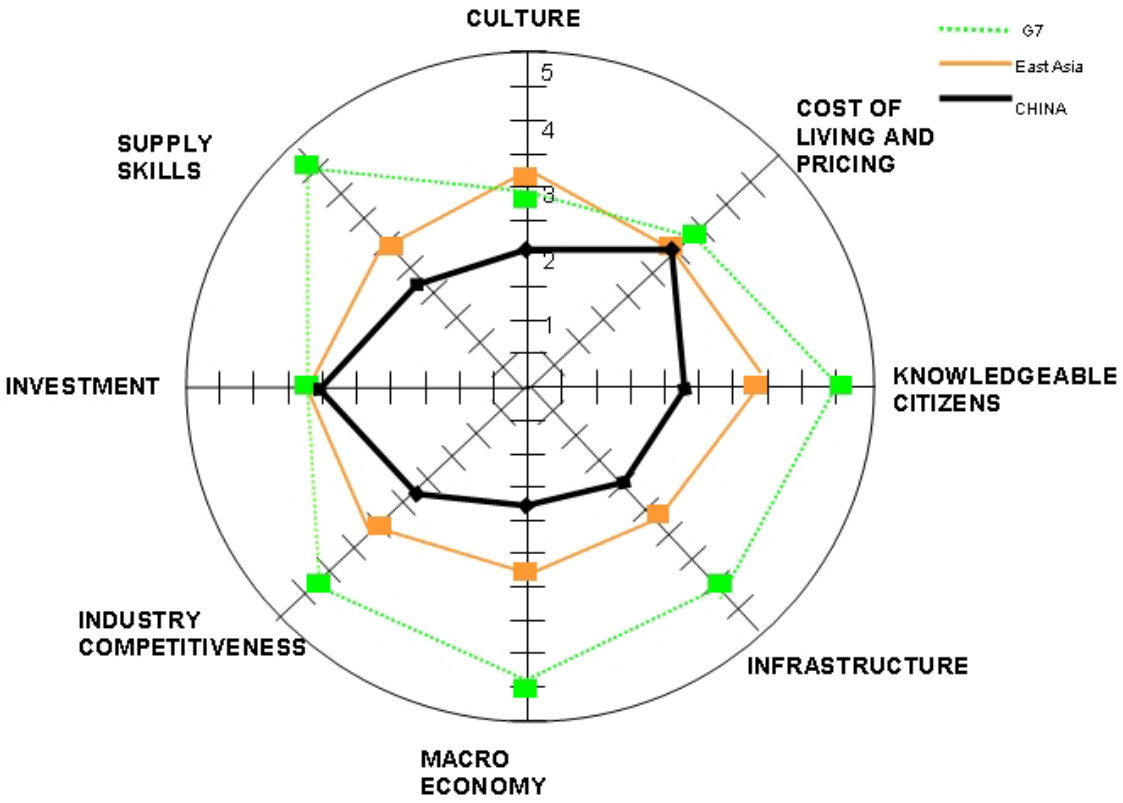


Figure 12. People's Republic of China E-Readiness

HONG KONG, CHINA

Table 7. Hong Kong, China Scorecard

Knowledgeable Citizen	HONG KONG	Access to Skilled Workforce	HONG KONG
Adult Literacy Rate 1999	4	Public Spending on Education as % of GDP, 1999	3
Secondary Enrollment 1998	3	University Education Meets the Needs of Economy	4
Tertiary Enrollment 1998	3	Well Educated People Do not Emigrate Abroad	3
8th Grade Achievement in Science	4	Extent of Staff Training 2001	4
MGMT Education Available in first-class Business Schools	3	Research Collaboration Companies/Universities	4
Flexibility of People to Adapt to New Challenges	5	Number of Technical Papers per Million People 1997	4
Average Score	**3.67**	**Average Score**	**3.67**
Ranking	**4**	**Ranking**	**2**
Macro Economy		**Digital Infrastructure**	
Trade as % of GDP, 1999	5	Telephone per 1,000 People, 1999	5
Adequate Regulations & Supervision Financial Institutions	5	Mobile Phones per 1,000 People, 1999	5
Protection of Property Rights	5	Computers per 1,000 People 1999	5
Tariff & Non-tariff Barriers 2001	5	Internet Hosts per 10,000 People, 2000	4
Soundness of Banks	5	International Telecom, Cost of Call to US 1999	4
Local Competition	5	Investment in Telecom as % of GDP 1998	2
Regulatory Framework	5	Computer Processing Power (% Worldwide MIPS 1998)	1
Government Effectiveness	4	E-Government	5
Political Stability	5	ICT Expenditure as % of GDP 1999	5
Press Freedom 2002	4	Freedom on the Internet	5
Rule of Law	4		
Control of Corruption	4		
Average Score	**4.67**	**Average Score**	**4.10**
Ranking	**1**	**Ranking**	**2**
Competitiveness		**Culture**	
Technology Achievement Index	3	National Culture is Open to Foreign Influence	5
Gross Tertiary Science & Engineering Enrollment Ratio	2	English Language	5
Admin. Burden for Start-Ups	5	Percentage of Urban Population	5
Patent Applications Granted by USPTO 1999	4	Percent of Population 65 Years or Older	1
Private Sector Spending on R&D	4		
Total Expenditure for R&D as % of GNI, 1987-1997	3		
High-Tech Exports (% of Manufactured Exports 1999)	2		
Average Score	**3.29**	**Average Score**	**4.00**
Ranking	**3**	**Ranking**	**3**
Ability, Willingness to Invest		**Cost of Living and Pricing**	
Composite ICRG Risk Rating 2000	4	International Cost of Living based on $100 US	1
Availability of Venture Capital	4	Inflation Rate-CPI in %	5
Entrepreneurship among Managers	5	GDP per Capita (PPP) in US$	5
FDI as % of GDP 1990-1999	1	**Average Score**	**3.67**
Average Score	**3.50**	**Ranking**	**1**
Ranking	**2**	**Overall Ranking**	**2**

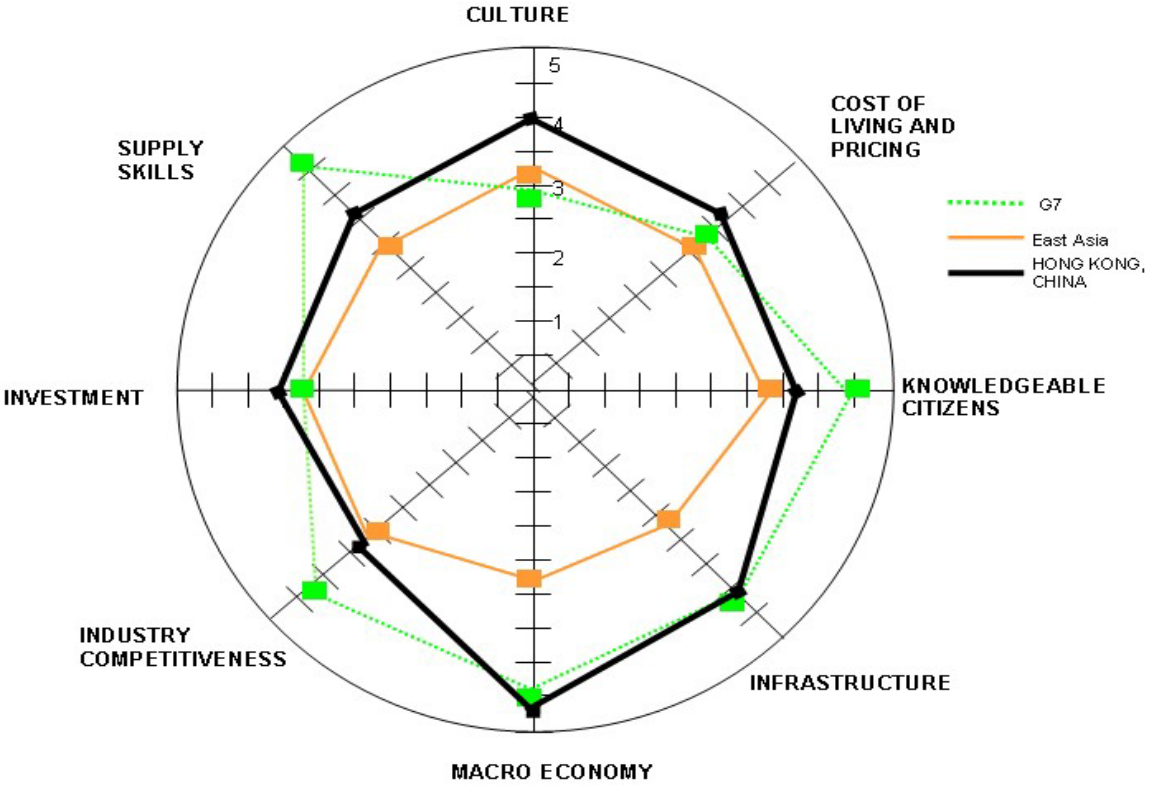


Figure 13. Hong Kong, China E-Readiness

INDONESIA

Table 8. Indonesia Scorecard

Knowledgeable Citizen	INDONESIA
Adult Literacy Rate 1999	3
Secondary Enrollment 1998	2
Tertiary Enrollment 1998	2
8th Grade Achievement in Science	3
MGMT Education Available in first-class Business Schools	2
Flexibility of People to Adapt to New Challenges	3
Average Score	**2.50**
Ranking	**7**
Macro Economy	
Trade as % of GDP, 1999	2
Adequate Regulations & Supervision Financial Institutions	2
Protection of Property Rights	1
Tariff & Non-tariff Barriers 2001	3
Soundness of Banks	1
Local Competition	4
Regulatory Framework	1
Government Effectiveness	2
Political Stability	1
Press Freedom 2002	3
Rule of Law	1
Control of Corruption	1
Average Score	**1.83**
Ranking	**8**
Competitiveness	
Technology Achievement Index	1
Gross Tertiary Science & Engineering Enrollment Ratio	1
Admin. Burden for Start-Ups	3
Patent Applications Granted by USPTO 1999	1
Private Sector Spending on R&D	3
Total Expenditure for R&D as % of GNI, 1987-1997	1
High-Tech Exports (% of Manufactured Exports 1999)	1
Average Score	**1.57**
Ranking	**9**
Ability, Willingness to Invest	
Composite ICRG Risk Rating 2000	1
Availability of Venture Capital	2
Entrepreneurship among Managers	3
FDI as % of GDP 1990-1999	1
Average Score	**1.75**
Ranking	**7**

Access to Skilled Workforce	INDONESIA
Public Spending on Education as % of GDP, 1999	1
University Education Meets the Needs of Economy	2
Well Educated People Do not Emigrate Abroad	3
Extent of Staff Training 2001	3
Research Collaboration Companies/Universities	3
Number of Technical Papers per Million People 1997	1
Average Score	**2.17**
Ranking	**8**
Digital Infrastructure	
Telephone per 1,000 People, 1999	1
Mobile Phones per 1,000 People, 1999	1
Computers per 1,000 People 1999	1
Internet Hosts per 10,000 People, 2000	1
International Telecom, Cost of Call to US 1999	3
Investment in Telecom as % of GDP 1998	2
Computer Processing Power (% Worldwide MIPS 1998)	1
E-Government	1
ICT Expenditure as % of GDP 1999	1
Freedom on the Internet	3
Average Score	**1.50**
Ranking	**9**
Culture	
National Culture is Open to Foreign Influence	4
English Language	2
Percentage of Urban Population	2
Percent of Population 65 Years or Older	4
Average Score	**3.00**
Ranking	**6**
Cost of Living and Pricing	
International Cost of Living based on $100 US	4
Inflation Rate-CPI in %	3
GDP per Capita (PPP) in US$	2
Average Score	**3.00**
Ranking	**3**
Overall Ranking	**10**

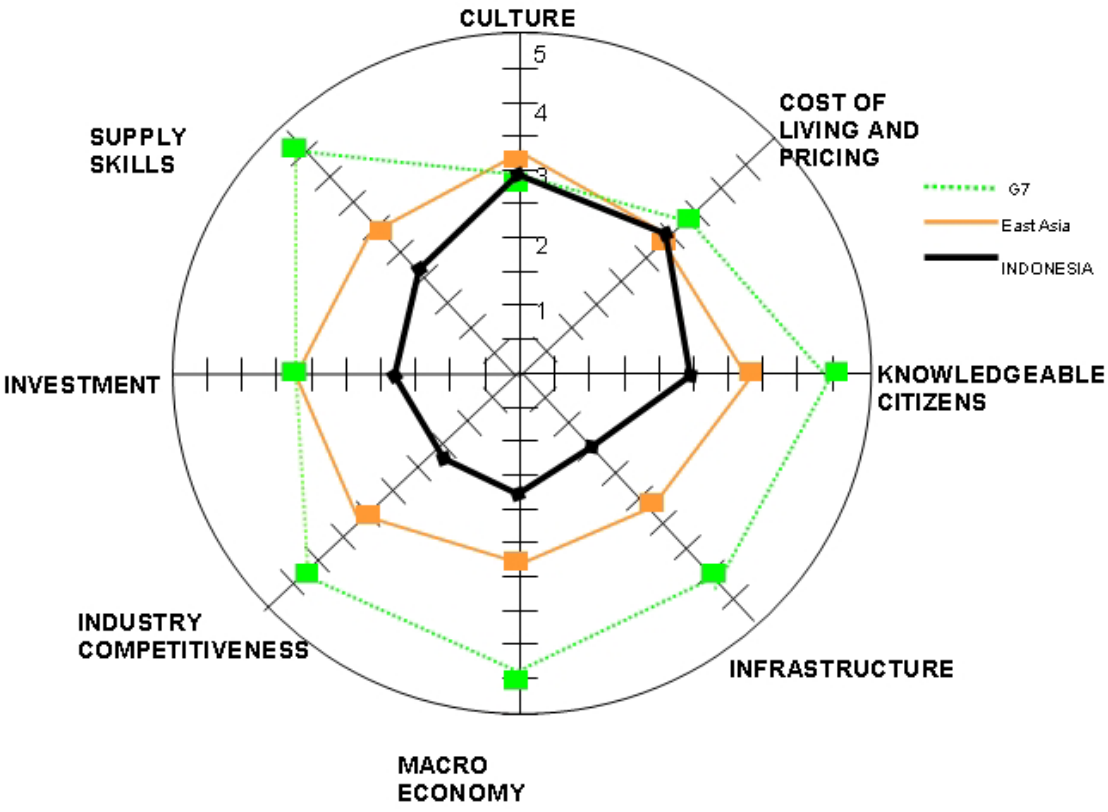


Figure 14. Indonesia E-Readiness

SOUTH KOREA

Table 9. South Korea Scorecard

Knowledgeable Citizen	KOREA	Access to Skilled Workforce	KOREA
Adult Literacy Rate 1999	5	Public Spending on Education as % of GDP, 1999	5
Secondary Enrollment 1998	5	University Education Meets the Needs of Economy	2
Tertiary Enrollment 1998	5	Well Educated People Do not Emigrate Abroad	2
8th Grade Achievement in Science	5	Extent of Staff Training 2001	4
MGMT Education Available in first-class Business Schools	3	Research Collaboration Companies/Universities	4
Flexibility of People to Adapt to New Challenges	4	Number of Technical Papers per Million People 1997	3
Average Score	**4.50**	**Average Score**	**3.33**
Ranking	**1**	**Ranking**	**3**
Macro Economy		**Digital Infrastructure**	
Trade as % of GDP, 1999	2	Telephone per 1,000 People, 1999	4
Adequate Regulations & Supervision Financial Institutions	2	Mobile Phones per 1,000 People, 1999	5
Protection of Property Rights	2	Computers per 1,000 People 1999	4
Tariff & Non-tariff Barriers 2001	3	Internet Hosts per 10,000 People, 2000	3
Soundness of Banks	2	International Telecom, Cost of Call to US 1999	5
Local Competition	3	Investment in Telecom as % of GDP 1998	4
Regulatory Framework	2	Computer Processing Power (% Worldwide MIPS 1998)	1
Government Effectiveness	2	E-Government	3
Political Stability	3	ICT Expenditure as % of GDP 1999	3
Press Freedom 2002	3	Freedom on the Internet	4
Rule of Law	3		
Control of Corruption	3		
Average Score	**2.50**	**Average Score**	**3.60**
Ranking	**6**	**Ranking**	**4**
Competitiveness		**Culture**	
Technology Achievement Index	5	National Culture is Open to Foreign Influence	3
Gross Tertiary Science & Engineering Enrollment Ratio	5	English Language	3
Admin. Burden for Start-Ups	3	Percentage of Urban Population	4
Patent Applications Granted by USPTO 1999	4	Percent of Population 65 Years or Older	3
Private Sector Spending on R&D	4		
Total Expenditure for R&D as % of GNI, 1987-1997	5		
High-Tech Exports (% of Manufactured Exports 1999)	4		
Average Score	**4.29**	**Average Score**	**3.25**
Ranking	**1**	**Ranking**	**5**
Ability, Willingness to Invest		**Cost of Living and Pricing**	
Composite ICRG Risk Rating 2000	4	International Cost of Living based on $100 US	3
Availability of Venture Capital	4	Inflation Rate-CPI in %	4
Entrepreneurship among Managers	4	GDP per Capita (PPP) in US$	4
FDI as % of GDP 1990-1999	1	**Average Score**	**3.67**
Average Score	**3.25**	**Ranking**	**1**
Ranking	**3**	**Overall Ranking**	**4**

