

# East Asia in the Information Economy

## Opportunities and challenges

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**Abstract** *The Information Economy has captured the imagination of all levels of society. Yet very often, analyses tend to reflect personal biases or propose incredulous scenarios. This essay does not seek to rewrite old rules for a new economy; rather, it seeks to provide a balanced perspective on opportunities and challenges facing East Asia, using a multidisciplinary approach. It finds that although these countries differ in their levels of development in the Information Economy, their prospects of growth depend on the policies that they choose to pursue. Deliberations on economic issues (such as the potential for productivity gains from ICT), political concerns (including the need to cope with changing government-people dynamics), and social changes (such as the diminution of local cultures and the widening digital divide) often involve both costs as well as benefits. The optimal balance is likely to differ between countries, with no clear model answers.*

### Introduction

The almighty NASDAQ, once held as the paragon of the Information Economy, is now languishing in a backlash of weary investors and spooked fund managers. Early hopes that this so-called New Economy would prove to be a malady for all forms of economic ills have largely been dashed, and the vociferous bull voices – whether founded in ignorant optimism or sheer foolishness – have mostly been silenced. Yet stock markets, like a wanton woman, are by nature fickle, and although valuations of Information Economy firms have firmly returned to palatable levels, they are by no means the true measure of the true potential of information and communications technologies (ICT) and the information age that they herald.

Indeed, even as the continued drama of the Information Economy continues to unfold, it has become possible – in retrospect – to make some early assessments on this

information revolution. The reality of the situation is likely to fall between the extremes of limitless opportunity and impossible challenges. This essay seeks to mop away excessive hype and scepticism and to draw lessons from objective analysis, based on a multidisciplinary approach.

### The information economy landscape in East Asia

The economies of East Asia are a unique as they are diverse. They range from those seeking to pursue the siren song of development to those whose levels of development rival the very best in the world; from economies that have embraced *laissez-faire* to those that are now in the throes of transition. In terms of their progress in embracing the Information Economy, however, the economies show a greater degree of convergence, albeit at different levels[1].

### Information economy building blocks

The backbone of the Information Economy rests upon telecommunications infrastructure – without which the promise of interconnectivity and interactivity would be but an empty shell. In concert is the diffusion rate of personal computers (PCs), the workhorse of Information Economy. Such building blocks are often the limiting factors that prevent the deployment of more advanced forms of ICT, such as the Internet.

The telecoms infrastructure in East Asian nations ranges from moderate to high levels of development. Beyond



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inter-country differences, some larger countries – notably China[2] – experience fractures within their economies with regard to infrastructure, where rural areas lag far behind urban areas. Newly industrialist economies (NIEs) all possess high levels of telephone penetration, and employ, or are in the process of implementing, advanced digital technologies. Telecommunications players in these countries tend to operate in a competitive environment, and PC penetration in these economies is usually also fairly high.

Such technological sophistication, however, is not duplicated in emerging Asia. Most have only about one line shared between ten people. Technologies vary widely between countries, and although most have flirted with liberalisation in the telecommunications market, the mark of dominance exerted by the former state monopolies is unmistakable. The situation is worse in the transition economies. Most languish with poor line densities, backward technologies, and almost a total absence of computers.

### **The Internet and e-commerce**

Infrastructure, obviously, feeds into Internet and e-commerce activity. The statuses of both reflect a similar pattern to that PC and telecoms development.

In East Asia, Japan is the leader with the largest number of hosts. It also dominates e-commerce activity – with estimates amounting to US\$27.3 billion, or a full 70 per cent of all Asian e-commerce (eMarketer, 2001). Following closely behind, the NIEs have an average of some 787,000 hosts between them, and account for much of the remaining e-commerce activity in East Asia. Internet penetration rates are high, typically competing with developed nation levels. Due to freely competitive ISP markets, costs of access are affordable.

Again, emerging Asia lags the group, although individual success stories exist. Brunei, for example, has a host-to-population ratio only slightly shy of Korea's[3]. Worse would be the transition economies, which have largely been left behind by the Internet revolution. The only oasis amongst the transition economies' ICT wilderness comes from Vietnam. China, for all its promise, still has an e-commerce scene in its nascent stages, with access charges prohibitive to all save the wealthy[4].

