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# 11

## **Leapfrogging into ICT Revolution: The Case of Vietnam and the Transitional Economies**

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In the contemporary world forum, the term "knowledge-based economy" is widely used to describe a current development trend in which the innovation, creation, generation, and application of knowledge are driving forces for development. Among other things, a knowledge-based economy is characterized by a rapid and widespread development of information and communications technology (ICT). This is because the dramatic development of ICT during the last three decades has brought about substantial changes in the way we live and in the very nature of economic activity.

The ICT revolution has been marked by a rapid fall in the price of telecommunications, an increase in the use of ever-faster computers, and the resulting transformation of science, education, and commerce. It is expected that in the next century, computers will connect families, schools, organizations, businesses, factories, and even individuals and

appliances. So, an information society based on a computerized society will be formulated. Recognizing the role of ICT and its tremendous impact on the world economy, the Group of Eight (G-8)<sup>1</sup> adopted the Okinawa Charter on the Global Information Society, which declares that "ICT is one of the most potent forces in shaping the twenty-first century" (Group of Eight 2000, paragraph 1).

While it is obvious that ICT brings about many positive changes for developed countries and has become the central factor in many of these countries' industrial and technological strategies, it is still not clear whether the poorer developing countries will be able to benefit from the spread of ICT. Different conclusions have been reached on this. For example, it has been argued that the rapid diffusion of ICT provides opportunities for newly industrialized countries (NICs) to achieve "world class" production of some ICT-related products and/or knowledge-based service. For developing countries, the danger of being digitally divided from developed nations is real, so even though there is no guarantee that ICT will open the door to opportunities and prospects for the least developed countries, they are unlikely to benefit from the spread of ICT unless concrete efforts are made to upgrade their capacity.

During the last decade, many countries in Asia such as Japan, Korea, Singapore, India, Malaysia, China, and so on have contributed to building the global ICT industry in several ways. China, for example, has devoted a large amount of resources to research and development (R&D) for the promotion of new technologies, which has subsequently enabled them to develop significant technological capability. The ASEAN countries - both old and new members - on the other hand, are also building their ICT industries and promoting the application of ICT goods and services in various areas of economic and social activities. Very recently, leaders of the ten ASEAN members adopted the e-ASEAN Framework Agreement.<sup>2</sup>

However, this development will not be easy for Vietnam and the other new ASEAN members (including Cambodia, Laos, and Myanmar) that are currently in transition to a market economy.<sup>3</sup> Being further behind in the development stages, and possessing underdeveloped technological infrastructures, having less professional and skilled labour forces, and lacking transparent and institutionalized legal frameworks,

these countries will have to cope with several challenges in the process of ICT development. However, if the CLMV nations - Cambodia, Laos, Myanmar, and Vietnam - are able to take advantage of the enabling nature of ICT, and diffuse and assimilate ICT widely in their economies, and accelerate co-operation with more technologically advanced ASEAN members, they can take advantage of shortcuts in building their own ICT industry.

This chapter provides an initial analysis on whether a transitional economy such as Vietnam can leapfrog in the case of ICT, and if *so*, how it can best do so. While the first section provides an overview of the role of ICT in socio-economic development, the second section addresses the digital divide between the CLMV transitional economies and other ASEAN countries. This is followed by a detailed examination of the current status of Vietnam's ICT development. Finally, the last section of this chapter focuses on the policy implications faced by a transitional economy such as Vietnam in the process of building its own ICT industry.

### **1. The Role of ICT in Socio-Economic Development**

The role of ICT in an economy can be understood in terms of the following conceptual framework.<sup>4</sup> There are four main blocks by which ICT operates under:

1. ICT goods sectors;
2. information content sectors;
3. communication network sectors;
4. informatization sector.

The last three decades have witnessed rapid expansion and diversification of ICT innovations and applications. Along with this process, the emergence of the term "knowledge-based economy" has coincided with, and has been made possible by, technological progress, particularly ICT, which is a driving force for development. For many developed countries, ICT has proven its ability to bring about tremendous opportunities in several ways.

ICT provides new and faster ways of delivering and accessing information, innovative ways for effecting real-time communication, and new ways to do business and create livelihood opportunities. The

technology is putting more and more information into the public domain, leading to a rearrangement of social forces and governance structures towards greater efficiency, transparency, and accountability.