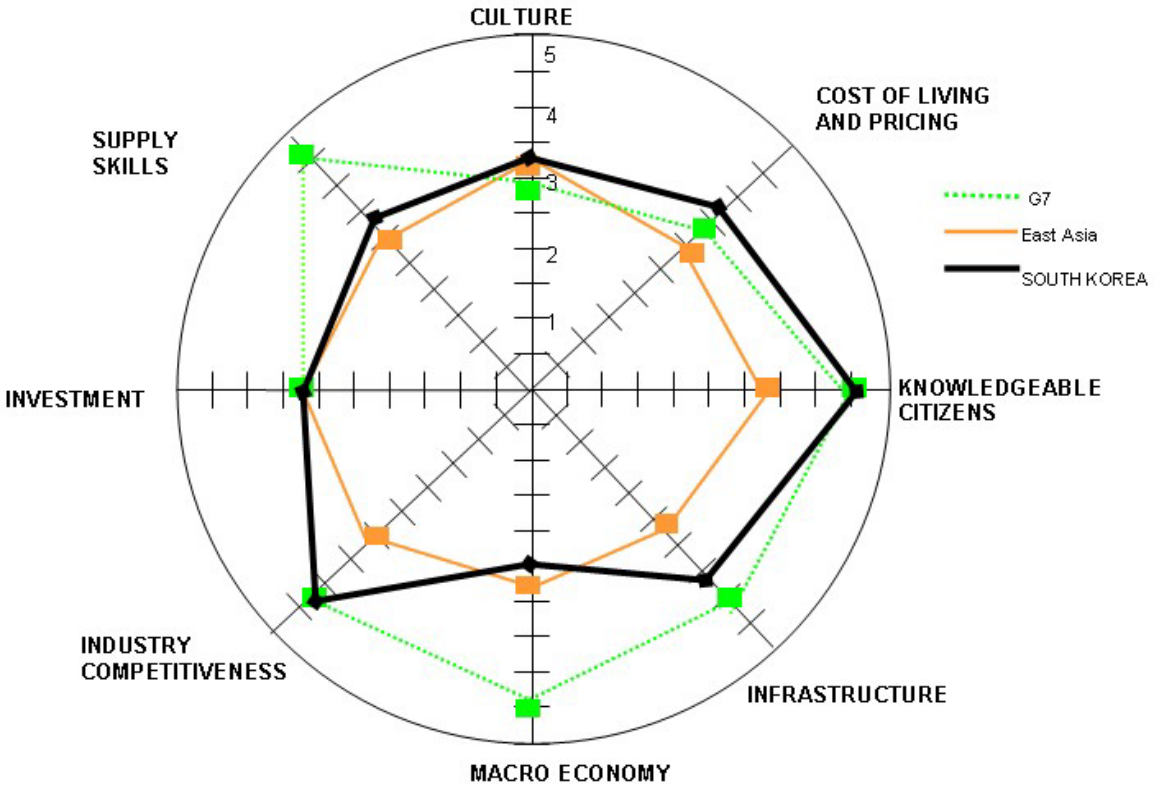


Figure 15. South Korea E-Readiness

MALAYSIA

Table 10. Malaysia Scorecard

Knowledgeable Citizen	MALAYSIA	Access to Skilled Workforce	MALAYSIA
Adult Literacy Rate 1999	3	Public Spending on Education as % of GDP, 1999	4
Secondary Enrollment 1998	5	University Education Meets the Needs of Economy	3
Tertiary Enrollment 1998	2	Well Educated People Do not Emigrate Abroad	2
8th Grade Achievement in Science	3	Extent of Staff Training 2001	4
MGMT Education Available in first-class Business Schools	2	Research Collaboration Companies/Universities	3
Flexibility of People to Adapt to New Challenges	3	Number of Technical Papers per Million People 1997	2
Average Score	**3.00**	**Average Score**	**3.00**
Ranking	**6**	**Ranking**	**4**
Macro Economy		**Digital Infrastructure**	
Trade as % of GDP, 1999	4	Telephone per 1,000 People, 1999	3
Adequate Regulations & Supervision Financial Institutions	4	Mobile Phones per 1,000 People, 1999	3
Protection of Property Rights	3	Computers per 1,000 People 1999	3
Tariff & Non-tariff Barriers 2001	2	Internet Hosts per 10,000 People, 2000	3
Soundness of Banks	3	International Telecom, Cost of Call to US 1999	4
Local Competition	3	Investment in Telecom as % of GDP 1998	4
Regulatory Framework	2	Computer Processing Power (% Worldwide MIPS 1998)	1
Government Effectiveness	2	E-Government	2
Political Stability	3	ICT Expenditure as % of GDP 1999	4
Press Freedom 2002	2	Freedom on the Internet	3
Rule of Law	2		
Control of Corruption	2		
Average Score	**2.67**	**Average Score**	**3.00**
Ranking	**4**	**Ranking**	**5**
Competitiveness		**Culture**	
Technology Achievement Index	3	National Culture is Open to Foreign Influence	3
Gross Tertiary Science & Engineering Enrollment Ratio	1	English Language	4
Admin. Burden for Start-Ups	4	Percentage of Urban Population	3
Patent Applications Granted by USPTO 1999	1	Percent of Population 65 Years or Older	4
Private Sector Spending on R&D	3		
Total Expenditure for R&D as % of GNI, 1987-1997	1		
High-Tech Exports (% of Manufactured Exports 1999)	5		
Average Score	**2.57**	**Average Score**	**3.50**
Ranking	**4**	**Ranking**	**4**
Ability, Willingness to Invest		**Cost of Living and Pricing**	
Composite ICRG Risk Rating 2000	3	International Cost of Living based on $100 US	4
Availability of Venture Capital	3	Inflation Rate-CPI in %	3
Entrepreneurship among Managers	3	GDP per Capita (PPP) in US$	3
FDI as % of GDP 1990-1999	3	**Average Score**	**3.33**
Average Score	**3.00**	**Ranking**	**2**
Ranking	**4**	**Overall Ranking**	**5**

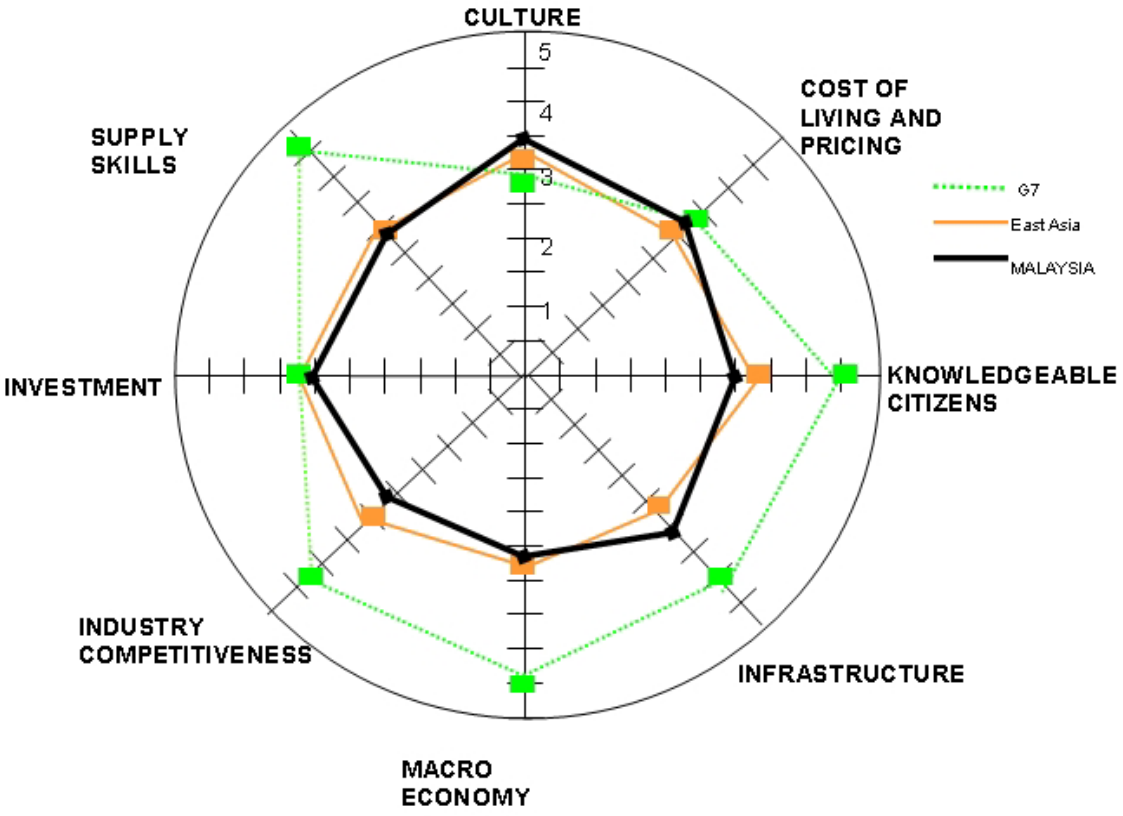


Figure 16. Malaysia E-Readiness

PHILIPPINES

Table 11. Philippines Scorecard

Knowledgeable Citizen	PHILIPPINES	Access to Skilled Workforce	PHILIPPINES
Adult Literacy Rate 1999	4	Public Spending on Education as % of GDP, 1999	3
Secondary Enrollment 1998	4	University Education Meets the Needs of Economy	4
Tertiary Enrollment 1998	3	Well Educated People Do not Emigrate Abroad	1
8th Grade Achievement in Science	1	Extent of Staff Training 2001	3
MGMT Education Available in first-class Business Schools	4	Research Collaboration Companies/Universities	3
Flexibility of People to Adapt to New Challenges	5	Number of Technical Papers per Million People 1997	1
Average Score	**3.50**	**Average Score**	**2.50**
Ranking	**5**	**Ranking**	**6**
Macro Economy		**Digital Infrastructure**	
Trade as % of GDP, 1999	3	Telephone per 1,000 People, 1999	2
Adequate Regulations & Supervision Financial Institutions	4	Mobile Phones per 1,000 People, 1999	1
Protection of Property Rights	2	Computers per 1,000 People 1999	2
Tariff & Non-tariff Barriers 2001	3	Internet Hosts per 10,000 People, 2000	1
Soundness of Banks	4	International Telecom, Cost of Call to US 1999	3
Local Competition	3	Investment in Telecom as % of GDP 1998	4
Regulatory Framework	2	Computer Processing Power (% Worldwide MIPS 1998)	1
Government Effectiveness	1	E-Government	1
Political Stability	1	ICT Expenditure as % of GDP 1999	2
Press Freedom 2002	3	Freedom on the Internet	5
Rule of Law	1		
Control of Corruption	1		
Average Score	**2.33**	**Average Score**	**2.20**
Ranking	**7**	**Ranking**	**6**
Competitiveness		**Culture**	
Technology Achievement Index	2	National Culture is Open to Foreign Influence	4
Gross Tertiary Science & Engineering Enrollment Ratio	1	English Language	5
Admin. Burden for Start-Ups	3	Percentage of Urban Population	3
Patent Applications Granted by USPTO 1999	1	Percent of Population 65 Years or Older	5
Private Sector Spending on R&D	3		
Total Expenditure for R&D as % of GNI, 1987-1997	1		
High-Tech Exports (% of Manufactured Exports 1999)	5		
Average Score	**2.29**	**Average Score**	**4.25**
Ranking	**6**	**Ranking**	**2**
Ability, Willingness to Invest		**Cost of Living and Pricing**	
Composite ICRG Risk Rating 2000	2	International Cost of Living based on $100 US	5
Availability of Venture Capital	2	Inflation Rate-CPI in %	1
Entrepreneurship among Managers	3	GDP per Capita (PPP) in US$	2
FDI as % of GDP 1990-1999	1	**Average Score**	**2.67**
Average Score	**2.00**	**Ranking**	**4**
Ranking	**6**	**Overall Ranking**	**7**