### **ICT hardware and software**

East Asia has traditionally been associated with electronics goods production. The NIEs, together with some of the countries in developing Asia (namely, Malaysia and the Philippines), are major world manufacturers and exporters of ICT hardware. The famed production networks in the region account for large chunks of world output in virtually all ICT goods – from semiconductor equipment (Taiwan) to hard disk drives (Singapore) to memory chips (Korea) to PCs (Malaysia).

Although the traditional strength of the NIEs is in their hardware industries, there has been a growing

consciousness about the importance of the software sector. As such, efforts have been directed towards expanding the industry, although they have yet to pierce the software fortresses of Bangalore, Israel or Silicon Valley.

These production fronts, however, hide an underlying weakness in ICT diffusion in the region. The potential exists for the region to exploit its fount of hardware and software production and increase the level of informatisation in their respective countries – and there is ample evidence that this insight has not been lost on the region's governments[5].

### **The two-edged sword: opportunities and challenges**

Economic theory has long trumpeted the benefits of technology as a source of economic growth[6]. However, the actual processes underlying technological progress were often a black box – technology was envisioned as an exogenous, almost mythical force that impacted economies during arbitrary spurts. This view has since been challenged by the endogenous growth literature that has asserted a role for governments to intervene in the provision of technology, due to its nature as a public good[7].

### **Productivity magic and other possible myths**

The essential motivator of such growth in the Information Economy revolves around the positive effects of increases in total factor productivity through improvements in labour and capital productivity. Up till the 1990s, though, there were questions as to whether ICT would fulfil its initial promise of increased economy-wide productivity growth – to the extent that the phenomenon came to be known as the productivity paradox[8]. This conundrum was devastatingly demolished by a series of studies[9], based on US data, asserting the positive effects that ICT had on productivity growth. A breed of New Economists then emerged, crediting ICT for everything from slaying inflation to taming unemployment[10]. This optimism was not limited to America – studies on industrialised countries showed positive returns to ICT investment. For the Asia Pacific, however, gains were far more modest[11].

Although productivity gains have generally been taken for granted as an expected return to ICT investment, recent thinking – both in academic and business circles – has increasingly come to question the sustainability of such productivity gains – or the very existence of gains to begin with[12]. Indeed, the recent demise of the technology bubble, and the accompanying slippery slide down the (supposedly dead) business cycle, has reinforced the case of the sceptics and has descended into a chorus of “told-you-so”.

Nonetheless, the investments in ICT made over the past 10-20 years are faits accomplis, and few would deny the widespread effect ICT has on the macroeconomy and modern life (DeLong, 2002). Of primary concern to the academic and policy maker today is how these already expended resources can be translated into economically

productive ones. Here, the existing research on general purpose technologies[13] (GPTs) provides a clue.

### **General purpose technologies**

In a typical case in the literature[14], the introduction of a major new technology in an economy generates a cycle consisting of two distinct phases. The first involves the diversion of resources into developing complementary inputs that utilise this new technology, leading inevitably to both output and productivity being placed on the back burner. When the time to reap arrives in the second phase, it becomes worthwhile to harness the advantages of manufacturing with this new technology, and output, wages and profits rise again. Between economies, when the North engages in the first phase of the cycle, the South will enjoy a temporary boom, which ends when the North completes its research and development (R&D) in the second phase and re-asserts its lost competitiveness[15].

There are lessons here for East Asia. The period between the 1980s and first half of the 1990s was probably the gestation period for ICT in the industrialised economies. From the mid-1990s, the productivity surge in the USA as well as the EU suggests the maturation of these developed nations into the second phase. This implies two things. First, the Asian miracle – fuelled by the electronics boom – may well be at ebb. This is a serious consequence, and would imply an urgent need for economies to leverage the ICT revolution in propelling themselves to developed nation status – a clarion call to NIEs. Second, countries that have been left behind will find the catch-up game far more difficult to play. This means that developing Asia and the transition economies will need to actively engage in ICT diffusion and R&D if they are to bridge the existing technological chasm.