First, ICT paves the way towards *greater knowledge-sharing* (Nath 2000). For centuries, knowledge has been passed on from one generation to another through written texts, folklore, word-of-mouth, religions, and customs, and has been preserved geographically and hierarchically. However, ICT breaks all the natural, social, cultural, and hierarchical barriers to knowledge-sharing in an unprecedented manner. This is because the ICT network is based on the principle of inclusion and participation rather than on exclusion. Information hosted on the Internet is automatically meant to be in the public domain. The technology allows individuals to bring together knowledge by harvesting data from other sites and adding value to the data by prioritizing, translating, and updating.

Second, in well-interconnected economies, ICT acts as *a force multiplier* in the enrichment of the knowledge base of society, through the quick dissemination of knowledge products and best practices to a great number of people. Use of the force multiplier attribute of ICT in the fields of education, training, and business development can result in the creation of new social capabilities.

Third, ICT has a *radical and fundamental impact on society and economy*, just like the earlier general-purpose technologies such as the harnessing of steam, the use of electricity, and the adoption of the internal combustion engine. At present, ICT can be found in almost all economic activities, improving the speed and efficiency of markets, reducing transaction costs, and creating a range of products and services that were inconceivable a few years ago. ICT is present not only in computers, military goods, and computer products, but also in the control mechanism of machinery. Thus, the ICT goods sector continually expands, creating new jobs and sub-sectors. The informatization sector, on the other hand, brings about dramatic changes in economic activities that improve the competition capability of traditional industrial sectors. For instance, ICT changes the way business is conducted: when information is accessible twenty-four hours a day, seven days a week, the demand for storage and capital is reduced since inventory systems

can be kept leaner through improved information flows. The Internet, the final converging technology, will combine telecommunications, broadcasting, and publishing to create digital households, web life-styles, and digital learning infrastructures to enable tele-learning, tele-shopping, and tele-working.

For developing countries, however, ICT provides both tremendous opportunities and substantial challenges. Apart from the substantial opportunities that ICT brings to society, many people in developing countries are excluded from enjoying its benefits. Furthermore, the poor remain very much isolated - economically, socially, and culturally from the advances in ICT. Statistics show that 95 per cent of all computers and 75 per cent of the world's telephone lines are found in developed nations and ten industrial countries, which account for only 20 per cent of the global population. In addition, 60 per cent of total Internet access can be found in North America and Western Europe, while only 3 per cent is in Eastern Europe and 2 per cent in Asia and the Pacific (Arunachalam 1998).

In another study, Manuel (1998) indicates that the highest levels of science and technology that share and command overall ICT development are concentrated in a few dozen R&D centres, almost all of which are in the United States, Western Europe, and Japan. This illustrates the fact that digital divides exist in ICT development between and among developing and industrial countries, and the process of trying to catchup with competitors who have already enjoyed a major headstart is not an easy task. Nevertheless, the experiences of all previous technological revolutions have shown that if developing countries are unable to act quickly, to seize the potential of the new technologies, and to establish policies that support new applications, they will fall even further behind. The strategic question for those countries is not whether they should apply and develop ICT to achieve integration into global markets, but how to apply it fully and more strategically than others, and with sufficient speed.

## **2. Digital Divides and Challenges for Transitional Economies in Southeast Asia**

There is evidence of rapid growth in ICT industries in many Southeast

Asian countries during the last decade.<sup>5</sup> Singapore, for example, has invested significant resources to develop its high-technology capability in semiconductors and other ICT products, which has enabled it to become a regional hub for commerce, communications" and transportation. Malaysia is already a prominent centre of semiconductor chip packaging. The government has launched the national initiative of a Multimedia Super Corridor (MSC), which is positioned to be the catalyst to expand ICT products and industries by capitalizing on mutual synergies. Other ASEAN countries such as Thailand, the Philippines, and Indonesia have become important platforms for offshore electronics assembly and test operations for global corporations. However, ICT growth and the status of its development have not been progressing equally among ASEAN countries; in particular, the ASEAN transitional economies of the CLMV remain far behind in terms of level of I CT development.