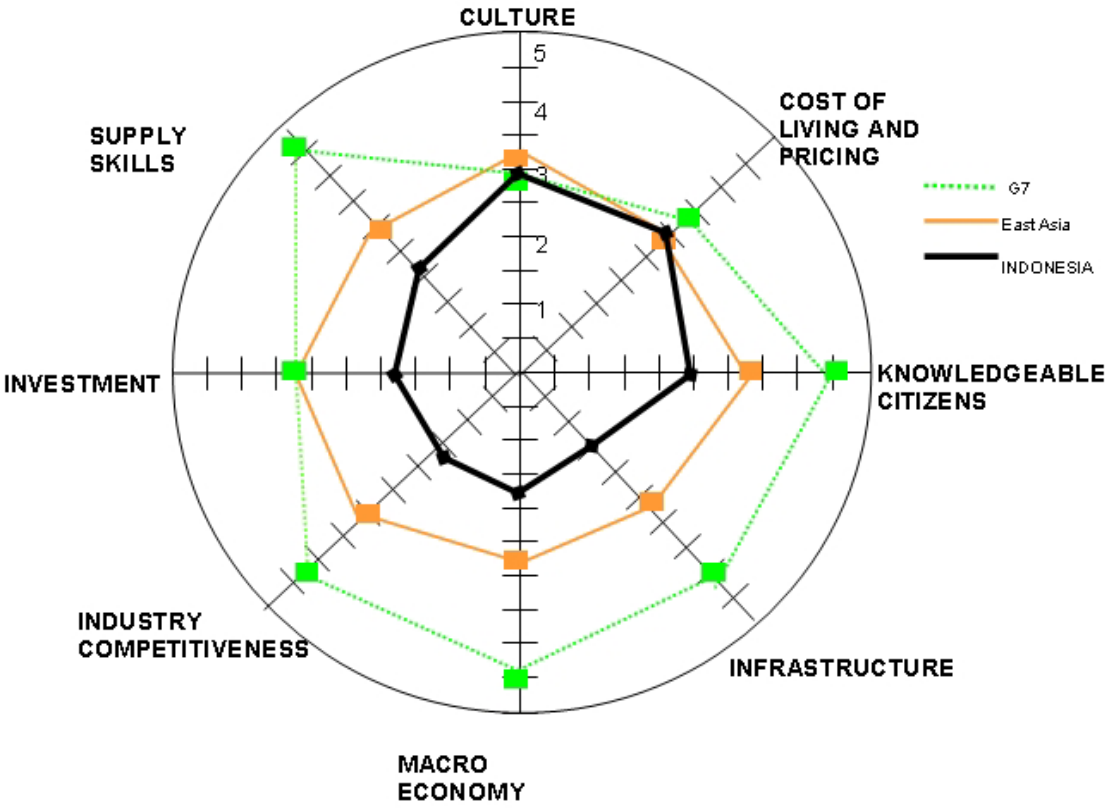


Figure 17. Indonesia E-Readiness

SINGAPORE

Table 12. Singapore Scorecard

Knowledgeable Citizen	SINGAPORE	Access to Skilled Workforce	SINGAPORE
Adult Literacy Rate 1999	4	Public Spending on Education as % of GDP, 1999	2
Secondary Enrollment 1998	3	University Education Meets the Needs of Economy	5
Tertiary Enrollment 1998	4	Well Educated People Do not Emigrate Abroad	3
8th Grade Achievement in Science	5	Extent of Staff Training 2001	5
MGMT Education Available in first-class Business Schools	4	Research Collaboration Companies/Universities	5
Flexibility of People to Adapt to New Challenges	5	Number of Technical Papers per Million People 1997	4
Average Score	**4.17**	**Average Score**	**4.00**
Ranking	**2**	**Ranking**	**1**
Macro Economy		**Digital Infrastructure**	
Trade as % of GDP, 1999	5	Telephone per 1,000 People, 1999	4
Adequate Regulations & Supervision Financial Institutions	5	Mobile Phones per 1,000 People, 1999	5
Protection of Property Rights	5	Computers per 1,000 People 1999	5
Tariff & Non-tariff Barriers 2001	5	Internet Hosts per 10,000 People, 2000	4
Soundness of Banks	5	International Telecom, Cost of Call to US 1999	5
Local Competition	4	Investment in Telecom as % of GDP 1998	3
Regulatory Framework	5	Computer Processing Power (% Worldwide MIPS 1998)	1
Government Effectiveness	5	E-Government	5
Political Stability	5	ICT Expenditure as % of GDP 1999	5
Press Freedom 2002	2	Freedom on the Internet	3
Rule of Law	5		
Control of Corruption	5		
Average Score	**4.67**	**Average Score**	**4.00**
Ranking	**1**	**Ranking**	**3**
Competitiveness		**Culture**	
Technology Achievement Index	4	National Culture is Open to Foreign Influence	5
Gross Tertiary Science & Engineering Enrollment Ratio	3	English Language	5
Admin. Burden for Start-Ups	5	Percentage of Urban Population	5
Patent Applications Granted by USPTO 1999	4	Percent of Population 65 Years or Older	3
Private Sector Spending on R&D	5		
Total Expenditure for R&D as % of GNI, 1987-1997	4		
High-Tech Exports (% of Manufactured Exports 1999)	5		
Average Score	**4.29**	**Average Score**	**4.50**
Ranking	**1**	**Ranking**	**1**
Ability, Willingness to Invest		**Cost of Living and Pricing**	
Composite ICRG Risk Rating 2000	5	International Cost of Living based on $100 US	2
Availability of Venture Capital	4	Inflation Rate-CPI in %	4
Entrepreneurship among Managers	4	GDP per Capita (PPP) in US$	5
FDI as % of GDP 1990-1999	5	**Average Score**	**3.67**
Average Score	**4.50**	**Ranking**	**1**
Ranking	**1**	**Overall Ranking**	**1**

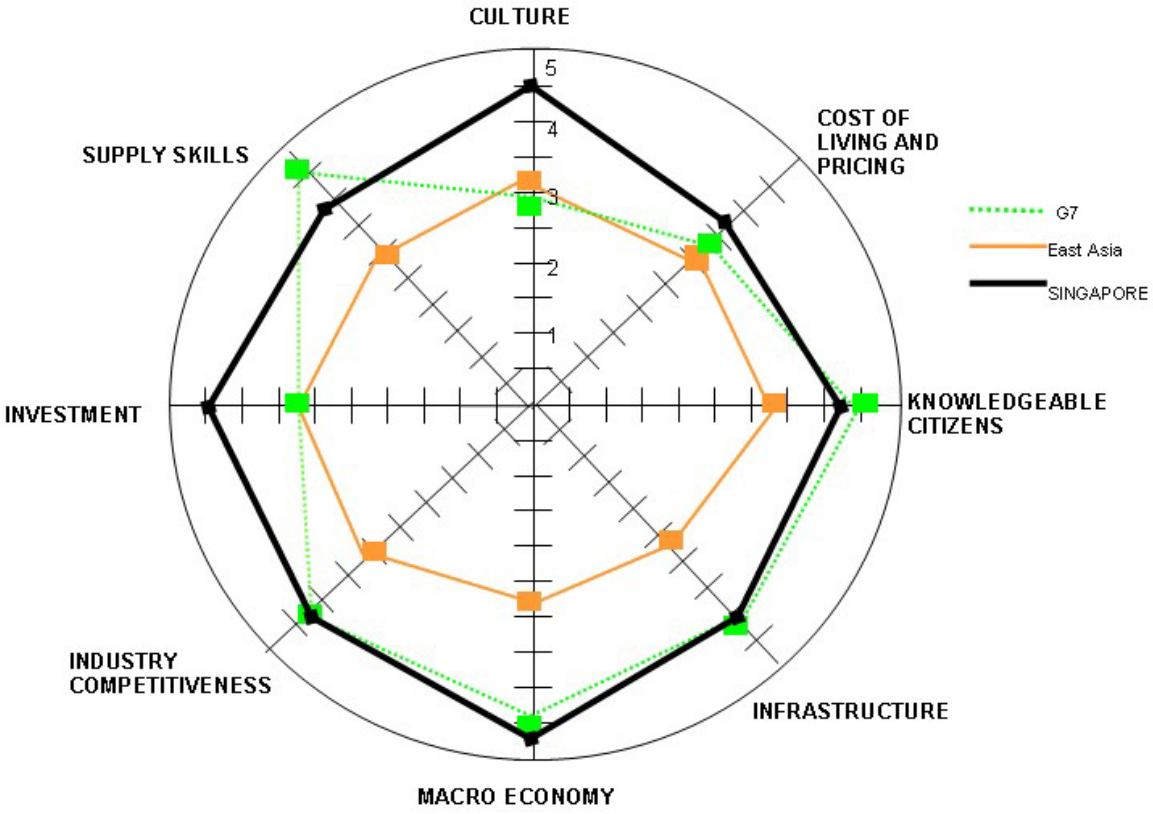


Figure 18. Singapore E-Readiness

CHINESE TAIPEI

Table 13. Chinese Taipei Scorecard

Knowledgeable Citizen	CHINESE TAIPEI	Access to Skilled Workforce	CHINESE TAIPEI
Adult Literacy Rate 1999	4	Public Spending on Education as % of GDP, 1999	3
Secondary Enrollment 1998	3	University Education Meets the Needs of Economy	5
Tertiary Enrollment 1998	3	Well Educated People Do not Emigrate Abroad	3
8th Grade Achievement in Science	5	Extent of Staff Training 2001	4
MGMT Education Available in first-class Business Schools	4	Research Collaboration Companies/Universities	5
Flexibility of People to Adapt to New Challenges	5	Number of Technical Papers per Million People 1997	4
Average Score	**4.00**	**Average Score**	**4.00**
Ranking	**3**	**Ranking**	**1**
Macro Economy		**Digital Infrastructure**	
Trade as % of GDP, 1999	3	Telephone per 1,000 People, 1999	4
Adequate Regulations & Supervision Financial Institutions	2	Mobile Phones per 1,000 People, 1999	5
Protection of Property Rights	3	Computers per 1,000 People 1999	5
Tariff & Non-tariff Barriers 2001	4	Internet Hosts per 10,000 People, 2000	4
Soundness of Banks	3	International Telecom, Cost of Call to US 1999	5
Local Competition	4	Investment in Telecom as % of GDP 1998	3
Regulatory Framework	4	Computer Processing Power (% Worldwide MIPS 1998)	1
Government Effectiveness	1	E-Government	5
Political Stability	4	ICT Expenditure as % of GDP 1999	5
Press Freedom 2002	4	Freedom on the Internet	5
Rule of Law	3		
Control of Corruption	3		
Average Score	**3.17**	**Average Score**	**4.20**
Ranking	**3**	**Ranking**	**1**
Competitiveness		**Culture**	
Technology Achievement Index	3	National Culture is Open to Foreign Influence	5
Gross Tertiary Science & Engineering Enrollment Ratio	3	English Language	2
Admin. Burden for Start-Ups	5	Percentage of Urban Population	4
Patent Applications Granted by USPTO 1999	5	Percent of Population 65 Years or Older	2
Private Sector Spending on R&D	4		
Total Expenditure for R&D as % of GNI, 1987-1997	3		
High-Tech Exports (% of Manufactured Exports 1999)	4		
Average Score	**3.86**	**Average Score**	**3.25**
Ranking	**2**	**Ranking**	**5**
Ability, Willingness to Invest		**Cost of Living and Pricing**	
Composite ICRG Risk Rating 2000	4	International Cost of Living based on $100 US	1
Availability of Venture Capital	4	Inflation Rate-CPI in %	4
Entrepreneurship among Managers	5	GDP per Capita (PPP) in US$	4
FDI as % of GDP 1990-1999	1	**Average Score**	**3.00**
Average Score	**3.50**	**Ranking**	**3**
Ranking	**2**	**Overall Ranking**	**3**

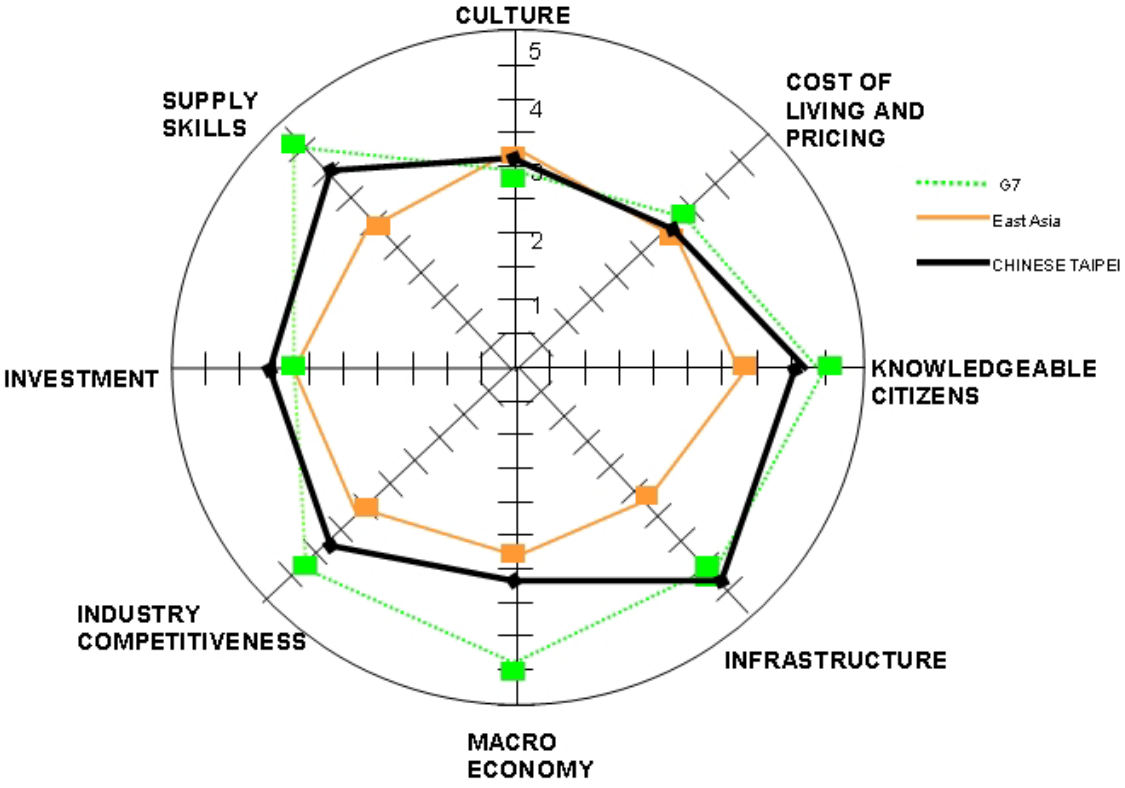


Figure 19. Chinese Taipei E-Readiness

THAILAND

Table 14. Thailand Scorecard

Knowledgeable Citizen	THAILAND	Access to Skilled Workforce	THAILAND
Adult Literacy Rate 1999	4	Public Spending on Education as % of GDP, 1999	3
Secondary Enrollment 1998	4	University Education Meets the Needs of Economy	2
Tertiary Enrollment 1998	3	Well Educated People Do not Emigrate Abroad	4
8th Grade Achievement in Science	3	Extent of Staff Training 2001	3
MGMT Education Available in first-class Business Schools	3	Research Collaboration Companies/Universities	4
Flexibility of People to Adapt to New Challenges	4	Number of Technical Papers per Million People 1997	1
Average Score	**3.50**	**Average Score**	**2.83**
Ranking	**5**	**Ranking**	**5**
Macro Economy		**Digital Infrastructure**	
Trade as % of GDP, 1999	3	Telephone per 1,000 People, 1999	3
Adequate Regulations & Supervision Financial Institutions	2	Mobile Phones per 1,000 People, 1999	1
Protection of Property Rights	3	Computers per 1,000 People 1999	2
Tariff & Non-tariff Barriers 2001	4	Internet Hosts per 10,000 People, 2000	2
Soundness of Banks	2	International Telecom, Cost of Call to US 1999	4
Local Competition	4	Investment in Telecom as % of GDP 1998	1
Regulatory Framework	3	Computer Processing Power (% Worldwide MIPS 1998)	1
Government Effectiveness	1	E-Government	2
Political Stability	2	ICT Expenditure as % of GDP 1999	1
Press Freedom 2002	3	Freedom on the Internet	4
Rule of Law	3		
Control of Corruption	1		
Average Score	**2.58**	**Average Score**	**2.10**
Ranking	**5**	**Ranking**	**7**
Competitiveness		**Culture**	
Technology Achievement Index	2	National Culture is Open to Foreign Influence	5
Gross Tertiary Science & Engineering Enrollment Ratio	1	English Language	3
Admin. Burden for Start-Ups	5	Percentage of Urban Population	1
Patent Applications Granted by USPTO 1999	1	Percent of Population 65 Years or Older	3
Private Sector Spending on R&D	3		
Total Expenditure for R&D as % of GNI, 1987-1997	1		
High-Tech Exports (% of Manufactured Exports 1999)	4		
Average Score	**2.43**	**Average Score**	**3.00**
Ranking	**5**	**Ranking**	**6**
Ability, Willingness to Invest		**Cost of Living and Pricing**	
Composite ICRG Risk Rating 2000	3	International Cost of Living based on $100 US	3
Availability of Venture Capital	2	Inflation Rate-CPI in %	3
Entrepreneurship among Managers	3	GDP per Capita (PPP) in US$	3
FDI as % of GDP 1990-1999	2	**Average Score**	**3.00**
Average Score	**2.50**	**Ranking**	**3**
Ranking	**5**	**Overall Ranking**	**6**