Does that mean that the cause is lost for those left behind? This contradicts existing development research on the potential for leapfrogging, but can easily be reconciled by an examination of other economic gains from ICT. Specifically, one needs to search the wealth of research in information and network economics.

### **Information economies and network externalities**

Asymmetric information – the imbalance of information between economic agents – is a plague that afflicts a host of different consumer and producer markets[16], leading to inefficiencies and possibly a failure in the market mechanism. The promise of ICT in this arena is its ability to promote information flows, hence correcting informational deficiencies. This increased exchange of information yields the hallowed “network externalities” – the benefits buried in connected technology that are released when a sufficient number of users get on board. Together, these two aspects of the Information Economy imply fundamental changes to the conduct of business, and have spawned an entire field of study into the economics associated with electronic commerce (e-commerce) and weightless goods[17].

First, due to low marginal costs of production and distribution coupled with high initial fixed costs, production and value chains are changed, requiring businesses to develop new models of pricing and distribution. Second, weightless goods tend to yield increasing returns both in scale and scope due to production efficiencies and product complementarity. Third, e-commerce exerts influences on market structure, generally by promoting competition and market creation through mediums such as online auctions and electronic exchanges. The stiffer competition is likely to incentivise firms to differentiate their products in order to maintain profits, as well as limit their ability to extract consumer surplus through exercising price discrimination. On balance, therefore, e-commerce is expected to lead to improved production processes and greater consumer sovereignty.

### **Building the informational infrastructure**

In order to harvest these gains, East Asian economies will have to confront several issues. Of central importance is the need for ICT infrastructure. This is not limited to physical information infrastructures such as telecommunications and computer networks, but also to the non-physical environment embodied in the legal and regulatory framework. For physical infrastructure, the approach would depend on the stage of development of the country. Obviously, there is a logical progression in the task: there is little use in discussing digital broadband networks when telephone penetration rates are dismal. Similarly, in the absence of reliable electricity provision, the fastest computers are but lifeless desktop boxes. Here, the technologically backward countries possess a distinct edge – the absence of legacy systems there creates the opportunity to leapfrog.

Non-physical infrastructure is paramount in attempting to create a climate that fosters creative enterprise in ICT goods and services, and the positive feedback that such knowledge engineering entails: hence, deregulation in the ICT sectors, drafting of laws that explicitly recognise electronic transactions and protect intellectual property, and a cautious hand in the taxation of e-commerce and ICT.

### **To truck and barter: electronic marketplaces**

Another issue involves the proliferation of electronic marketplaces. These include older electronic exchanges such as proprietary Electronic Data Interchange (EDI) networks, as well as Internet-based business-to-business (B2B), business-to-consumer (B2C) and consumer-to-consumer (C2C) portals[18]. Although such e-markets are unlikely to completely usurp the more traditional methods of exchange, especially in the B2C and C2C areas, there is some evidence[19] that businesses are increasingly seeking to conduct their transactions online due to significant cost savings.

For East Asian economies, this means challenges on both sides of the coin: producers need to ensure security

and privacy, and consumers require a paradigm shift in mindset regarding buying and selling electronically. Contrary to New Economy gurus, however, e-commerce has not led to the overnight disintermediation of the middleman, the complete revamping of businesses, or the abolishment of the shopping experience. Rather, e-commerce will gradually seep into business practices and personal lifestyles, and time will unlock its prize of lower transactions costs. On the part of governments, they can usher in the spread of e-commerce by actively integrating ICT into their online procurement procedures (B2G) and their provision of public services (G2C) – the pursuit of e-government.

### **The (unhealthy) fear of path dependency**

Network economics also raises the spectre of path dependence. This embodies the fear that technically inferior goods, services or technologies may entrench themselves[20] and lead to reduced welfare for all[21]. The common response is for legislators to actively quash any corporate marriage that even remotely hints of monopoly power. Yet, this action seems premature, given that academic opinion remains decidedly unsettled on this subject[22]. The notion that first-mover advantages are accentuated in cyberspace has also been discredited, as the wave of “dot.com” failures accompanied by the relative success of late-coming industrial behemoths testify. Thus, East Asian policy makers will need to carefully examine each purported case of anti-competitive behaviour, before jumping the gun and unduly resorting to antitrust action.