This issue has been raised in many regional and ASEAN-level fora. Very recently, the informal summit of ASEAN leaders held from 24 to 26 November 2000 in Singapore decided to accelerate the establishment of e-ASEAN. This initiative aims for the establishment of a common legal and economic environment for ICT, and to develop human resources as well as implement measures for its diffusion in different sectors. In order to do so, the leaders of the more advanced ASEAN countries agreed to take any action necessary to help the CLMV countries develop the ICT industry in their economies.

While the above-mentioned support would to some extent enable the CLMV nations to leapfrog the ICT development process, the governments of these transitional economies in Southeast Asia should undertake for themselves the necessary reforms and initiatives required to facilitate the development of ICT in their countries. This is the most crucial factor that would help the CLMV countries to address the existing digital divide between them and the more advanced countries in Southeast Asia. What are the various disparities that currently impede

ICT development in the CLMV countries and prevent them from catching up with their other ASEAN neighbours?

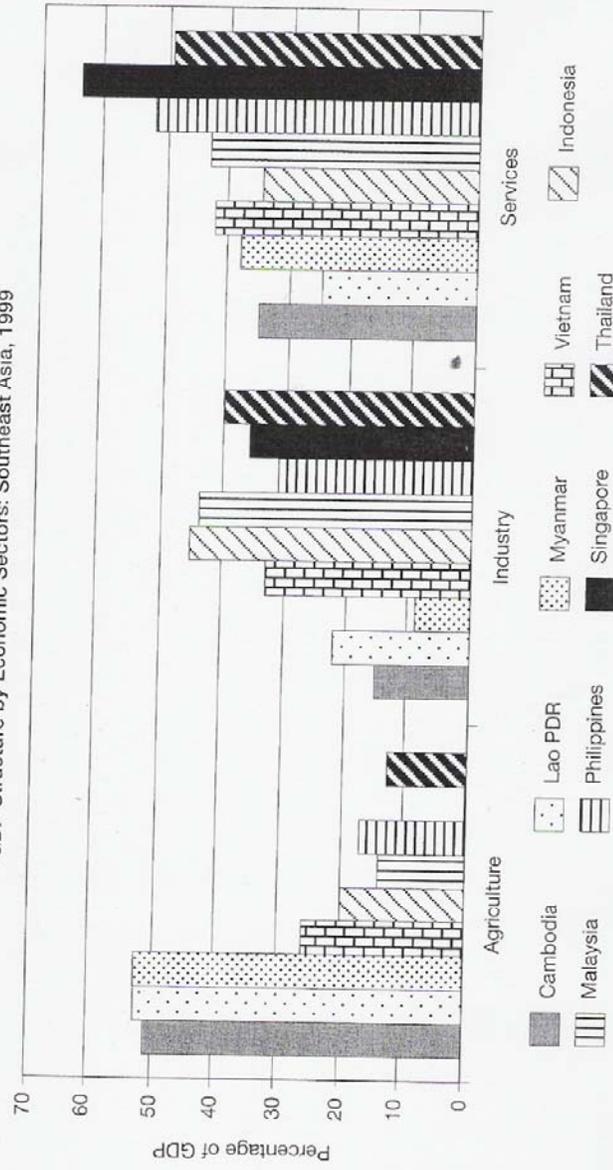
First, there is a big *gap between the CLMV and other more advanced ASEAN countries in terms of economic structure, size of economy, as well*

as the stage of technological development. As shown in Figure 11.1, the economies of the CLMV are mainly based on agriculture, whereas the more developed ASEAN countries tend to be based more on industry and services. While the average share of agriculture in the gross domestic product (GDP) of the old member countries is about 10 per cent, that of the CLMV is about 50 per cent. This indicates that the CLMV countries have yet to complete their industrialization process. With the current underdevelopment in their industrial sector and infrastructure, the future growth of ICT in these countries cannot depend on the development of the agricultural sector, but must instead mobilize other resources. Moreover, unlike other ASEAN countries, the majority of the population in the CLMV live in rural areas (Table 11.1). This is an important point to note in any measure undertaken to ensure the widespread use of ICT so that the application of ICT benefits not only people in urban cities but also the rural population.