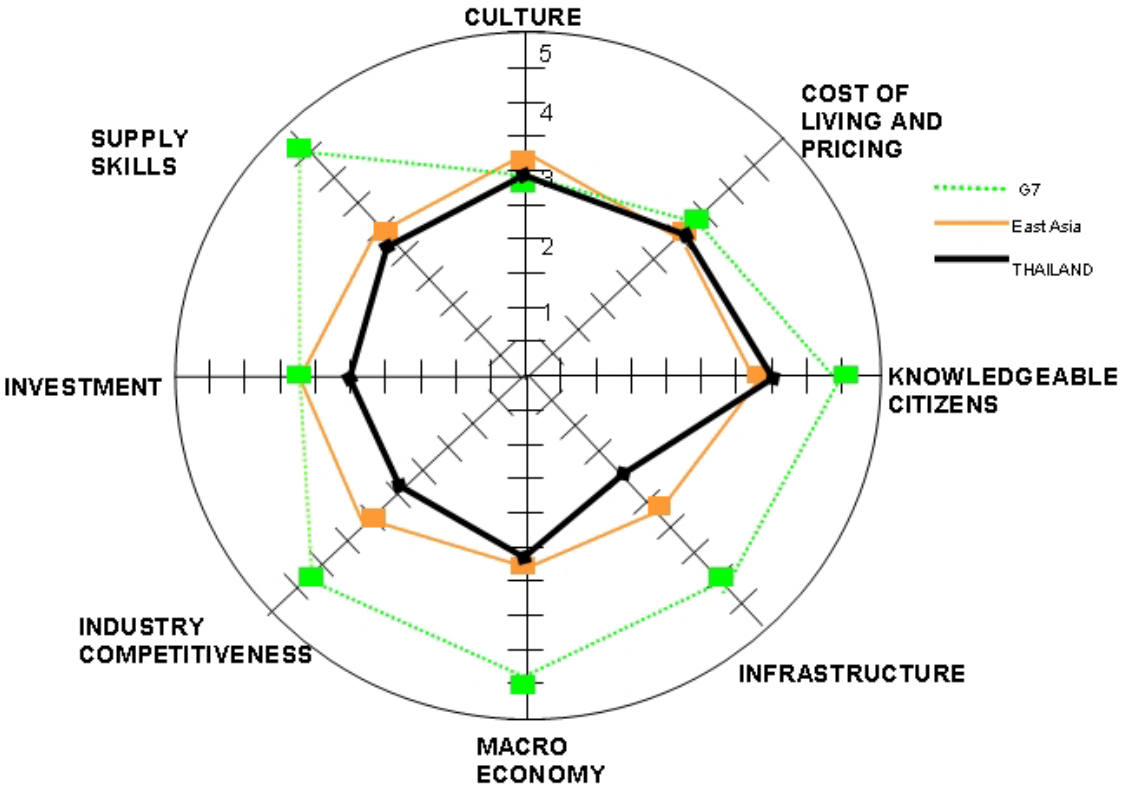


Figure 20. Thailand E-Readiness

VIETNAM

Table 15. Vietnam Scorecard

Knowledgeable Citizen	VIETNAM	Access to Skilled Workforce	VIETNAM
Adult Literacy Rate 1999	4	Public Spending on Education as % of GDP, 1999	3
Secondary Enrollment 1998	3	University Education Meets the Needs of Economy	1
Tertiary Enrollment 1998	2	Well Educated People Do not Emigrate Abroad	3
8th Grade Achievement in Science	2	Extent of Staff Training 2001	2
MGMT Education Available in first-class Business Schools	2	Research Collaboration Companies/Universities	3
Flexibility of People to Adapt to New Challenges	2	Number of Technical Papers per Million People 1997	1
Average Score	**2.50**	**Average Score**	**2.17**
Ranking	**7**	**Ranking**	**8**
Macro Economy		**Digital Infrastructure**	
Trade as % of GDP, 1999	3	Telephone per 1,000 People, 1999	1
Adequate Regulations & Supervision Financial Institutions	2	Mobile Phones per 1,000 People, 1999	1
Protection of Property Rights	2	Computers per 1,000 People 1999	1
Tariff & Non-tariff Barriers 2001	1	Internet Hosts per 10,000 People, 2000	1
Soundness of Banks	2	International Telecom, Cost of Call to US 1999	1
Local Competition	4	Investment in Telecom as % of GDP 1998	2
Regulatory Framework	1	Computer Processing Power (% Worldwide MIPS 1998)	1
Government Effectiveness	1	E-Government	1
Political Stability	3	ICT Expenditure as % of GDP 1999	5
Press Freedom 2002	1	Freedom on the Internet	3
Rule of Law	1		
Control of Corruption	1		
Average Score	**1.83**	**Average Score**	**1.70**
Ranking	**8**	**Ranking**	**8**
Competitiveness		**Culture**	
Technology Achievement Index	1	National Culture is Open to Foreign Influence	4
Gross Tertiary Science & Engineering Enrollment Ratio	2	English Language	2
Admin. Burden for Start-Ups	4	Percentage of Urban Population	1
Patent Applications Granted by USPTO 1999	1	Percent of Population 65 Years or Older	3
Private Sector Spending on R&D	3		
Total Expenditure for R&D as % of GNI, 1987-1997	1		
High-Tech Exports (% of Manufactured Exports 1999)	1		
Average Score	**1.86**	**Average Score**	**2.50**
Ranking	**8**	**Ranking**	**7**
Ability, Willingness to Invest		**Cost of Living and Pricing**	
Composite ICRG Risk Rating 2000	3	International Cost of Living based on $100 US	5
Availability of Venture Capital	2	Inflation Rate-CPI in %	2
Entrepreneurship among Managers	3	GDP per Capita (PPP) in US$	1
FDI as % of GDP 1990-1999	4	**Average Score**	**2.67**
Average Score	**3.00**	**Ranking**	**4**
Ranking	**4**	**Overall Ranking**	**9**

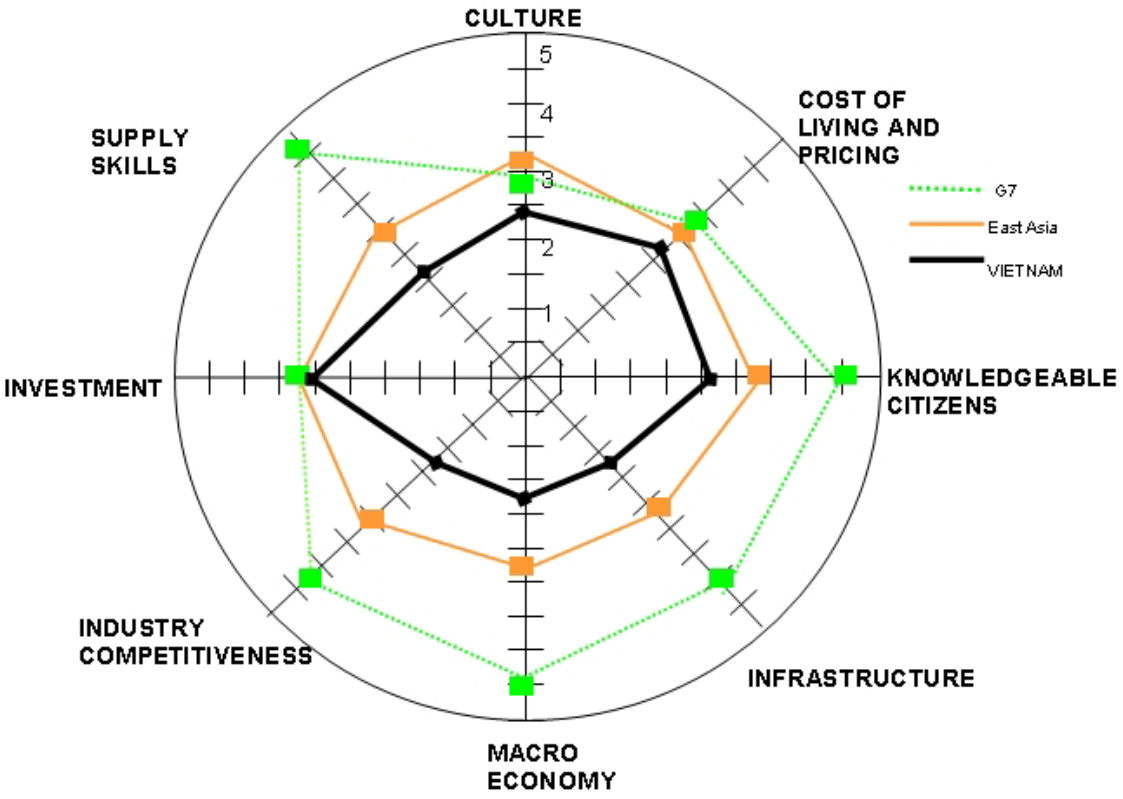


Figure 21. Vietnam E-Readiness

Suggestions for Improving E-Readiness through Human Resource Development

In order to decrease the digital divide, APEC members need to invest resources to make sure that they increase their e-readiness. This will not only help their citizens to become more aware of IT issues and economic opportunities, but will also open a wide array of educational possibilities as well (e.g., distance learning via the Internet). An IT literate population and skilled workforce will be better able to compete in the global arena using e-commerce. This report has used ten APEC member nations to provide an overview of e-readiness in the region. It is apparent from this discussion that some countries decided early on to focus their efforts on creating knowledge-based societies which embraced new technological developments. These nations realized that they needed to improve the IT skills of their population and formulated a number of strategies to meet these goals. Today, although disparities still exist in the level of development among Asian countries, most policymakers realize that with increasing globalization and continuous technological improvement that they must become more advanced in this area in order not to fall behind their neighbors. Beyond the physical improvements necessary for a well-planned infrastructure, the most important area that countries need to improve upon is in the development of their human capital. Without the support of a population which understands the value information technology can contribute to a society, a modernized infrastructure means little.

This section of the report highlights the types of programs that are offered by a variety of institutions to increase e-commerce knowledge, including awareness programs for the general public, training workshops aimed at specific target groups, and university and college coursework. A resource list for the reader is also provided in Appendix C.

Training Programs

Programs Designed for General Public

We have discussed the importance of knowledgeable citizens. There is a general need to introduce e-commerce applications to all classes of population throughout East Asia. Introduction and promotion of e-commerce has been sporadic and uneven throughout APEC member economies. It would be beneficial to have a coherent and effective strategy for disseminating the information regarding the potential of e-commerce to the general population, using a variety of educational means.

Executive Training Programs

Business executives would be the most natural target to get acquainted with e-commerce technologies and acquire the ability to use them to expand their business acumen. Informal interviews at APEC workshops suggest that most business executives have little or incomplete knowledge about this subject. More workshops with concrete case studies, with lessons learned from successes and failures of e-commerce ventures would be helpful.

Training Efforts to Assist Small- and Medium-Sized Enterprises

While executive training programs target business leaderships to promote a general climate for adoption of e-commerce, it is imperative that a more concerted effort be made to reach out to SMEs. This is important for two reasons. First, according to OECD data, most workers in the global economy actually work for smaller organizations rather than their larger counterparts. Second, as SMEs do business across borders, there is an urgent need to adopt Internet technology to increase regional and global presence in a swift and cost-effective manner. Emphasis should be on training on the benefits of enhancing business value via system integration and networking, and more fundamentally on the ability to extend the value chain across regional and international borders.

Specialized Programs

E-commerce is a continuously evolving process and decision-makers involved in this new economy should periodically update their know-how regarding recent developments. Examples of such changes are issues regarding transaction security (e.g., public key infrastructure (PDI)), mobile computing and mobile commerce, and new marketing strategies for online businesses.

University and College Programs

Undergraduate and MBA Programs

Business schools have offered specialized graduate programs in areas such as accounting and finance in the past. However, an important new trend began to emerge in the 1990s when they realized that alternative programs allowed them to gain access to a new market on nontraditional business students. Such areas include international business, health-care administration, and the management of not-for-profit organizations. Among these were programs that have become extremely popular in information technology and e-commerce. Many of the programs are shorter and cost less to obtain than traditional MBA degrees. The issue here is to help APEC member economies search for innovative ideas in e-commerce applications.

A current trend in undergraduate education in Western economies is to produce fast learners rather than specialists, because graduates are likely to work in areas that do not even exist today. This approach allows students to be more flexible in their jobs and adjust to unanticipated changes in the environment.

Master of Science (MSc) programs in e-commerce are typically designed to offer graduate students more of an opportunity to specialize in this field. Some 12-month full time programs consist of six or seven-week sessions where students take five courses per mini-semester. Additionally, MSc programs can be completed over 24 months on a part-time "Flex-Mode" basis and are conducted via the Internet with employees of different organizations at various locations. E-learning technologies include video lectures over the Internet. Some current offerings are Mobile Computing, Language Technologies in e-commerce, Web Application Development, Data Mining, Intelligent Agents, Multimedia, and Conflict Resolution. Capstone practicum courses let students develop e-commerce systems for corporate sponsors.

Another trend is to move from just producing managers in the IS function to "producing technology-knowledgeable" managers. In other words, these programs accept professionals with a variety of technical and non-technical background and produces graduates who, although they have an expertise in technology, can interact effectively with other organizational functions. This philosophy is reflected in the design of the schools' specialized programs. Graduate students may choose to earn general MBA degrees or they may specialize in certain fields by taking a number of hours of coursework within that discipline. Those who elect an Information Management specialization are required to take such core courses as Managing Information, Managing Systems, and Digital Economy & Commerce. They may also select from courses with such titles as: Strategic Analysis for High Technology Industries, Information Systems Design and Implementation, Information Technology Strategy and Services, Data Communications, Networks, and Distributed Processing, and Managing Information-Intensive Change.

Doctoral Programs

While the emphasis of this report has primarily been on ways to enhance the education of citizens in terms of their e-readiness and creating a skilled IT workforce, it must be noted that investments must be made in producing instructors knowledgeable in this area. University undergraduate and graduate programs need to incorporate IT and e-business materials into existing classes and create new courses aimed at training future instructors. It is also important to have faculty available with doctoral degrees from institutions specializing in IT-related areas. Academic institutions in APEC countries must offer competitive salaries to attract specialized IT faculty. This is not an easy task since many qualified candidates can earn considerably higher fees for their consulting services.

It is also important that business schools in the region be able to produce more Ph.D. graduates in this field and find ways to keep them in academia. Pay scales commensurate with those found in the private sector are, of course, imperative to retain the best

educators, but it is also necessary to offer these individuals further professional development. This may best be done by encouraging them to publish in top academic journals and providing more funding for research and travel so as to allow them to interact with their colleagues from around the world at professional conferences. Many schools also allocate resources to special centers or departments designated towards academic research. The attraction and retention of good faculty is directly related to ensuring that the university system in each country is committed to becoming more innovative in terms of providing more research opportunities and turning out graduates who are able to be creative and adaptable to changing situations.

Regional Centers for Excellence

It is important for each APEC member economy to create and nurture a core number of centers of excellence in e-commerce. The notion behind this concept springs from the successful use of business incubators by various universities and governmental institutions to help new startups gain access to resources that they could not otherwise afford. Similarly, these centers would be a catalyst to drive adoption of e-technologies where they would provide a number of specialized services such as training e-workers, helping to generate venture capital funds for high-tech and e-business startups, and finding resources to facilitate the use of e-commerce. At least three elements must be met to sustain a center of excellence. These are the existence of an active research university, innovative businesses, and IT-friendly government policies. Government-industry-university partnerships are crucial to the success of this concept.

Another role of these centers for excellence is to be national gateways to the global silicon networks encouraging international cooperation. Examples of such cooperation are the intense flows of capital, ideas and trade between high-tech companies in Chinese Taipei and California's Silicon Valley.

Government-Sponsored Urban and Rural IT Literacy Campaigns

A major cause of the digital divide in East Asia is the uneven development of information infrastructures between urban and rural areas. This is undoubtedly one of the most difficult obstacles to overcome as it entails having to engage in an intense and comprehensive effort to increase computer literacy, provide universal Internet access, and enhance the ability to innovate in the Internet economy. Governments should take the lead in guaranteeing affordable Internet access to remote areas and offer training programs at local community centers.

Final Remarks

Our data tend to substantiate the increasing role of information technology in promoting national wealth. East Asia has remarkably improved its national and communication infrastructures. There are reasons to believe the information revolution has been a crucial driver for improving economic, political and social conditions. In fact, improved and less costly use of information technology has facilitated information flow within and across national boundaries, accelerated participation in global trade and increased press freedom. Promoters of information technology use should claim credit for this trend.

Singapore; Hong Kong, China; Chinese Taipei and South Korea lead the region in their ability to capitalize on the information revolution to sustain their economic engine. The rest of East Asia, however, while recording significant progress in deploying national information and telecommunication infrastructures, appears to lag behind due to its lack of resources, principally drained by the vast size of its economically disadvantaged populations.