### **Innovation and growth: human capital and institutions as key**

The Information Economy has brought to the forefront the importance of knowledge, or “weightless goods”. Such knowledge has engendered nations to lust after innovation and innovativeness as a means for growth and as a source of competitive advantage[23]. It is through innovation, then, that an economy would enjoy growth. This, in turn, hinges on the nation’s human capital and its institutions.

Manpower policy in East Asia has to rapidly evolve as human capital becomes detrimental in the knowledge-based economy of the future. Levinson (2000) argues that education, together with technology – in particular, technological training and exposure to ICT – are the necessary ingredients that equip human capital for the Information Economy, and is possibly the single most valuable development intervention. East Asia has striven to upgrade its levels of both math and science education, coupled with higher utilisation levels of computers[24]. Here, ICT provides the very solution to the problem – computer assisted and Internet-based learning would open the doors of opportunity to a wider segment of the populace than ever before.

In transition economies and, to a lesser extent, emerging Asian countries, rigidities in the labour market that impede

inflows of skilled manpower should be removed. In particular, policies that promote foreign talent recruitment and local talent retention should be pursued. These policies, together with productivity gains from ICT, should lead to improvements in employment performance. However, this should be an outcome of microeconomic reform, not macroeconomic twiddling with monetary policy, which is likely to tempt an erosion of the central bank’s credibility and reputation[25].

Institutional reform in East Asia is somewhat of an enigma, not least because the unholy trinity of corruption, cronyism and nepotism permeates all levels of society, both public and private[26]. Still, the resounding lesson from the Asian financial crisis is the importance of corporate governance and a sound institutional environment, and the Information Economy does not negate that. With proper institutions in place, the dissemination of public policy is eased, and distortions that arise from market failure are less likely to occur. With regard to the Information Economy, these would include a national innovation system that co-ordinates science and technology policy, oversees R&D bodies and pools national technological resources[27], a sound legal and regulatory framework, and developed institutions for venture capital financing.

### **Production networks in East Asia**

Because of the increasing interconnection of the world economy brought about by globalisation, the production of goods, especially ICT goods, are no longer confined to national borders. Indeed, international production sharing has led economists to extend the traditional assumption of comparative advantage in production to comparative advantage in the assembly of a product. Empirical studies suggest that such production networks are extensive across East Asia, especially in the context of ICT goods (Borras *et al.*, 2000).

East Asia’s success in establishing free trade between nations has been a mixed bag. On the one hand, the ASEAN Free Trade Area (AFTA) has meant the dismantling of a multitude of trade barriers, but on the other, countries have also been slow to open sensitive industries to international competition. However, there has been remarkable achievement in promoting unfettered trade in ICT goods, and more recent initiatives toward region-wide economic cooperation have posited, *inter alia*, unrestricted trade in ICT goods, services and investment, and possibly even labour[28]. Such co-operative efforts bode well for ensuring that the international networking effects of the Information Economy are not lost.

### **Global governance and security**

The globalisation process poses external challenges to sovereign states, including those of East Asia. These manifest themselves as challenges to governance and security. The varying – even haphazard – degrees of global governance efforts has led to different degrees of social and

economic exclusion among different people groups. This occasions the need for the East Asian governments to negotiate with the international institutions[29] that establish regulation and standards in the Information Economy in order to avoid being marginalized or excluded from the global network economy. It is important that their voices are heard, as these organisations can powerfully influence ICT investment flows, protect individual privacy, and ensure information security.

A possible way forward would be to get the regional house in order. Through ASEAN+3 agreements, a common regional standard for e-commerce and intellectual property initiatives can be meted out. This cannot be overemphasised as the departure of East Asian standards from international norms has been soundly criticised by Western governments. This applies even within regional fora, especially for the transition economies that have already experienced some form of international isolation.