Second, the GDP per capita of the CLMV countries is considerably lower than that of other ASEAN countries. Table 11.1 suggests that the average GDP per capita of the CLMV<sup>6</sup> is approximately half that of Indonesia, 1/6 that of Thailand, 1/11 that of Malaysia, and 1/98 that of Singapore. As GDP per capita is assumed to indicate ability to access ICT in terms of both the supply and demand side, the low figure means that the CLMV countries would face difficulties in promoting ICT application and diffusion. On the supply side, these countries are unlikely to spend large amounts of capital investing in ICT (which is considered to be very capital-intensive), as their priority would be to create more jobs to provide income for their population. On the demand side, the low average GDP per capita of the CLMV countries does not allow them access to the Internet and other ICT services.

Third, as human resource development is an important factor for ICT development, it is worth noting that there is a *significant gap between the CLMV countries and the rest of ASEAN in terms of the Human Development Index (HDI)*.<sup>7</sup> Although the transitional economies in Southeast Asia had made some progress in increasing the level of their HDI over the last five years, Figure 11.2 indicates that the HDI of these countries still lags behind those of other ASEAN countries such as Singapore, Malaysia, Thailand, and the Philippines. In addition, the

Figure 11.1  
GDP Structure by Economic Sectors: Southeast Asia, 1999



Source: World Bank, *World Development Report 2000/2001: Attacking Poverty* (2000).

Table 11.1  
 Size of the Economy: Southeast Asia, 1999

Country	Population (million)	Urban Population (%)	GNP per capita		GNP per capita measured at PPP	
			US\$	Rank	US\$	Rank
Cambodia	10.9	22	260	186	1,286	176
Lao PDR	5.4	22	280	184	1,726	161
Myanmar	48.8	27	-*	-	-	-
Vietnam	79.4	21	370	167	1,755	160
Indonesia	207.7	38	580	150	2,439	143
Malaysia	22.7	56	3,400	82	7,963	72
Philippines	74.7	57	1,020	131	3,815	118
Brunei	0.3	67	-	-	-	-
Singapore	3.9	100	29,610	9	27,024	7
Thailand	62.1	36	1,960	102	5,599	90

\* Estimated to be of low income (US\$755 or less).

PPP = Purchasing power parity.

Source: World Bank, *World Development Report 2000/2001: Attacking Poverty* (2000).

share of unskilled and low-skilled labour in the CLMV is much higher than in other ASEAN countries.

Fourth, there is a *lack of an adequate pool of professionals qualified in the ICT field*. The transitional countries in Southeast Asia either have yet to create their own technological capabilities,<sup>8</sup> or they remain in a weak position with technological capabilities that have already been created. ICT requires indigenous technological capabilities in the main areas of production, design engineering, and so on, and should proceed at the right pace to achieve optimal assimilation and efficient utilization, with at least some of its components produced domestically. The CLMV countries are currently between the initial and second stages of technological development.<sup>9</sup>

Fifth, the digital divide between the CLMV and other ASEAN countries can also be seen in terms of *accessibility to ICT*. As shown in Table 11.2, in terms of number of personal computers per 1,000 persons in 1998, Vietnam leads the CLMV countries with a ratio of 6.4, followed by Laos and Cambodia at the level of about 1 computer per 1,000

persons. This figure is much lower than that of Malaysia and Singapore, and slightly lower than that of Thailand, the Philippines, and Indonesia. In terms of number of Internet hosts per 10,000 persons in January 2000, the ratios scored by the three transitional countries of Laos, Myanmar, and Vietnam were almost zero. Cambodia fared only slightly better, with a ratio of 0.13. This indicates that people in the CLMV countries, especially those in the rural areas, are very much isolated from and do not have accessibility to ICT.

Sixth, *organizational structure* is another challenge if the CLMV countries are to leapfrog into the ICT revolution. There are severe constraints to the impact of state-sponsored research institutes on industry and economic productivity. That is because of a sharp segmentation between production enterprises and state-sponsored research institutions. Research institutions for the most part are "supply-driven", with little connection with the production needs. Moreover, the very modest financing for R&D via the state budget is fragmented, and this has resulted in very small amounts being disbursed CO individual research projects. This makes any form of serious research impossible, as in the case of Vietnam (Project VIE/99/002, May 2000).