As suggested by the data collected for this report, East Asia as a whole remains as diverse as it always has been – this time in the digital market place. Our e-readiness ranking confirms the inevitable economic legitimacy that for a country, there is a definite and positive correlation between its wealth and its readiness to use information technology to leverage competitiveness. As such, it appears that the digital divide phenomenon is real, and it will further deepen the gap between the "haves" and the "have nots."

As a regional entity, East Asia trails significantly behind the United States and the world Group of Seven top economic powers. Despite the spectacular adoption of mobile telephones and personal computers, the search for an e-commerce "killer application" remains elusive for most Asian businesses. Asia has yet to score a success similar to that of Federal Express with its real-time tracking technology, or Classmates.com with its innovative business model, let alone the now-classic Amazon.com.

Indeed, there are a number of major areas of uncertainty that still cloud the climate of e-commerce in Asia. The relevance and evidence of productivity and return on IT investment have yet to be proved. Changing social needs and priorities are in the making in developing economies. With unpredictable outcomes, support for e-commerce is not in the top agenda of many governments. And, in the context of regional cooperation in Asia, it is not clear how to define the roles and functions of key players – such as governments, non-governmental organizations, and private sectors – in using technology to promote economic prosperity and social welfare. The general economic and business conditions worldwide remain precarious, which is of concern to needed investors.

The aspect of e-commerce that is of most immediate importance in Asia is not "pure" e-commerce that is selling digital goods with digital delivery and digital money. Physical –

not digital – goods and services remain Asia's most important trade. Since overhead costs related to selling physical goods are high; focusing on regional e-markets would help reduce these costs and provide a chance for e-commerce to find its raison d'être. As such, perhaps Asia's best option is to use information technology to foster regional cooperation.

Refocusing on regional e-commerce will not eliminate the challenges. On the contrary, e-commerce issues such as the lack of transaction security and technical support, weakness of market research, insufficient funding, inadequate infrastructure, costly bandwidth access and unclear business laws are more prevalent in Asia. Nonetheless, the cultural, social and economic disparities seem to be better understood regionally. And the notion of regional cross-border Internet-based cooperation seems to be, psychologically and politically, more practical than attempting to connect to the entire world.

Last but not least, the most intriguing cue that emerges from the set of 52 e-commerce readiness indicators is that non-technology factors such as education, economic stability and attitude toward risk, are as important as technology factors for any economy to fully reap the benefits of digital progress.

Therefore, if APEC members in East Asia are to succeed in the digital economy, HRD is the single most important capacity building factor. It is our hope that the data gathered in this report constitute a basis for policy makers to define a sound national HRD policy.

Appendix A - Definition of the Evaluation Factors

In this appendix, we briefly describe the 52 factors used to measure e-readiness. For referencing purposes, the data sources are also indicated with the definitions.

1. Adult Literacy Rate

The adult literacy rate presents 1999 data of male and female adult literacy at ages 15 and above and is taken from the UNDP Human Development Report 2001. It consists of estimates and projections from UNESCO's February 2000 literacy assessment, which is based on population data from the 1998 World Population Prospects database and literacy statistics collected through national population censuses and estimation procedures.[1]

2. Secondary Enrollment

Secondary education completes the provision of basic education and moreover offers subject or skill-oriented instruction.

3. Tertiary Enrollment

Tertiary education, whether or not leading to an advanced research qualification, normally requires the successful completion of education at the secondary level. The data represent the net enrollment ratio as a percentage of the relevant age group.

Indicators 2 and 3 are taken from Table 2.12, pages 86-88 of the World Development Indicators 2001 by the World Bank which can be accessed at http://www.worldbank.org/data/wdi2001/index.htm

4. 8th Grade Achievement in Science

This factor is the 1999 average score of 8th grade students' performance on a standardized science test in a fixed sample of schools per nation. It is taken from the Third International Mathematics and Science Study (TIMSS), an online report from the National Center for Educational Statistics of the U.S. Department of Education, available at http://nces.ed.gov/timss/timss-r/figure_1.html.

5. Management Education is Locally Available in first-class Business Schools

The data represent statistical scores based on a large sample group in each country responding to the question if "management education is locally available in first-class business schools" in their country. (1= strongly disagree, 7 = strongly agree). It is taken from the 2000/2001 Global Competitiveness Report (Table 11.16, Page 322) published by

[1] UNDP. *Human Development Report 2001: Making New Technologies Work for Human Development*. Published for the United Nations Development Programme. Oxford University Press New York 2001. Page 138.

the World Economic Forum (WEF, 2000) in collaboration with the Center for International Development (CID) of Harvard University. The report is partially available at http://www.weforum.org/site/homepublic.nsf/Content/Global+Competitiveness+Programme%5Creports.

6. Flexibility of People to Adapt to New Challenges

Based on a survey with the above topic, statistical scores are given to countries on a 1-10 scale. This factor is taken from the World Competitiveness Yearbook 2001, (Table 4.5.02, Page 513) of the Institute for Management Development at http://www.imd.ch.

7. Trade as % of GDP, 1999

Trade is the sum of all exports and imports of goods and services, measured as a percentage of GDP. The 1999 data are from the World Development Indicators 2001 (Table 1.5. Pages 28-30) and can be accessed at http://www.worldbank.org/data/wdi2001/index.htm

8. Legal Regulation of Financial Institutions

This is a statistical score on a 1-10 scale based on a survey questioning if legal regulation of financial institutions is adequate for financial stability in the countries. It is taken from the World Competitiveness Yearbook 2001 (Table 2.4.14, Page 430) of the Institute for Management Development (http://www.imd.ch).

9. Protection of Property Rights

The data present statistical scores based on a large sample group in each country responding to the question if "property rights are clearly delineated and protected by law" in their country. (1= strongly disagree, 7 = strongly agree). It can be found in Table 3.11, page 240 of the 2000/2001 Global Competitiveness Report by the World Economic Forum (WEF, 2000).
http://www.weforum.org/site/homepublic.nsf/Content/Global+Competitiveness+Programme%5Creports.

10. Tariff & Non-Tariff Barriers

A cumulative score for 2001 is assigned to each country based on the analysis of its tariff and non-tariff barriers to trade, such as import bans and quotas as well as strict labeling and licensing requirements. This score is part of the "Index of Economic Freedom" by the Heritage Foundation, which provides detailed information about the economic policies of 161 countries, focusing on factors that contribute directly to economic freedom (http://www.heritage.org/index/2001/world.html).

Factors 11 and 12 can be found at Table 8.06, page 289 and Table 10.01, Page 306 of the 2000/2001 Global Competitiveness Report by the World Economic Forum (WEF, 2000).
http://www.weforum.org/site/homepublic.nsf/Content/Global+Competitiveness+Programme%5Creports

11. Soundness of Banks
The data are statistical scores based on a large sample group in each country responding to the question if "banks are generally healthy with sound balance sheets " in their country. (1: strongly disagree, 7: strongly agree).

12. Local Competition
The data are statistical scores based on a large sample group in each country responding to the question if "competition in the local markets is intense and market shares fluctuate constantly" in their country. (1: strongly disagree, 7: strongly agree).

Indicators 13 to 17 relate to the World Bank Policy Research Paper "Governance Matters", Daniel Kaufmann, Aart Kraay, Pablo Zoido – Lobaton, October 1999, which can be downloaded at http://www.worldbank.org/wbi/governance/pubs/aggindicators.htm
These are five aggregate governance indicators, which were constructed using an unobserved component methodology with data from 31 different indicators of governance by 13 different sources (see source for more information).

13. Regulatory Framework
This indicator measures the incidence of market-unfriendly policies such as price controls or inadequate bank supervision, and perceptions of the burdens imposed by excessive regulation in areas such as foreign trade and business development.

14. Government Effectiveness
This indicator combines perceptions of the quality of public service provision and bureaucracy, competence of civil servants, independence of civil service from political pressures, and credibility of the government's commitment to policies.

15. Political Stability
This index combines several indicators measuring perceptions of the likelihood of destabilization or overthrow of the government in power.

16. Rule of Law
This indicator includes several indicators measuring the extent of confidence and obedience to the rules of society. They include perceptions of crime, effectiveness and predictability of the judiciary, and enforceability of contracts.

17. Control of Corruption
This indicator measures corruption, for example by the frequency of "additional payments to get things done", and the effects of corruption on the business environment.

18. Press Freedom
This is the 2002 cumulative score illustrating the degree of press freedom in a country. A low number score corresponds to high press freedom.
The data can be viewed at http://www.freedomhouse.org/research/pressurvey.htm.

19. Technology Achievement Index (TAI)

The UNDP Technology Achievement Index "...aims to capture how well a country is creating and diffusing technology and building a human skill base - reflecting the capacity to participate in the technological innovations of the network age."[2] The composite index strictly measures achievements and is designed for policy makers, focusing on indicators that reflect policy objectives for all countries regardless of the level of technological development. The four dimensions of technological capacity for this purpose are: creation of technology, diffusion of recent innovations, diffusion of old innovations, and human skills.

The Human Development Report can be downloaded at http://www.undp.org/hdr2001/.

20. Gross Tertiary Science and Engineering Enrollment Ratio

This factor corresponds to the number of scientists and engineers trained at the tertiary level and engaged in professional Research & Development activity per million population within the years 1987-97. It can be accessed at Table 5.11, Pages 310-312 of the 2001 World Development Indicators (http://www.worldbank.org/data/wdi2001/index.htm). The data are here taken from the Knowledge Assessment Matrix (KAM) of the World Bank, where they are transformed into a natural logarithm for comparison purposes http://www1.worldbank.org/gdln/kam.htm.

21. Administrative Burden for Start-Ups

The data present statistical scores based on a large sample group in each country responding to the question if "starting a new business is easy" in their country. (1: strongly disagree, 7: strongly agree).

It can be found at Table 10.04, Page 307 of the 2000/2001 Global Competitiveness Report by the World Economic Forum (WEF, 2000).

http://www.weforum.org/site/homepublic.nsf/Content/Global+Competitiveness+Programme%5Creports.

22. Patent Applications granted by the USPTO per million population 1999

This factor consists of the number of patent applications granted by the United States Patent and Trademark Office to a country in 1999 divided by its population in 1999. These data, as well as a complete data set from January 1977 to December 2001 can be downloaded at http://www.uspto.gov/web/offices/ac/ido/oeip/taf/reports.htm#PSR ("By Geographic Origin", " Patent Counts by Country/State and Year, All Patents, All Types Report").

The 1999 data are taken from the Knowledge Assessment Matrix (KAM) of the World Bank, where they are transformed into a natural logarithm for comparison purposes http://www1.worldbank.org/gdln/kam.htm.

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[2] UNDP. Human Development Report 2001: Making New Technologies Work for Human Development. Published for the United Nations Development Programme. Oxford University Press New York 2001. Page 46

23. Private Sector Spending on R&D

The data present year 2000 statistical scores based on a large sample group in each country responding to the question if "companies invest heavily in research and development relative to their international peers". (1: strongly disagree, 7: strongly agree). The results are at Table 7.07, Page 282 of the 2000/2001 Global Competitiveness Report by the World Economic Forum (WEF, 2000). http://www.weforum.org/site/homepublic.nsf/Content/Global+Competitiveness+Programme%5Creports.

Factors 24 and 25 can be found in Table 5.11. Pages 310-312 of the 2001 World Development Indicators, which can be partly accessed at http://www.worldbank.org/data/wdi2001/index.htm.

24. Total Expenditure for R&D as % of GNI, 1987-1997

This factor consists of current and capital expenditures on creative, systematic activity that increases the stock of knowledge, including fundamental and applied research and experimental development work leading to new devices, products, and processes.

25. High-Technology Exports as % of Manufactured Exports, 1999

High-technology exports handle products with high R&D intensity. Such high-technology products are used for example in the areas of aerospace, computers, pharmaceuticals, scientific instruments, electrical machinery, and so on.

26. Composite ICRG Risk Rating

The *International Country Risk Guide* (ICRG) rating comprises 22 variables in three subcategories of risk: political, financial, and economic. While there are separate indices for each category, the Composite ICRG Risk Rating is the overall index based on all components. The composite score, ranging from zero to 100, is broken into categories from Very Low Risk (80 to 100 points) to Very High Risk (zero to 49.5 points). The year 2000 data are available through the World Development Indicators 2001 (Table 5.2 Pages 274-276) or the publisher of ICRG, the PRS Group (http://www.countrydata.com, for methodology: http://www.prsgroup.com/commonhtml/methods.html#_International_Country_Risk)

27. Availability of Venture Capital

This is the statistical score based on a large sample group in each country responding to the question if "entrepreneurs with innovative but risky projects can generally find venture capital" in their country. (1-strongly disagree, 7-strongly agree). The data can be found at Table 8.13, Page 293 of the 2000/2001 Global Competitiveness Report by the World Economic Forum (WEF, 2000) http://www.weforum.org/site/homepublic.nsf/Content/Global+Competitiveness+Programme%5Creports.

28. Entrepreneurship among Managers

This is a statistical score on a 1-10 scale based on a survey with the question if managers of the country generally have a sense of entrepreneurship. The results are listed in Table 3.4.07, Page 470 of the 2001 World Competitiveness Yearbook of the Institute for Management Development (http://www.imd.ch).

29. FDI as % of GDP 1990-1999

This factor represents the average of Foreign Direct Investment as a percentage of GDP for the period of 1990-1999. The data can be accessed through the Statistical Information Management Analysis (SIMA) database of the World Bank, available in limited edition at http://devdata.worldbank.org/query/. Full service is available only to World Bank staff.

30. Expenditure on Education

The factor "public spending on education as a percentage of Gross Domestic Product" of the year 1999 is taken from the 2001 World Development Indicators of the World Bank, Table 3.15, Pages 180-182 (http://www.worldbank.org/data/wdi2001/index.htm).

31. University Education Meets the Needs of a Competitive Economy

The statistical score on a 1-10 scale is given to the countries based on a survey examining the above topic.

32. Well Educated People Do Not Emigrate Abroad

The statistical score on a 1-10 scale is given based on a survey asking if the above stated issue of brain drain is a problem in the country.

The data for Indicators 31 and 32 are listed in Table 3.2.16, Page 458 and Table 2.5.08, Page 439 respectively, both in the World Competitiveness Yearbook 2001 at http://www.imd.ch.

33. Extent of Staff Training

This is the statistical score based on a large sample group in each country responding to the question if "companies invest heavily, to attract, motivate, and retain staff" in their country. (1: strongly disagree, 7: strongly agree). The country scores are listed in Table 11.12, Page 320 of the 2000/2001 Global Competitiveness Report by the World Economic Forum (WEF, 2000) http://www.weforum.org/site/homepublic.nsf/Content/Global+Competitiveness+Programme%5Creports.

34. Research Collaboration between Companies and Universities

The data present statistical scores based on a large sample group in each country responding to the question if "companies collaborate closely with local universities in research and development activities" in their country. (1: strongly disagree, 7: strongly agree). They are available at Table 7.06, Page 281 of the 2000/2001 Global Competitiveness Report by the World Economic Forum (WEF, 2000)

http://www.weforum.org/site/homepublic.nsf/Content/Global+Competitiveness+Programme%5Creports.

35. Number of Technical Papers per Million People

This factor includes scientific and technical journal articles published in the fields of physics, biology, chemistry, mathematics, clinical medicine, biomedical research, engineering and technology, and earth and space sciences. It is listed in Table 5.11. Pages 310-312 of the 2001 World Competitiveness Yearbook. The data are taken from the Knowledge Assessment Matrix (KAM) of the World Bank, where they are transformed into a natural logarithm for comparison purposes http://www1.worldbank.org/gdln/kam.htm.

The source of the following factors is the International Telecommunications Union (ITU), an international organization within the United Nations system to coordinate global telecommunication networks and services. The data can be viewed at ITU's ICT free statistics homepage http://www.itu.int/ti/industryoverview/.

The data for the year 2000 are here taken from the Knowledge Assessment Matrix (KAM) of the World Bank, where they are transformed into a natural logarithm for comparison purposes http://www1.worldbank.org/gdln/kam.htm.

36. Telephone Mainlines per 1,000 people, 2000

The indicator includes telephone lines connecting a customer's equipment to the public switched telephone network.