#### **Navigating the maze of government-people dynamics**

At the domestic level, changing government-people dynamics oblige governments and their people to renegotiate their relationships. The Information Economy opens up enormous possibilities for improving dialogue between government authorities and the populations that they serve. This can be a healthy trend towards more open and transparent government. ICT also allows new forms of participation in government decisions. When individuals can locate information, identify like-minded people, deliberate choices, and voice opinions more easily, democratic processes are facilitated and human security is enhanced. There is also greater empowerment of the citizen, through more participation in governance. On the opposite end, the recent “people power” demonstrations in the Philippines – aided by cellular text messaging systems – is a stark reminder of the fact that governments now need to be more accountable. Given existing power structures and hierarchical leaderships in East Asia, this process is far from an easy task.

Still, governments operate most effectively if they can interact with citizens and respond to development problems. The Information Economy can improve opportunities for widespread citizen participation in government by cutting through bureaucratic layers. It also aids in co-ordinating community-based initiatives by allowing local groups to interact over greater distances. Likewise, this has a cautionary ring, since it is now harder to impose controls. ICT can facilitate gatherings that may not have the blessings of the central administration, such as the recent Falun Gong meetings in China.

#### **Bottom up: social development with ICT**

Past experiences of East Asian miracles highlight the importance of achieving threshold levels of social capability in order to produce ICT and ensure the effective use of it. The impact of ICT on social development involve areas such as

the levels of general education and technical competence in a country, as well as the broader, socially defined institutional structures that guide social activity. If an improvement in social capability is achieved, the Information Economy can improve the people's quality of life. For example, in health care, time and money is saved with more efficient exchanges of information between health professionals, particularly in countries with higher doctor-to-patient ratios, such as Cambodia and the Philippines. In social logistics, public access to information such as environment monitoring and emergency-management systems benefit natural disaster-prone areas such as Indonesia or Japan. Finally, the influence of the Internet on the individual psyche cannot be underestimated – although this means dealing with both positive and negative impacts[30].

#### **Convergence of world cultures?**

As globalisation continues its march, the convergence of cultures and value systems appears inevitable. Although some authors caution against the complacency of assuming that distinct cultures can meet[31], there is also the belief that the progress of Man will realise an apex, leading to the “end of History” (Fukuyama, 1992). It would appear that the Information Economy is an ideal medium by which this phenomenon may be ushered in. The increased exposure of cultures to one another can conceivably diminish a sense of national identity, and this brings considerations of its own. East Asian societies have to study how local cultures and social circumstances might be enhanced, even as countries race to exploit the opportunities afforded by the Information Economy. In effect, a new mindset is needed when dealing with a knowledge-based society. Governments must re-examine their policies regarding censorship and propaganda, since the free-form nature of the Internet breaks any monopoly that governments may have once held on information, and, by extension, on national identity[32]. Conversely, the Information Economy can lead to a rejuvenation of native culture – the Internet can not only furnish information on local cultures but also enhance its spread[33]. Traditional development tools, such as community radio, can be revolutionised by ICT and be metamorphosed from a one-way communication medium to a two-way interactive empowerment tool. In sum, technology, as a neutral medium, can lead to either an erosion or strengthening of culture and tradition.

In East Asia, the backlash from this globalisation from the Information Economy often includes fears of a westernisation of Asian society through the indiscriminate export of Western – especially American – norms, and the ensuing decline of moral standards and lifestyles. Another afterwave is captured by the anti-globalisation protests that have increasingly come to mark meetings involving international institutions. Some of these fears revise the traditional protectionist arguments of losses in local employment and degradation of the environment. Other newer priorities of these protesters,

such as the erosion of democratic processes due to a lack of accountability by these institutions, are less reactionary and merit attention[34].

### **Mind the gap: digital divides**

Social stratification is not a new idea. Divides exist between the rich and poor, the urban and rural, the male and female, the Caucasian and non-Caucasian. The Information Economy has gifted another level to this story: the digital divide. This is simply the gap between individuals, households, businesses and geographic areas at different socio-economic levels with regard to their opportunities to access ICTs and the Internet. Digital divides exist both between countries, as well as within countries, and take on several permutations[35]. Often, intra-country divides mirror existing income, rural-urban, gender, race, and generational gaps. Efforts to bridge these divides have been mixed, with developed countries usually experiencing greater success than developing ones[36].