Seventh, the *institutional framework* needs consideration as well. It should be noted that the CLMV countries are not yet free from the mechanism of command economies. The nascent market economy is not fully established and does not yet operate smoothly. Despite some advances, progress in terms of the transparency and consistency of legal regulations is still found wanting. Businesses continue co-operate in a legal framework lacking in consistency and transparency. With regard to the ICT sector and ICT-applied sectors, regulations are not fully promulgated and even when implemented, are weakly enforced. There is an absence of private R&D activities and an anti-monopoly policy.<sup>10</sup> Charges for Internet access in the CLMV thus remains among the highest in the world, and strong regulatory controls are put in place.

Eighth, a proper *ICT infrastructure*<sup>11</sup> is a pre-condition for the transitional economies to leapfrog into the ICT revolution. Table 11.2 also shows indicators - such as the number of television sets, main telephone lines, mobile phones, personal computers (measured per 1,000 persons), Internet hosts (per 10,000 persons), and scientists and engineers

Table 11.2  
Communications, Information, and Science and Technology: Southeast Asia

Country	No. of television sets <sup>a</sup>	No. of main telephone lines <sup>a</sup>	No. of mobile phones <sup>a</sup>	No. of personal computers <sup>a</sup>	No. of Internet hosts (per 10,000 persons, Jan. 2000)	No. of scientists and engineers in R&D (per million persons, 1987-97)	High-tech exports (% of mfg. exports, 1998)
Cambodia	123	2	6	0.9	0.13	—	—
Lao PDR	4	6	1	1.1	0.00	—	—
Myanmar	7	5	0	—	0.00	—	—
Vietnam	47	26	2	6.4	0.07 <sup>b</sup>	379 <sup>c</sup>	—
Indonesia	136	27	5	8.2	1.00	182	10
Malaysia	166	198	99	58.6	25.43	93	51
Philippines	108	37	22	15.1	1.58	157	71
Singapore	348	562	346	458.4	452.25	2,318	59
Thailand	236	84	32	21.6	6.46	103	31

<sup>a</sup> Per 1,000 persons, in 1998.

<sup>b</sup> *Saigon Economic Times*, 3 August 2000.

<sup>c</sup> International Development Research Centre (1999).

— = No data available.

Source: World Bank, *World Development Report 2000/2001: Attacking Poverty* (2000).

in R&D (per million persons) in 1998 - used as representative indicators of the quality of the ICT infrastructure in the ASEAN countries. Among the ASEAN countries, the CLMV economies, led by Vietnam, rank at the bottom in terms of ICT infrastructure. Leapfrogging in terms of ICT will depend on the speed and extent of ICT adoption and diffusion. But in the transitional economies in Southeast Asia the lags between the availability, adoption, and the eventual diffusion of ICT are significant, due mainly to the relative scarcity of the requisite skills and physical and research structure (Table 11.2).<sup>12</sup>

Finally, citizens of the CLMV nations face a socio-economic hurdle in their ability to handle ICT applications, despite their relatively high average net enrolment ratio in education compared with other ASEAN countries (Table 11.3). This is because they have lower levels of computer literacy and Internet skills. Much of this stems from their inadequacies in English language ability as compared with other ASEAN countries. This highlights serious shortcomings in the current educational and training system, which has not been responsive to the demands of the changing economy, particularly in the ICT and ICT-applied sectors.

Table 11.3

Country	Education: Southeast Asia, 1980 and 1997					
	Public expenditure on education (% of GNP)		Net enrolment ratio (% of relevant age group)			
			Primary		Secondary	
	1980	1997	1980	1997	1980	1997
Cambodia	-	2.9	100	100	15	39
Lao PDR	-	2.1	72	73	53	63
Myanmar	1.7	1.2	71	99	38	54
Vietnam	-	3.0	96	100	47	55
Indonesia	1.7	1.4	89	99	42	56
Malaysia	6.0	4.9	92	100	48	64
Philippines	1.7	3.4	95	100	72	78
Singapore	2.8	3.0	100	91	66	76
Thailand	3.4	4.8	92	88	25	48

Source: World Bank, *World Development Report 2000/2001: Attacking Poverty* (2000).