37. Mobile Phones per 1,000 people, 2000

This factor includes users of portable telephones subscribing to an public mobile telephone service which provides access to the public switched telephone network.

38. Computers per 1,000 persons, 2000

This indicator includes self-contained computers for use by a single individual.

39. Internet Hosts per 10,000 people, 2000

Those are computers with active Internet Protocol (IP) addresses connected to the Internet.

40. International Telecommunications, Cost of Call to the United States ($/3 min), 1999

This factor lists the cost of a three-minute call from the country to the United States at the peak rate in 1999. The data are available in Table 5.9, Pages 302-304 of the 2001 World Development Indicators of the World Bank. (http://www.worldbank.org/data/wdi2001/index.htm).

41. Investment in Telecommunications as % of GDP 1998

The data are listed in Table 4.2.01, Page 487 of the 2001 World Competitiveness Yearbook (http://www.imd.ch).

42. Rating of Computer Processing Power 1998

This factor presents the country percentage rate of total worldwide Millions of Instructions per Second. It is listed in Table 4.2.07, Page 490 of the 2001 World Competitiveness Yearbook (http://www.imd.ch) and the Computer Industry Almanac (http://www.c-i-a.com/iia_info.htm).

43. E-Government (World Bank, 2002)

This factor refers to the availability of government online service in the countries. The original data represent ratings on a scale from 1 to 7 (7 as best). They were then converted to our 1 to 5-scale. Beside these year 2000 data, this publication of January 2002 also contains comparable data of the year 1995 and averages for low and high-income economies. The data can be accessed at http://www.developmentgateway.org/node/133831/ in the section "Statistics-ICT at a Glance Tables." After choosing an economy, a link leads to the appropriate World Bank pdf-files, where the factor is located under "ICT Business & Government Environment."

44. ICT Expenditure as % of GDP 1999

This includes external spending on IT (IT products purchased by businesses, households, governments, and education institutions), internal spending on IT (e.g. internally customized software, and capital depreciation), and spending on telecommunications and other office equipment. It is depicted in Table 5.10, Pages 306–308 of the 2001 World Development Indicators by the World Bank (see above).

45. Freedom on the Internet 2001

The data for Freedom on the Internet represent a qualitative ranking into Most/Moderately/Least, according to the level of restrictions. These results are based on an examination of each economy's Internet penetration, regulatory environment and intent, and cost of Internet access. It is a part of the report "Press Freedom Survey 2001", which can be downloaded in pdf-format from the web site http://www.freedomhouse.org/research/pressurvey.htm.

46. International Cost of Living Indices

The international cost of living indices of the Expat Forum represent the cost of a basket of goods and services in a country that would cost US$100 in the United States. In order to calculate a single number, the information had to be simplified. The data and assumptions can be accessed at http://www.expatforum.com/Resources/icol.htm, which was updated in January 2002.

47. Inflation Rate

The inflation rate is illustrated by the Consumer Price Index of 1999 in percent. The indicator is taken from the individual country profiles in the economy section of Asia

Source, an online publication of the organization Asia Society, an American institution dedicated to information about and communication with Asia and the Pacific. The profiles are available at http://www.asiasource.org/profiles/ap_mp_01.cfm.

48. GDP per Capita (PPP) in International $, year 2000

The Gross Domestic Products of the countries were converted to international dollars using purchasing power parity (PPP) rates. An international dollar then has the same purchasing power over GDP as the U.S. dollar has in the United States.
The data are part of the World Development Indicators 2001 of the World Bank and represent the year 2000. They can be accessed over a query at the SIMA web site of the World Bank http://devdata.worldbank.org/query/.

49. National Culture is Open to Foreign Influence, 2001

The statistical score on a 1-10 scale is given to countries based on a survey questioning if the country's national culture is open to foreign influence. The data are listed in Table 4.5.01, Page 512 of the World Competitiveness Yearbook 2001 at http://www.imd.ch.

50. English Language

The factor is based on the assumption that common use of the English language facilitates the adoption of electronic commerce. A score of 5 corresponds to "English as one of the main languages," 4 to "English is commonly spoken," 3 to "English is often taught in High Schools," 2 to "English language is not as common," and 1 to "little usage." Scores were given according to the information in the Languages section of the CIA World Factbook, available at http://www.cia.gov/cia/publications/factbook/.

51. Percentage of Urban Population 1999

This factor is based on the assumption that a higher percentage of urban population facilitates the adoption of e-commerce, because of the more advanced infrastructure and business structures in urban environments. Therefore a higher percentage of urban population in the country was regarded as supportive for e-readiness. The 1999 data was taken from the World Bank World Development Report 1999/2000, available at http://www.worldbank.org/wdr/2000/pdfs/engtable2.pdf.

52. Percentage of Population 65 Years and Older 2000

The factor is based on the assumption that older people are more entrenched in their own culture and less likely to adapt to Information Technologies and electronic business. Therefore a higher percentage corresponds to a lower country score in this factor. The 2000 data are taken from the Statistical Information Management Analysis (SIMA) database of the World Bank, available in limited edition at http://devdata.worldbank.org/query/.

Appendix B – Review of Research Methodologies

In this appendix, we briefly report the work done by other institutions on e-readiness. The intent is to position our framework in relation to the ones that are commonly cited in policy-making circles. In fact, we can classify the e-readiness measurement effort into two categories. We call the first category of studies "self-assessment tools", in that the institutions proposing these tools do not actually conduct any measurement. Instead, they propose a set of indicators that the researcher could use to capture the ability of a country to compete in cyber-space. The second category reported here consists of actual surveys performed by a number of institutions on subjects related to the deployment of national information infrastructures, telecommunication systems, and e-readiness.

"Self-assessment tools" are made available by the World Bank, APEC, the MOSAIC Group, the Center for International Development at Harvard University, and the Computer Systems Policy Project. These institutions provide a framework and a resulting questionnaire that any country could use to self-assess the level of e-readiness, or the status of its national information and telecommunication infrastructure.
In the second section, we summarize the survey findings conducted by other major institutions, in particular those of McConnell International, the Economist Intelligence Unit and the E-ASEAN task force. We also include in this section the country case studies of the International Telecommunications Union and the work by the World Times, which provides an Information Society Index that is widely used in publications of e-commerce readiness. Further two publications by InfoDev offer basic policy-making indicators that aim at National Information Infrastructure development in developing countries, highlighting the potential effects of digital divide. Another short section gives an overview of organizations, which list a number of e-readiness methodologies available on the Internet.

This appendix serves two purposes. The first is to provide readers with alternative focuses on assessing e-readiness. The second is to cross-validate our e-readiness variables, by showing that we are attempting to strike a more comprehensive, balanced framework.

Self-Assessment Tools

World Bank: KAM

The interactive Knowledge Assessment Matrix of the World Bank consists of a set of 69 structural and qualitative variables that benchmark an economy and identify the problems, opportunities and needs for policy or investment focus. The comparison contains a group of 100 economies (most of the developed OECD economies and approximately 60

developing economies). The metrics for the detailed statistical assessment of the countries' readiness for the information economy are within the criteria of economic and institutional regime, educated and skilled population, information infrastructure, and efficient innovation system. The customized scorecards for each country are graphically comparable to different control groups. This 2002 website can be accessed at http://www1.worldbank.org/gdln/kam.htm.

APEC

The APEC Electronic Commerce Steering Group published a self-assessment guide in 2000, available at http://www.apecsec.org.sg/ (under "Publications and Libraries, free downloads/2000"), with the goal of helping governments to achieve focused policies for the development of e-commerce within the specific country environment. A questionnaire with policy and trade focus is aimed at measuring six categories. These include basic infrastructure and technology (speed, pricing, access, market competition, industry standards, foreign investment), access to network services (bandwidth, industry diversity, export controls, credit card regulation), use of the Internet (use in business, governments, homes), promotion and facilitation (industry led standards), skills and human resources (ICT education, workforce), and positioning for the digital economy (taxes and tariffs, industry self-regulations, government regulations, consumer trust).

The detailed questionnaire contains 100 multiple choice questions, but does not have aggregate scoring. Policy should be focused on sections with less than optimal results.

An application is available for the case of Hong Kong, China at the above address as well as at http://www.info.gov.hk/digital21/eng/ecommerce/ec_assessment.html.

MOSAIC

The MOSAIC Group is a consortium of universities that has studied the state of the Internet in nearly 30 countries since 1997, measuring pervasiveness, geographic dispersion, sectoral absorption, connectivity infrastructure and organizational infrastructure, Internet service market, and sophistication of use. Selected experts assign ordinal values from 0 to 4 to each dimension and questionnaires then further focus on the factors determining those values by stimulating or constraining the Internet, and on predictions for the coming year.

The publication "A Framework for Assessing the Global Diffusion of the Internet" is available at http://mosaic.unomaha.edu/2001_GDI_Framework.htm. Examined APEC countries include Singapore (1997, 2000), and the group of China, Taiwan, and Hong Kong, China (1999), to be accessed at the publications website http://mosaic.unomaha.edu/Pages /GDI_Publications.html. Further, a questionnaire version can be found at http://som.csudh.edu/fac/lpress/gdiff/question.htm.

CID - Center for International Development, Harvard University

This site considers itself an educational resource that describes the determinants of a community's readiness for the networked world. It explains the relationships between

factors and adoption and use of ICT, and is a diagnostic tool that systematically examines those factors to assess a community's actual readiness. The assessment part of the website http://www.readinessguide.org is an interactive assessment tool categorizing countries along four defined stages of development according to each of the 19 criteria with focus on technology infrastructure, pervasiveness of technology, and the regulatory and business environment. Specifically, the main categories are networked access, learning, society, economy, and policy, containing such criteria as availability, speed and quality of network access, use of ICT in schools, workplace, economy, and government, ICT policy regarding telecommunications and trade, ICT training programs, and diversity of organizations and available content online. The assessment is meant to serve as a basis for further analysis and planning. Further information about the work of the Information Technologies Group of CID can be obtained at http://www.cid.harvard.edu/ciditg.

CSPP – Computer Systems Policy Project

The CSPP community assessment guide and its self-assessment tool were published in 1998 and designed by chief technologists of the major computer companies in the U.S. to help communities throughout the industrialized world understand their readiness to compete in the networked world. Assessments rate communities along four development stages for each of the five categories, focusing on existing infrastructure and the pervasiveness of technology in society (prevalence and integration of ICT in homes, schools, businesses, government, health care, and additional focus on competition among access providers, speed of access, and government policy). Measurements are made in infrastructure, access, applications and service, economy, and policy, privacy, security, and ubiquity. The guide can be accessed at http://www.connectedcommunities.net/assessmet_guide.htm, the relevant self-assessment questions are at http://www.cspp.org/projects/readiness/23ques.htm.

Surveys and Reports

McConnell International

The comparative estimate of e-readiness report "Ready? Net. Go!- Partnerships Leading the Global Economy" was published in May 2001 and is an update of the report "Risk E-Business: Seizing the Opportunity of Global E-Readiness," which was prepared in collaboration with World Information Technology and Services Alliance (WITSA) in 2000. A group of 53 countries is rated on a scale of 1 to 3 ("majority of conditions are suitable to the conduct of e-business and e-government" to "substantial improvement is needed in the conditions necessary to support e-business and e-government"), with the indication of existence of public-private partnerships that are achieving e-readiness impact. The 5 categories of ranking include infrastructure and access ("connectivity"), government policies ("e-leadership" and "information security"), ICT education ("human capital"), and "e-business climate", and have 3 to 5 criteria to be measured in each

category. The report can be downloaded at http://www.mcconnellinternational.com/ereadiness/default.cfm.

Economist Intelligence Unit (EIU)

These are e-readiness rankings available from EIU, based on the extent to which a country's business environment is conducive to Internet-based commercial opportunities. Six categories with a total of 29 indicators are used to derive an overall score on a scale from 1 to 10 (best). These categories are connectivity (digital infrastructure), business environment (from the EIU business environment rankings, containing 70 indicators), e-commerce consumer and business adoption (especially payment and logistics systems), legal and regulatory environment, supporting e-services, and social and cultural infrastructure (education, innovation). The 60 ranked countries are distinguished into e-business leaders, contenders, followers, and laggards. The table can be viewed at http://www.ebusinessforum.com/ under "e-readiness rankings", while individual country assessments are available at the same site through entering the name of the desired country under "doing e-business in…."

ASEAN

"ASEAN IT Readiness Indicators for the Digital Economy and Development" of the E-ASEAN Taskforce include the categories "Areas of Basic Infrastructure and Technology," "Access to Necessary Services," "Level and Type of Use of the Internet," "Promotion and Facilitation Activities," "Skills and Human Resources," and "Positioning for the Digital Economy" and the according criteria. Although they represent a current picture of the situation in ASEAN, the site only refers to "member countries" without specific names. The data can be accessed at http://itmatters.com.ph/indicators/indicator.html.

International Telecommunications Union

ITU has been publishing detailed Internet Country Case Studies, including Singapore (2000) and Indonesia, Malaysia, Philippines, Thailand, and Vietnam in 2001. The studies examine country backgrounds, Information and Communication Technology markets, Internet policy, national adoption of ICT (e-commerce, e-government, health care, and education), and recommendations. Those publications can be downloaded at http://www.itu.int/ti/casestudies/.

World Times

The World Times publishes an Information Society Index, which is available through http://www.worldpaper.com/home.html under "Research." Note: The link to the IS Index does not currently work at this website (06/07/2002).

InfoDev and Analysys

Along with the report "The Networking Revolution and the Developing World", Analysys developed the guide "A Toolkit for Networking Progress in Developing Countries" in 2000. The simple toolkit is intended to assist in the optimization of national networking performance through regulatory reforms and other initiatives. Although the publication does not include a self-assessment scoring option for user countries, it provides a methodology to direct and advise policymakers in the developing a practical program for national networking reform. It consists of explanations of context, obstacles and opportunities, benchmarking, and a subsequent action plan with policy initiatives, investment programs, and collaborative initiatives. Both reports can be downloaded at http://www.infodev.org/projects/internet/ 400networkingrevolution/.

InfoDev and Pyramid Research

Pyramid Research developed a report on information infrastructure indicators, published in 1999. Beside the executive summary about the path of the Internet revolution and the implications for a future digital divide with developing countries based on their current progress along that path, an extensive set of infrastructure indicators from 1990 to 2010 was collected and forecasted in Excel format for every country. This publication is available at http://www.infodev.org/projects/ internet/375pyramid/.

Methodology Publication Listings and Comparisons

InfoDev

InfoDev has a more detailed and very informative summary of most e-readiness publications available to date, to be found at http://www.infodev.org/ereadiness/methodology.htm. This site includes also a selection of Africa-focused as well as Europe-focused e-readiness websites.

Bridges.org

Bridges.org, an international non-profit organization with focus on the use of ICT for development, published a "Comparison of E-Readiness Assessment Models" in March 2001, to be found on the website http://www.bridges.org/ereadiness/report.html.
The report examines goals, measures, definitions and up-to-date applications of various tools and specifically makes comparisons between:

1. Ready-to-use self-assessment tools like questionnaires, including:
    a) CSPP's "Readiness Guide for Living in the Networked World,"
    b) CID's "Readiness for the Networked World: A Guide for Developing Countries,"
    c) APEC's "E-Commerce Readiness Assessment".

2. Third Party Surveys and Reports, including:

a) McConnell International's "Risk E-Business: Seizing the Opportunity of Global E-Readiness,"
b) Mosaic's Global Diffusion of the Internet Project, with a Turkey and Pakistan case study,
c) WITSA's International Survey of E-Commerce (World Information Technology and Services Alliance, 2000, http://www.witsa.org/papers/EcomSurv.pdf),
d) CIDCM's Negotiating the Net Model (Center for International Development and Conflict Management at the University of Maryland, Leland Initiative Africa, 2001, http://www.bsos.umd.edu/cidcm/projects/neo.html).

There is a list of other e-readiness assessment models, including Digital Divide reports and position papers that can be used for the development of assessment tools as well.
The work was updated in March 2002 with a detailed listing of the countries, which were assessed by the methodologies.