It is an absolute necessity for East Asia to address this growing disparity in tandem with social welfare measures adopted by countries for their citizens. Embedded in ICT is the potential for it to be a social leveller, as it affords small and medium enterprises greater access to markets and gives individuals access to information once the preserve of the wealthy upper-class. Policy makers should therefore consider policies aimed at both the public as well as private sector. For example, enhancing learning and educational opportunities through electronic delivery methods could be implemented through accrediting private providers that use ICT and the Internet as an instructional tool, as well as funding the use of ICT in public universities. Other policies should target improving access to ICT.

It should be noted, however, that there are dissenting voices as to how the information highway should be paved. In particular, Baker (2001) argues that apparent inequities in the diffusion of the technologies should not be reduced to a simple socio-economic concern. The digital divide – far from being one-dimensional – is a multi-layered policy problem.

### **Conclusion**

It is clear that the influences of the Information Economy on the economic, political and social fabric of East Asian nations are both pervasive as well as unique, and the concerns raised require that both high-level policy makers as well as the average citizen adapt to the changes that are brought about. In practical situations, most issues impose costs as well as yield benefits – the challenge is how to find the optimal balance, one that is suitable for the specific country in question.

As with any step into the unknown, this essay is likely to raise as many questions as it answers. However, the objective is not to provide a formulaic policy solution to the monster of ICT. In that sense, it is limited in that it is unable to provide a comprehensive list of policy recommendations. However, the

insights drawn for the region should go a long way towards increasing our understanding of these transformations taking place before us, as well as opening our minds to the exciting possibilities that exist, waiting to be harnessed. ■

### **Notes**

- 1 For expository ease, this essay will – where necessary – address the countries in several (admittedly) artificial blocs: the Newly Industrialised Economies (NIEs), the economies of emerging Asia, the transition economies of Cambodia, Laos, Myanmar and Vietnam, and China and Japan, which are treated separately. The NIEs consist of Hong Kong, Korea, Singapore and Taiwan, the emerging Asian economies are the ASEAN-5 of Brunei, Indonesia, Malaysia, the Philippines and Thailand, and the transition economies are Cambodia, Laos, Myanmar and Vietnam.
- 2 China, due to its size and demography, is a strange animal: its poor overall countrywide teledensity and PC penetration levels are not reflective of true discrepancies. For example, fixed teledensity in urban cities such as Shanghai and Beijing is estimated to be about 28 per 100 people, compared to rural areas where it falls to 1 per 100 or less.
- 3 Specifically, Brunei's approximately 40 hosts per 10,000 people compares favourably to Korea's 60 per 10,000 (Netsizer, 2001).
- 4 For example, ChinaNet charges US\$73 for 40 hours' access per month above the US\$60 monthly average wage.
- 5 Many East Asian countries have a national ICT plan. Examples include Hong Kong's Cyberport, Malaysia's Multimedia Supercorridor, and Singapore's ICT 21.
- 6 The subject has enjoyed better treatment elsewhere and will not be repeated here. The interested reader is referred to any rudimentary text on economic growth, such as Barro and Sala-i-Martin (1995).
- 7 An example of the former is the classical Solow (1956) growth model, and its various extensions. The endogenous growth literature was kick-started by Romer (1986), and has since blossomed. Aghion and Howitt (1997) is an excellent reference in this respect.
- 8 Attributed to Solow (1987), who quipped in a 1987 New York Times book review that "... we see the computer age everywhere but in the productivity statistics".
- 9 Most influential were the papers by Brynjolfsson and Hitt (1996) and Oliner and Sichel (2000).
- 10 Best captured in the writings of Yardeni (2001).
- 11 See Dewan and Kraemer (1998, 2002) and Kraemer and Dedrick (1994). Kraemer and Dedrick (2002) subsequently question the findings of their earlier paper on whether there were indeed true gains in productivity in East Asia.
- 12 Academics in this camp include Krugman (1997) and Gordon (1999), the latter taking the more extreme stand that there was no real productivity improvement to begin with. Madrick (2001) sums up the case of business disillusionment with the New Economy.
- 13 General purpose technologies refer to technological advancements characterised by pervasiveness in use and