### 3. Current Status of ICT in Vietnam and Plans for Development of the ICT Industry

#### 3. 1. *Background*

In 1996, at the Eighth Communist Party's Congress, Vietnam confirmed the path of industrialization and asserted that it expected to become an industrialized country by the year 2020. For the last decade (1991-2000) this country had achieved a relatively high GDP growth rate, based mainly on the rapid growth of export and investment (in particular, on growth in foreign direct investment [FDI]). This was a result of the *doi moi* reform policy, which emphasized the opening up of the economy by mobilizing both domestic and external resources, thus shifting from a centrally planned economy to a socialist-oriented market economy. The economic performance for the last decade can be seen in Table 11.4, from which the following observations may be made.

First, during the period 1991-2000, the economy had been growing at an average annual rate of 7.5 per cent, while exports grew at 18 per cent. Second, the economic structure has been moving slowly towards a more industrial economy, with the share of agriculture in GDP decreasing and that of the industry and services sectors increasing. Third, the employment structure has shifted very slowly compared with the pace in economic growth and economic structural change. A major proportion (68 per cent in the year 1999) of the labour force was working in the agricultural sector. Fourth, real GDP per capita in 2000 had multiplied by 1.8 times as compared with the level in 1990. In general, however, by the end of the 1990s, Vietnam remained a mainly agrarian country with a relatively low level of development. Among the ten countries in Southeast Asia, Vietnam is ranked eighth in terms of GNP per capita, although it is ranked at the sixth place in terms of the HDI (Table 11.1 and Appendix Figure A11.2).

In 2000, Vietnam set a strategy for development into the next decade and reconfirmed its commitment to industrialization and modernization. However, in the new development period, Vietnam cannot continue with the old path of development policy. This is because in the context of international integration and rapid changes in the world economy, the expansion of exports would very much depend on the world market, where there are already many competitors wanting to share a slice of the

Table 11.4  
Selected Economic Indicators of Vietnam, 1991-2000

	1991-95	1996-2000	1991-2000
Annual GDP growth rate (%)	8.2	6.7	7.5
Agriculture	5.9	5.0	5.4
Industry	13.7	12.2	12.9
Service	10.1	6.4	8.2
Annual export growth (%)	13.3	22.8	18.1
Investment structure (%)	100	100	100
State budget	23.6	21.9	22.5
Domestic business	52.0	54.2	53.4
Foreign direct investment	24.4	23.9	24.1
	1990	1995	2000
Economic structure (% of GDP)	100	100	100
Agriculture	38.7	27.2	25
Industry	22.7	28.8	34.1
Service	38.6	44.1	40.9
Employment structure (%)*	100	100	100
Agriculture	73.3	69.7	67.8
Industry	12.4	13.3	12.9
Service	14.3	17	19.3
GDP per capita (US\$)	206	--	378
(as compared with 1990)	--	--	1.8

\* The figures in the last column are those of the year 1999.

Sources: Ministry of Planning and Investment (MPI) and General Statistical Office (GSO), in CIEM, *Vietnam's Economy in 1999* (2000, charts 3 and 9, pp. 100-3).

same market "cake". It will also be more difficult to mobilize investment than in recent years, unless appropriate policies and structural reforms are made. In addition, it should be understood that the industrialization process in the next decade should not simply be an increase in the share of the manufacturing sector in GDP. The industrialization of Vietnam in the new international context should be seen as a transformation from an inefficient, agriculture-based, and labour-intensive economy to an effective, productive economy with easy access to information and advanced technology (in particular, ICT) in all its economic activities.

### 3.2. *Steps towards ICT Development*

Although the government has only recently shown a keen interest in ICT, Vietnam had already made considerable progress in ICT development during the last decade.

In 1991 the policy for ICT development was mentioned for the first time in the Communist Party's Resolution (26-NQITW). Thereafter, a number of regulations related to ICT were issued by the government as well as by related government agencies (Box 11.1). In the implementation of these regulations, Vietnam has benefited from the world's development of ICT by importing the technology and spreading its use in different economic sectors and taken the initial steps preparing for developments in ICT.