Comparison of the Measurement Variables

The following section contains tables to graphically highlight the differences in methodologies. The first two tables consist of the indicators used in our research approach (UH = University of Hawaii). They are compared to the above described methodologies of the reports by McConnell International, Economist Intelligence Unit, and ASEAN, and the self-assessment tools by the World Bank, APEC, Center for International Development of Harvard University, and the community assessment of CSPP.

It should be noted that attempting to make a comparison between the different methodologies encounters several difficulties. Often indicators by different institutions serve a similar purpose, but are measured differently. In order not to lose focus due to the high level of detail, such factors are regarded as being comparable. Further, several methodologies are not specified beyond broader categories and examples, and indicators are not listed explicitly. Therefore, it may not be possible to provide a comprehensive evaluation because information about the factors is only partially available, as in the cases of McConnell International and the Economist Intelligence Unit. It then only represents factors likely to be used. Another problem to be considered is that some indicators are only partially comparable, since one approach may be more focused than the other, as for example the variables “Protection of Property Rights” and “Protection of Intellectual Property Rights”. In those cases the mark is in brackets (X) to make sure no indicator is ignored. Based on the above considerations, Tables 16 and 17 are attempts to compare the described methodologies regarding their use of indicators.
Sometimes there is a difference in the levels of detail between reports and self-assessment tools. The APEC e-readiness assessment guide is a good example of a very detailed approach with over 100 questions. Since we cannot list all indicators used in other research, Table 18 offers a selection of additional widely used indicators from different categories.

In conclusion and as presented in this appendix, our framework embraces most of the key variables affecting e-readiness. A major difference of our study compared to those mentioned in this chapter is that we focus on the ability and potentiality of an economy to engage in e-commerce, rather than just acknowledging the continued improvements of national information infrastructure and Internet technologies. By doing so, it is our hope that the proposed framework could be used to assess the ability of an economy to innovate and compete effectively in the new economy.

Table 16. Methodology Comparison – Categories 1 to 4

Knowledgeable Citizen	**UH**	**World Bank**	**McConnell**	**EIU**	**ASEAN**	**APEC**	**MOSAIC**	**CID**	**CSPP**
Adult Literacy Rate	**X**	**X**	**X**	**X**			**(X)**		
Secondary Enrollment	**X**	**X**	**X**	**X**					
Tertiary Enrollment	**X**	**X**	**X**						
8th Grade Achievement in Science	**X**	**X**							
MGMT Education Locally Available in first-class Business Schools	**X**	**X**							
Flexibility of People to Adapt to New Challenges	**X**	**X**							
Macro Economy									
Trade as % of GDP	**X**			**(X)**					
Adequate Regulations & Supervision of Financial Institutions	**X**	**X**		**(X)**					
Protection of Property Rights	**X**	**X**	**(X)**	**X**					**(X)**
Tariff & Nontariff Barriers	**X**	**X**	**X**	**(X)**		**(X)**			
Soundness of Banks	**X**	**X**	**X**						
Local Competition	**X**	**X**					**X**	**(X)**	
Regulatory Framework	**X**	**X**	**X**	**X**	**(X)**	**(X)**		**(X)**	**(X)**
Government Effectiveness	**X**	**X**	**X**	**X**					**(X)**
Political Stability	**X**	**X**	**X**	**X**					
Press freedom	**X**	**X**							
Rule of Law	**X**	**X**	**X**	**X**					
Control of Corruption	**X**	**X**							
Competitiveness									
Technology Assessment Index	**X**	**X**							
Tertiary Science & Engineering Enrollment	**X**	**X**	**X**						
Admin. Burden for Start-Ups	**X**	**X**		**X**					**X**
Patent Applications Granted by USPTO 2000	**X**	**X**	**X**						
Private Sector Spending on R&D	**X**	**X**	**X**						
Total Expenditure for R&D as % of GNI, 1987-1997	**X**	**X**	**X**						
High-Technology Exports	**X**	**X**	**X**						
Ability, Willingness to Invest									
Composite ICRG Risk Rating 2000	**X**	**X**							
Availability of Venture Capital	**X**	**X**							
Entrepreneurship among Managers	**X**	**X**	**X**	**X**					
FDI as % of GDP 1990-1999	**X**	**X**		**(X)**					

Table 17. Methodology Comparison – Categories 5 to 8

Access to Skilled Workforce	UH	World Bank	McConnell	EIU	ASEAN	APEC	MOSAIC	CID	CSPP
Public Spending on Education	X	X	X						
University Education Meets the Needs of Competitive Economy	X	X	X		(X)				
Well Educated People Do not Emigrate Abroad	X	X							
Extent of Staff Training	X	X	X	(X)	(X)			(X)	X
Research Collaboration Companies/Universities	X	X	X		X				
Technical Papers per Million Population	X	X	X						
Digital Infrastructure									
Telephone per 1,000 People	X	X	X	X	X	X		(X)	
Mobile Phones per 1,000 People	X	X	X	X	X	X		(X)	
Computers per 1,000 People	X	X	X	X	X	X	X	(X)	X
Internet Hosts per 10,000 People	X	X	X	X		X	(X)	X	
International Telecommunications, Cost of Call to US	X	X		(X)					
Investment in Telecom	X	X		X					
Computer Processing Power (% of total worldwide MIPS)	X	X					(X)		
E-Government (2001 WEF)	X	X	X	X	X		(X)	X	X
ICT Expenditure as % of GDP	X	X	(X)	X					
Freedom on the Internet	X				X				
Cost of Living and Pricing									
International Cost of Living Indices based on $100 US	X								
Inflation Rate-CPI in %	X								
GDP per capita (PPP) in US$	X			X					
Culture									
National Culture is Open to Foreign Influence	X	X							
English Language	X								
Percentage of Urban Population	X								
Percent of Population 65 Years or Older	X								

Note: The comparison shows that all approaches have several indicators in the fields of macro economy (especially the different regulatory issues) and digital infrastructure.

Table 18. Most Common Indicators for ICT Assessment

Examples of Widely-Used Indicators:	McConnell	EIU	ASEAN	APEC	MOSAIC	CID	CSPP
Internet Users per Capita		X	X	X	X	(X)	X
Community Access Centers	X					(X)	X
Cable Access or Digital Wireless			X	X	X	X	X
Connection Speed		X	X	X	X	X	X
ISDN/DSL per 1000 Mainlines			X	X	X	X	X
Cost of Internet Access and Pricing Structure	X		X	X	X	X	
ISP Market	X	X	X	X	X	X	X
Industry leaders/Government partnerships to promote IT	X		X				
Standards for Network Interconnection/Interoperability		X	X	X			
Availability of Local Content				X	(X)	X	
Infrastructure for Authorization, Settlement of E-Commerce	X	X	X	X	(X)	X	X
Level of Network Literacy		X	X	X	(X)	X	
Awareness Initiatives	X	X	X	X			
Schools with Internet Access	X	X	X	X	X	X	X
IT Education, Training Programs/ IT Curricula in Education	X	X	X	X		X	X
Major Internet Using Sectors			X		X		X

Appendix C

This appendix summarizes the human resources policies of the APEC economies considered in this report.

Economy	Policy	HR Training	Education	Comments	Source
China	1) no particularly policies listed	1) China lacks a professional IT workforce • Only 12.5% and 6.25% of workers in the information industry are software and hardware engineers, respectively • Enterprise computerization is still in the initial phase • Pioneers in EC market such as Legend have to design special courses and provide free training to their agents and customers and convince customers to use online ordering • Lack of self-developed core technologies • Lack of sufficient investment and HR to promote EC			1) ***e-Commerce and Development Report 2001 - UNCTAD***

Economy	Policy	HR Training	Education	Comments	Source
Hong Kong, China	1) government measures to promote the adoption of EC are outlined 2) in 1998 govt. launched the five-year "Information Technology for Learning in a New Era"	1) an EC strategy model is described which includes "education and training" 2) HK is also providing new IT and e-commerce related courses and enhancing vocational training to upgrade the IT skills of the workforce to sustain development in new economy • HK works with industry support organizations, including HKTDC, HKPC, Vocational Training Council (VTC) to provide IT training to SMEs • IT Training and Development Centre (ITTDC) - develops tailor made training programs • Digital Enterprise Resources Centre (DERC) facilitates process improvement/competitiveness through IT solutions • SME Training Centre - business skills and market knowledge in developing EB; $300 million fund could partially be used for IT training w/ SMEs	2) this program dealt with primary and secondary schools		1) 2) HAC-WGEETE Paper No. 4/2001. 2001. Information Infrastructure Advisory Committee Working Group on E-Commerce Environment and Technologies Exploitation. (website)

Economy	Policy	HR Training	Education	Comments	Source
Indonesia	1) Presidential Decree No. 50/2000 mandates the Min. of Communications (TKTI) to formulate and update ICT policy frame 2) various unnamed policies, including the government and the Indonesia User Computer Association jointly set up Job Classification and Standard of Competency in Information Technology to help develop regional standards 3) no particular policies directly related to IT HR	1) a) establish policy to stimulate R&D in ICT in private sector and in partnership with universities & public institutions (2001-3) b) collaboration between ICT industry and educational institutions (2001-5): Min. of National Education, Min. of Research, national institutes of science, private sector 2) training institute programs classified as: operator, software package for office automation (e.g., word processing, spread sheets), programmer, system analyst, design systems 3) this study surveyed MNCs to determine their needs • Skill shortages in IT area of managers, programmers, network consultants • All industries need 8-11 weeks to recruit • Survey shows more than 40% of all industries sampled predict difficulties in recruiting project managers and programmers • More than a third indicated difficulties in recruiting system analysts and networking consultants	1) school & university curricula will be gradually adapted; distance learning programs and development of Indonesian language software 2) based on 1995 data, there are 55,579 college & university post graduate students majoring in IT & 12,700 graduate from universities • university education consists of two groups: a) IT (hard & software), and b) information management		1) Government of Indonesia's Action Plan to Overcome the Digital Divide, Information and Communication Technologies in Indonesia under Presidential Instruction No. 6/20001. 2001. Five Year Action Plan for the Development and Implementation of Information and Communication Technologies (ICT) in Indonesia. 2) Setyoko, Besar. 2001. Information Technology Development and Its Implementation in Indonesia. ***Study Meeting on E-Commerce: Opportunity and Application.*** June 18-22. Hawaii, USA 3) Hendytio, Medelina K. date? ***Skill Shortage and Training Needs in Indonesia***. (website)

Economy	Policy	HR Training	Education	Comments	Source
Korea	1) 16 ministries are in the active process of formulating and implementing EC policies; MOCIE looks over EC policy as a whold, with particular focus on promoting EC in the industrial and trade sectors	1) deliver experts, professional human resources			1) EC Promotion Policies. 2002. Korea Electronic Commerce Resource Center. (website)

Economy	Policy	HR Training	Education	Comments	Source
Malaysia	1) Returning Scientists Program (early 1990s) sought to recruit overseas-based Malaysia scientists to work in local institutions on short-term contracts but had limited success 2) Human Resource Development Scheme	1) Multimedia Super Corridor high tech park launched in 1996 aims to attract ICT-based industries w/ special incentives • Due to shortage of qualified nations, expatriates need to be hired and often receive more liberal immigration treatment • Firms still have difficulties finding skilled workers 2) government-led training program associated w/ firm-based training seems to have had a significant impact on raising the level of training in manufacturing and business services but there is a lack of awareness of such programs • training programs are publicized through the internet • other industry-based organizations maintain databases on training programs			1) 2) 3) Kanapathy, Viyaykumari. date? ***Skill Shortage and Training Needs and HRD Strategies of MNCs in Malaysia*** (website)

Economy	Policy	HR Training	Education	Comments	Source
Philippines	1) Electronic Commerce Act 2) Medium-Term Philippine Development Plan 2001-2004 3) Department of Education Culture and Sports (DECS) Computerization Program 4) various ITECC initiatives to build EC in the country	1) promotes both formal and non-formal skills-development programs 2) the Philippines is the second highest among Asian countries in number of training facilities for computer programming and other computer-related courses - also topped U.S., India, Australia and all other countries in availability of qualified engineers, skilled ICT workers, and competent senior managers based on META Group study - due to declining advantage of knowledge of English and low math and science test scores intermediate solutions will be found through interventions in: a) increasing training of ICT professionals and ICT-enabled workers, b) giving high priority to education and training in ICT, c) greater emphasis on math & science, English, d) increasing ICT laboratories and R&D facilities in key learning centers	2) targets: ICT course graduates – 36,000 , engineering & technology graduates 37,000, math & science 5,000; tertiary enrollment for ICT ~255,000 by 2003-4, engineering & technology ~500,000, math ~15,000 increase of public high schools with computing and networking facilities from 30% to 80% 3) State universities and colleges (SUCs) Computerization Program: 159 schools & 166 public high schools given computers in 1999 & 2000, bringing total recipients to 986 since 1996 Philippine Secondary Schools Learning Competencies of Technology and Home Economic Program offered computer education as on of the	2) targets: ICT course graduates - 36,000, engineering & technology graduates 37,000, math & science 5,000; tertiary enrollment for ICT ~255,000 by 2003-4, engineering & technology ~500,000, math ~15,000] increase of public high schools with computing and networking facilities from 30% to 80% 3) State universities and colleges (SUCs) Computerization Program: 159 schools & 166 public high schools given computers in 1999 & 2000	1) Implementing Rules and Regulations of the Electronic Commerce Act. 2002?. Republic of the Philippines Department of Trade and Industry, Department of Budget and Management, Bangkok Sentral NG Pilipinas. (website) 2) 3) 4) The Medium Term Development Plan 2001-2004. (website)

Economy	Policy	HR Training	Education	Comments	Source
Singapore	1) Electronic Commerce Plan 2) Manpower21 by Ministry of Manpower (MOM) has 6 strategies • Integrated manpower training • Life-long learning • Augmenting the talent pool • Transforming the work environment • Developing a vibrant manpower industry • Redefining of partners • National IT Literacy Program aims to improve employment prospects of all Singaporeans	1) Education and other support programs put in place to help businesses exploit EC to enhance productivity and competitiveness • Businesses will be encouraged to invest in retraining of their manpower through incentive programs • EC training and awareness programs educate executives and the general public, including eVision Workshop NCB has jointly undertaken w/ Andersen Consulting to help CEOs and senior executives plan for EC • KEY PROGRAMS: a) mass training, b) EC for SME, c) manpower development – teaching EC in IT as well as business tertiary courses and retraining programs, d) mass education of public	1) EC will be taught in business and professional courses in universities and polytechnics 2) takes ~3 weeks to recruit IT skills, managerial and other skills • Average training expenditure per employee was highest for professional and technical workers ($12,511) • Competes globally for IT skills and expertise Singapore tries to attract IT talent from elsewhere which could cause friction with countries such as Malaysia which badly need such workers for its own MSC and other projects	2) human capital very important for globalization, ICT, and knowledge-based economy • desires to have technically skilled workforce and critical mass of technology entrepreneurs (technopreneurs) • In 1999 a Technopreneur 21 Committee came together with a S$1.7 billion Technopreneurship Fund to look at ways of promoting this area	1) Low, Linda. 2001 *Skill Shortages Training Needs and HRD Strategies of MNCs in Singapore*.