- complementarities with production and consumption use, leading to sustained and pervasive productivity gains. Examples of GPTs are the steam engine, electricity, and ICT.
- 14 Helpman and Trajtenberg (1998a, b), as well as the other contributions in the Helpman (1998) volume, remain the seminal work in the field, in the context of a closed economy. Chung (2000) studies the open economy implications of GPTs.
  - 15 The limitation here is that the open-economy model assumes that, due to comparative advantage, R&D only takes place in the North – evidently an oversimplification of the true state of affairs. Still, the numbers show that relatively little R&D takes place in East Asia outside of Japan.
  - 16 Classic examples of markets that are particularly susceptible in each category are the secondary motor-vehicle market (Akerlof, 1970) and the insurance market (Rees, 1989).
  - 17 Choi *et al.* (1997) and Shapiro and Varian (1998) are the standard references for the economics of e-commerce and the network economy.
  - 18 Examples of each in the East Asian context are SESAMi (a B2B portal specialising in a range of industries), Amazon.co.jp (the Japanese arm of the B2C bookseller) and InterAuct! (a C2C auction site based in Singapore).
  - 19 See, for example, Lucking-Reiley and Spulber (2001).
  - 20 For whatever reason, including historical accident or unfair business practices such as bundling or limit pricing.
  - 21 The most commonly cited case to illustrate path dependence is the prevalence of the QWERTY-layout keyboard over the Dvorak model – despite the superiority of the latter in terms of design. More recently, products such as Microsoft's Windows operating system and the various Internet protocols have raised similar questions.
  - 22 David (1997) discusses path dependence in the context of industrial organisation and concludes that lock-in effects can lead to the emergence of monopolies. Liebowitz and Margolis (1999), illustrating their case with a host of case studies, provide a cogent rebuttal.
  - 23 Such thinking derives from the works of Grossman and Helpman (1991) and Porter (1990).
  - 24 This coupling is important. Vietnam, which ranks high in the quality of its education system, is ranked poorly in terms of overall competitiveness by the Global Competitiveness Report (Porter *et al.*, 2000) precisely due to its low levels of computer use.
  - 25 This opens up an entire Pandora's box of arguments for and against interventionism, and the existence of a trade-off between inflation and unemployment. Suffice to say that mainstream economic thinking subscribes to minimal interference in monetary policy to counter unemployment. See Fischer (1990) for a broad survey.
  - 26 With possibly the exception of Singapore. See the various reports produced by the Political and Economic Risk Consultancy (PERC), especially PERC (2001).
  - 27 Wong (1995, 1999) elaborates on a conceptual framework for a national innovation system.
  - 28 The e-ASEAN framework set the precedent for international cooperation in goods, services, investment, and capacity building (ASEAN Secretariat, 2000a). In the November 2000 Summit Meeting of the ASEAN+3 nations, agreement was made to extend the initiative to include China, Japan and Korea (ASEAN Secretariat, 2000b).
  - 29 These include, but are not limited to, the International Telecommunications Union (ITU) and the International Consortium for Assigned Names and Numbers (ICANN).
  - 30 Examples of each are improvements in quality of social lifestyle and Internet addiction, respectively.
  - 31 As argued most convincingly by Huntington (1996).
  - 32 Ramanathan (2000) details the impact of the Internet on ASEAN media.
  - 33 For a pithy commentary on the preservation of culture in an inter-networked world, see Baharuddin (2000)
  - 34 For a complete treatment of the issues involved in the anti-globalisation case, see the anthology edited by Mander and Goldsmith (1997).
  - 35 Although there are some factors more commonly used to measure the digital divide. These include fixed tele-density, mobile tele-density, PC density, Internet host density, secure server density, and e-commerce usage density (Fazio *et al.*, 2000).
  - 36 For an example of developed nation approaches to the digital divide, see National Telecommunications and Information Administration (2002), Kraemer and Dedrick (2000) provide a perspective from East Asia.

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