The country's telecommunications infrastructure has also been improved, and the government has made significant budget investments to upgrade the ICT infrastructure as well as improve the capacity of the World Wide Web gateway. Furthermore, the government has recently announced a plan to develop several high-tech parks to facilitate ICT development.<sup>13</sup> Such policies have borne fruit and resulted in the

#### Box 11 .1

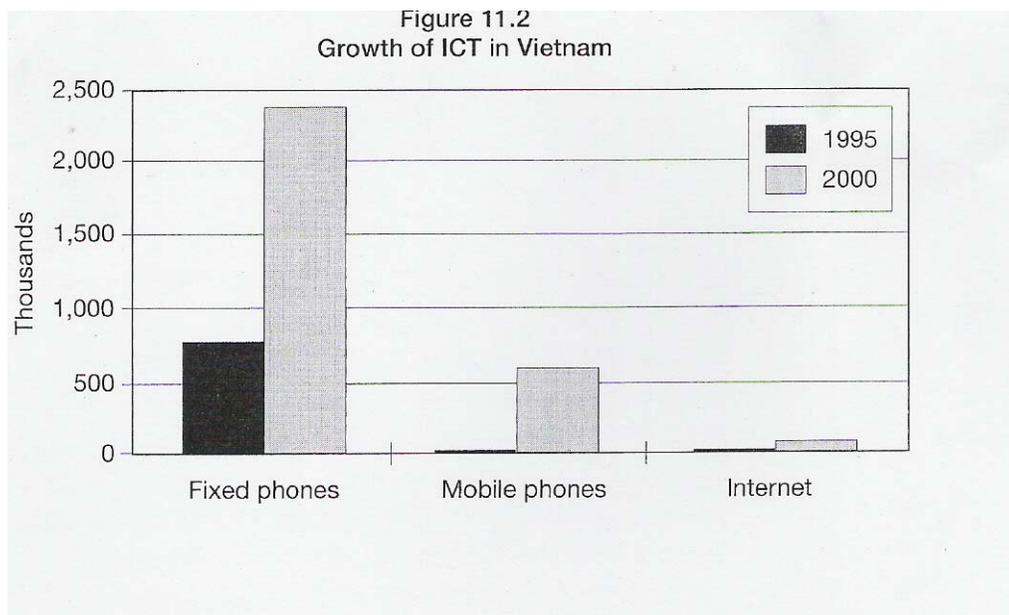
##### Government Policies Relating to ICT Development in Vietnam

1991	A policy to promote diffusion and application of ICT was introduced in the Communist Party's Resolution (26-NQrrW).
8/1993	Resolution No. 49/CP on the national programme of IT development for the period 1996-2000 was issued.
1993	A special Office of the Steering Committee directly under the authority of the Primer Minister was created and mandated with the development of a national IT programme.
1994	A programme of training on IT in some selected universities was launched.
1996	Accelerated application of IT in government management and government agencies.
5/2000	A government resolution on development of the software industry for the period 2001-2005 was issued.
9/2000	A government action plan for the development of software industry for the period 2001-2005 was drawn up.
10/2000	A directive (58-CTrrW) by the Communist Party of Vietnam on strengthening ICT development and application for industrialization and modernization was issued.

development of some ICT industries. Although Vietnam is a latecomer, it has been able to forge a niche in the world's market for ICT through the export of some ICT-related products such as television sets, cassettes, and some software products.

Information technology (IT) has been widely introduced in universities and a considerable number of computer personnel (software as well as hardware) had been trained during the last five years. In this regard, since 1994 seven universities in Vietnam have faculties specializing in IT education and have been providing 2,000 to 2,500 graduates annually to the IT labour market. Apart from the universities, some vocational colleges have also participated in the training of IT technicians. More importantly, initial steps have been taken to use and assimilate IT into the national management system. Finally, several national workshops have also been organized to involve national government officials and experts in discussions about what Vietnam should do *to* leapfrog in the area of ICT development. Furthermore, several studies have been made *by* both Vietnamese as well as international teams on the potential of ICT development in Vietnam.

The above-mentioned achievements indicate that the Vietnamese people have already recognized the importance of ICT in the development of its economy. Figure 11.2 illustrates the rapid growth in ICT penetration in Vietnam over the last five years, especially in terms



of the number of the fixed telephone and mobile phone lines. The data suggest that a more dramatic development of ICT can be expected in the coming period. However, this faces major challenges and difficulties, and these are discussed in the following sub-section.