Economy	Policy	HR Training	Education	Comments	Source
Taiwan	1) Bureau of Industry's current Human Resources Training Program 2) unnamed govt. plan(s) 3)There are a number of plans and relevant authorities: HR Training Program for the E-Commercialization of the (Manufacturing, Agriculture, Construction, Financial, Government Procurement, etc.) worth a total of NT$70,000; see reference for details)	1) train engineers needed by different industries as well as personnel in systems planning, design, and integration for industrial automation and digitization 2) Government has already formulated very comprehensive plans for the e-commercialization of industry and is instructing 50,000 enterprises in the use of advanced e-management and IT applications • Avg. of 8 individuals (man-time) per company to receive training in e-commerce, a total of 100,000 individuals (man-time) will receive training; Training categories: a) e-c. consultants, b) e-c. planning & implem. personnel, c) e-c. application service specialists 3) Executive Yuan's Industry Automation and E-Commercialization Program calls for HR training of ~330,000 individuals (man-time) from 50,000 enterprises in 200 systems	4) takes 8-11 weeks to recruit project managers, programmers, systems analysts • Takes 4-7 weeks for system consultants, IT maintenance personnel, and IT technicians • In survey of MNCs ~71% had trouble recruiting systems analysts, etc. (see details of stats in report) • Govt. training programs exist related to EC and other information sessions, and computer training programs • Companies can work closely with colleges and universities • Some firms have used EMBA programs to meet needs		1) 2) 3) Electronic Business White Paper in Taiwan: In the Age of Electronic Business and the Digital Economy. December 2000. iAeV Program Office the Executive Yuan 4) Ho, Chen Sheng. Date? ***Skill Shortages and Training Needs in Chinese Taipei***.

Economy	Policy	HR Training	Education	Comments	Source
Thailand	1) National Electronic Commerce Policy Framework (Oct., 2000) 3) NECTEC transformation, new Strategic Master Plan on Electronic, Computer, Telecommunication, and Information Technologies for 2000-2009 • Ministry of Public Health's Hospital Management System • Government Information Network (e-govt.) • Software Park • SchoolNet expansion program • Loan for computer learning • Promoting foreign investment programs with tax and other incentives	1) To promote HR development relevant to EC by allocating resources; Identify targets and working skills in current market and defining measure of effective development (e.g., financial & tax incentives) & establish institute of standards & HR in EC		2) difference between Singapore & Thailand on contracting out IT/communication work – computer density in Singapore is 439.8 computers per thousand people vs. 48.4 for Thailand (see World Competitiveness Year Book, 2001) – warning indicator for Thai economy if it does not want to enter the upcoming knowledge-based economy with a scarcity in manpower	1) *National Electronic Commerce Policy Framework*. October 2000 2) Puenpatom. Date?. *Skill Shortage and Training Needs within APEC members: the Case of Thailand*. 3) Toward E-Development in Asia and the Pacific: A Strategic Approach for Information and Communication Technology. June 2001. *Asian Development Bank*.

Economy	Policy	HR Training	Education	Comments	Source
Vietnam	1) the government is encouraging e-commerce ventures to promote export industries • There is little B2B and almost negligible B2C e-commerce at present 2) Proposed 10-Year Socioeconomic Development Strategy: 5-Year Plan (was due in 2001 at the party congress) • Resolutions on establishing and developing the software industry from 2000-2005 • Decree for regulations, establishment, management, and use of Internet in Viet Nam • Establishment of the National Internet Coordination Commision	1) twenty villages have been given free Internet access through post offices and public community centers	1) there is a lack of an adequately ICT-skilled labor force	1) the Internet has been limited to the major cities • wealthy and urban parts of Vietnamese society has been quick to embrace ICTs • there is only one access to the international Internet gateway, hence with the lack of competition ISP fees are unaffordable for most people • the financial sector is the leader in the use of ICT	1) Chowdhury, Mridul, Nguyen Kim Cuong, Le Hong Boi, Rran Luong Son. *Country Profiles: Vietnam*. 2) Toward E-Development in Asia and the Pacific: A Strategic Approach for Information and Communication Technology. June 2001. *Asian Development Bank*.

Economy	Policy	HR Training	Education		Source
e-Apec	1) e-APEC strategy report recommendations	1) training banking and securities supervisors and regulators • training programs to assist in the development and implementation of appropriate laws and regulations for e-transactions • further progress in the TELs work on the e-security training modules program and e-security workshops, PKI and information security • educate users on their responsibility to ensure security of networks • encourage economies to make greater investment in ICT education • create a knowledge network; expand digital capability and skills; consider development of a network of Skill Development Centers across the Asia Pacific region, in close collaboration with the business/private sector • develop a society and culture that honor education and training; provide comprehensive, high-quality education and training and skill development programs including basic education and distance learning • recognize importance of ICT as a core competency for teaching and learning programs across APEC economies;	1) General goals: encourage competitive and robust network infrastructure that enables the advanced application of technology in modern business methods and enhanced societal transactions • improve human capacity building; high priority should be given to effective education and training services • explore adding training projects building on APEC TPT-WG work providing face-to-face and online training over the internet to the transport industry on EC; "to prepare APEC economies and all of our people to use the information revolution"		1) e-APEC Task Force. 2001. *E-APEC Strategy*. October 2001.

References

Alsop, Ron. (2002). "Classes on E-Commerce are Erased from Schedules." *Wall Street Journal (WSJ.com)*. 2002. http://www.collegejournal.com/mbacenter/newstrends/20020109-alsop.html.

APEC Electronic Commerce Steering Group. (2000). Self Assessment Guide 2000. *http://www.apecsec.org.sg/ (under "Publications and Libraries, free downloads/2000")*.

APEC. (2000). Self Assessment Guide Application Hong Kong, China. *http://www.info.gov.hk/digital21/eng/ecommerce/ec_assessment.html.*

APEC. (2001). "Skill Shortages, Training Needs and Human Resource Development Strategies of Multinational Companies in APEC Member Economies". Human Resource Development Working Group. APEC Centre for Asia Pacific Social Transformation Studies at University of Newcastle & University of Wollongong. November 2001. *http://www.capstrans.edu.au/apec_report/*.

Asian Development Bank. (2001). "Toward E-Development in Asia and the Pacific: A Strategic approach for Information and Communication Technology". *Strategy and Policy Department*. June 2001.

Asia Society. Country Maps and Statistics. *Asia Source* (online publication of the organization). *http://www.asiasource.org/profiles/ap_mp_01.cfm*.

ASEAN. ASEAN IT Readiness Indicators for the Digital Economy and Development. *E-ASEAN Taskforce. http://itmatters.com.ph/indicators/indicator.html*.

Bridges.org. (2001). Comparison of E-Readiness Assessment Models. March 2001. *http://www.bridges.org/ereadiness/report.html*.

Bschool.com. (1999). Top Techno MBAs - ComputerWorld's Ranking of the Top Techno MBA Programs. *http://www.bschool.com/tech.html*.

Bui, Tung X. (2000). "E-Commerce Trends in Hawaii", *PRIISM*, University of Hawaii 2000. *http://ec.cba.hawaii.edu/ec2000/bui-report.html.*

Certified E-Commerce Consultant (CEC). MBA and Business School Rankings and Links to E-Business and Internet Degrees. *http://ceccertified.com/mba.html*.

Center for International Development and Conflict Management (CIDCM). "Negotiating the Net Model". *Leland Initiative Africa*. University of Maryland. 2001. *http://www.bsos.umd.edu/cidcm/projects/neo.html.*

Center for International Development (CID). Community E-Readiness Assessment. Harvard University. *http://www.readinessguide.org.*

Center for International Development (CID). GITR Country Profiles. Harvard University. *http://www.cid.harvard.edu/cr/profiles.html.*

Choi, Cheong Hyeon. (2000). "E-Commerce: Opportunities and Applications in Korea". *Department of Information System Management, Kwangwoon University*. Seoul, Korea.

CIA World Factbook. *http://www.cia.gov/cia/publications/factbook/.*

Computer Industry Almanac. *http://www.c-i-a.com/iia_info.htm.*

Computer Systems Policy Project (CSPP). (1998). Community Assessment Guide. *http://www.connectedcommunities.net/assessmet_guide.htm*; Self-Assessment Tool. *http://www.cspp.org/projects/readiness/23ques.htm*.

Development Gateway. Statistics - ICT at a Glance Tables. *http://www.developmentgateway.org/node/133831/.*

Economist Intelligence Unit (EIU). (2001). "E-Readiness Rankings 2001." *http://www.ebusinessforum.com/.*

Economist Intelligence Unit (EIU). (2002). "Country Profiles 2002." *http://www.ebusinessforum.com/.*

Expat Forum. (2002). "International Cost of Living Indices." *http://www.expatforum.com/Resources/icol.htm*.

Freedomhouse. (2002). Press Freedom Surveys 2001 and 2002. *http://www.freedomhouse.org/research/pressurvey.htm.*

Gonzalez, Eduardo T. (2000). "Information Technology in the Philippines: Challenges and Recent Policy Initiatives." *Development Academy of the Philippines*. 2000.

Heritage Foundation. (2001). Global Distribution of Economic Freedom. *http://www.heritage.org/index/2001/world.html.*

Hong Kong Digital 21. (2001). "Hong Kong Digital 21 Strategy: Connecting the World." http://www.info.gov.hk/digital21/eng/strategy2001/strategy_main.html.

Hung, Pham Thanh. (2001). "Country Paper Vietnam" for the Study Meeting on E-Commerce: Opportunities and Applications. 18 to 22 June 2001, Hawaii, USA. *Vietnam Productivity Centre-Directorate for Standards and Quality*.

Infodev and Analysys. (2000). “The Networking Revolution and the Developing World.” “A Toolkit for Networking Progress in Developing Countries.” 2000. *http://www.infodev.org/projects/internet/400networkingrevolution/.*

Infodev and Pyramid Research. (1999). Information Infrastructure Indicators 1990-2010, Executive Summary. *http://www.infodev.org/projects/internet/375pyramid/.*

Institute for Management Development. (2001). IMD World Competitiveness Yearbook 2001. *Institute for Management Development,* Lausanne, Switzerland. http://www.imd.ch.

Institute for Management Development. (2002). IMD World Competitiveness Yearbook 2002. *Institute for Management Development,* Lausanne, Switzerland. http://www.imd.ch.

International Telecommunications Union. ICT Free Statistics Homepage. *http://www.itu.int/ti/industryoverview/.*

International Telecommunications Union. Internet Country Case Studies including Singapore (2000) and Indonesia, Malaysia, Philippines, Thailand, and Vietnam (2001). *http://www.itu.int/ti/casestudies/.*

Kaufmann, Daniel. Kraay, Aart. Zoido, Pablo. (1999). “Governance Matters,” *World Bank Policy Research Paper*. Lobaton. October 1999. *http://www.worldbank.org/wbi/governance/pubs/aggindicators.htm.*

Lim, Wilson. (2001). “Accelerating E-Commerce Adoption by SMEs,” *Singapore Productivity and Standards Board.* Study Meeting on E-Commerce: Opportunities and Applications 18 to 22 June 2001, Hawaii, USA.

Lin, Yao Chin. (2000). “The Current Status and Perspectives of E-Commerce in Taiwan, R.O.C..” 2000. *Information Management Department*. Yuan Ze University. Taiwan, R.O.C.

McConnell International with World Information Technology and Services Alliance (WITSA). (2001). “Ready? Net.Go!, Partnerships Leading the Global Economy.” May 1, 2001. *www.mcconnellinternational.com*.

McConnell International with World Information Technology and Services Alliance (WITSA). (2000). “Risk E-Business: Seizing the Opportunity of Global E-Readiness.” 2000. *www.mcconnellinternational.com.*

MindLeaders. (2001). “MindLeaders E-Commerce Courses Approved for Certified E-Commerce Consultant Certification Program.” Press Release Columbus, Ohio. November 26, 2001. *http://www.mindleaders.com/news/cecml.html.*

Moon, Hyung-Nam. (2001). “Country Paper: E-Commerce Trends in Korea.” 2001. *Graduate School of Information and Communication*. Sookmyung Women’s University.

MOSAIC Group. (2000). "A Framework for Assessing the Global Diffusion of the Internet." *http://mosaic.unomaha.edu/2001_GDI_Framework.htm*. Questionnaire *http://som.csudh.edu/fac/lpress/gdiff/question.htm*. Country Cases *http://mosaic.unomaha.edu/Pages/GDI_Publications.html.*

National Center for Educational Statistics of U.S. Department of Education. “Third International Mathematics and Science Study (TIMSS).” *http://nces.ed.gov/timss/timss-r/figure_1.html.*

PRS Group, Inc. “ICRG (International Country Risk Guide).” *http://www.countrydata.com* *http://www.prsgroup.com/commonhtml/methods.html#_International_Country_Risk.*

Saufi Ahmad, Muhamad. (2000). “Best E-Commerce Practices Applications for Productivity Improvement in Malaysia.” 2000. *National Productivity Corporation (NPC)*. Malaysia.

Schneider, Mica. (2002). “Who needs a whole MBA?.” *Business Week*. New York. March, 25, 2002.

Siegel, Michael. Haghseta, Farnaz. O’Donnell, Shawn. (2002). “E-Readiness Framework and Tools: Goals and Approach”. MIT Center for E-Business Talk. March 6, 2002. *http://gssd.mit.edu/GSSD/gssden.nsf/e23fcf7a667f28f7852568b80074ee7b/9b74934d453cc5a9852568be0051c47d/$FILE/eBizPresentation.ppt*

Silverman, Rachel Emma. (2002). “Business Schools Tailor Courses to Web World,” *Wall Street Journal (WSJ.com)*. 2002. *http://www.collegejournal.com/mbacenter/newstrends/20000925-silverman.html.*

UNDP. (2001). “Human Development Report 2001: Making New Technologies Work for Human Development.” Published for the *United Nations Development Programme*. Oxford University Press. New York 2001.

US News.com. (2001). “E-Learning: Find E-Learning Courses and Degrees.” *http://www.usnews.com/usnews/edu/elearning/tools/elsearch.htm.*

United States Patent and Trademark Office (USPTO). *http://www.uspto.gov/web/offices/ac/ido/oeip/taf/reports.htm#PSR.*

Vogt, Peter. (2002). "Make Sure You Have Skills Employers Demand." *Wall Street Journal (WSJ.com)*. 2002. http://www.collegejournal.com/jobhunting/searchstrategies/20010419-vogt.html.

Wall Street Journal. Career Journal Executive Education Center. *http://cj.ce.com/cgi-bin/course/.*

Wall Street Journal (WSJ.com). Statistics E-Commerce Professionals: Median Annual Pay (from "eCommerce Professionals Compensation Survey 2000," Unifi Network Survey Unit, PricewaterhouseCoopers LLP, Westport, Conn.). *http://www.careerjournal.com/salaries/industries/internet/20010131-ecommerce-tab.html.*

Wisenberg Brin, Dinah. (2002). "More B-Schools Offer E-Commerce Programs". *Wall Street Journal (WSJ.com)*. 2002. http://www.careerjournal.com/myc/school/19990816-brin.html.

World Information Technology and Services Alliance (WITSA). "International Survey of E-Commerce, 2000." *http://www.witsa.org/papers/EcomSurv.pdf* .

Wong, Chin. (2002). "E-ASEAN Focuses on E-Gov't Initiatives." *Computerworld Philippines*. Metro Manila. April 8, 2002.

World Bank (2001). World Development Indicators 2001. *http://www.worldbank.org/data/wdi2001/index.htm.*

World Bank. Knowledge Assessment Matrix (KAM). *http://www1.worldbank.org/gdln/kam.htm.*

World Bank. Statistical Information Management Analysis (SIMA) Database. Limited Edition at *http://devdata.worldbank.org/query/.*

World Economic Forum (WEF, 2000) in Collaboration with the Center for International Development (CID) of Harvard University.(2001). "2000/2001 Global Competitiveness Report." *http://www.weforum.org/site/homepublic.nsf/Content/Global+Competitiveness+Programme%5Creports.*

World Economic Forum in Collaboration with the Center for International Development (CID) of Harvard University. (2002). "Global Information Technology Report 2001-2002: Readiness for the Networked World." Abstract at *http://www.cid.harvard.edu/ciditg/gitrr/.*

World Economic Forum. Siemens. World Computer Exchange. (2002). "Educational ICT Pilot Initiatives: Vietnam Country Report." Annual Meeting 2002: *Global Digital Divide Initiative: Steering Committee on Education.* New York January 31 to February 4. Access at *http://www.weforum.org*

World Times. Information Society Index. *http://www.worldpaper.com/home.html*. Variables at *http://www.worldpaper.com/2001/jan01/ISI/2001%20Isi%20Variables.html*.