### 3.3. *Current Status of ICT in Vietnam*

As demonstrated in Table 11.2, the current status of ICT in Vietnam is far behind that of other countries in the region. The figures indicate that further developments are needed before Vietnam can successfully interconnect with the knowledge-based economy. The discussion below examines this proposition, based on the ADB (2000) report on the preconditions for ICT development.<sup>14</sup>

The report argues that *human resources* is the most important factor in the ICT development process. To facilitate ICT development, it is necessary to have an adequate pool of professionals qualified in the sciences and mathematics, adept at problem solving, often working in multi-disciplinary teams, and utilizing their skills and knowledge to enable them to create and refine products constantly.

In the case of Vietnam, the number of personnel involved in R&D is quite numerous, especially for a country at Vietnam's stage of industrial development.<sup>15</sup> However, unlike other industrialized countries, Vietnam's existing pool of scientists and engineers is structured in such a way that most of them (73 per cent) are employed by either the national centres for R&D, ministries, or government agencies. Only a very small fraction of them work in industrial enterprises. In addition, many of these scientists and engineers are often sixty years old or above, most of them having received their training and education in a different era under the Soviet-oriented learning system based on the technology of heavy industry and on state planning and control. As it takes several more years to build up a younger generation of scientists and engineers with the expertise in ICT, Vietnam has to temper its ambitions concerning ICT development over the medium term.

Inadequate reforms in educational policy as contrasted with the development process have created difficulties in ICT development over the past few years. An unchanged teaching curriculum and the employment of the old theoretical (lecture-based) teaching method are

the main factors that prevent school and university students from developing their creativity and innovative capability. Moreover, knowledge and skills for the application of ICT have not been satisfactorily introduced into the university curriculum. As a result, the fresh graduates produced in general do not have the skills that the market needs. Most graduates have to undertake additional training (either in IT or English language courses) to get a job that requires their level of training. The rest have to work in other sectors, many of which do not require a university degree:

Many IT companies in Vietnam have complained that the education provided by the universities does not equip IT graduates with enough skills. According to them, most of the university graduates in IT lack operational and communication skills, and the capability to work and cooperate in a team. More importantly, their levels of creativity and discipline are still limited. Consequently, as the recent survey by the Information Association in Ho Chin Minh City has pointed out, although the city currently has about 6,000 university graduates qualified in IT, only about 25 per cent of them are actually employed by software companies. (*Saigon Economic Times*, 3 August 2000)

To spearhead the development in ICT, Vietnam needs a large number of professionals who are directly involved in this sector. However, as discussed above, the fresh IT graduates still fall short in the skills that the market needs. Many IT companies have had to re-train their staff after recruiting them from the labour market, and the actual number of employed IT staff is smaller than the number that was trained. Looking at the software industry alone, by the year 1999 Vietnam had only 1,500 software personnel working in ninety-five software companies. This figure is obviously very small compared with the target set by the government - 25,000 software professionals by the year 2005.

*Organizational structure* is another important factor in the development of ICT. The R&D institutions in Vietnam should work closely with enterprises to keep abreast of changing needs in the business world. Business enterprises, on another hand, must create an environment that encourages creativity and innovation. In this way, organizational structure working in concert with *human resources* will help Vietnam in the generation of ICT products.

At present the R&D institutions in Vietnam tend to work in

isolation, and structured networks are few in number. There are about 300 R&D institutions specializing in various areas such as the natural sciences, social and cultural research, education, agriculture, engineering, economics, and so on. Most of these institutions are state-funded and they offer few opportunities for exchange and shared learning; the linkages between R&D institutions and the productive sector are very weak as well. For the most part, research continues to be "supply-driven" and bears little relation to the needs of business and industry. Although some centres and research institutions specializing in ICT services were established during the past few years,<sup>16</sup> no strong links exist between them and the production enterprises.

The Vietnamese enterprises, on the other hand, do not seem to be much concerned with R&D. Apart from the R&D centres in large state general corporations and some R&D divisions attached to FDI enterprises, most of the SMEs in Vietnam are not involved in R&D activities.<sup>17</sup>

At present, Vietnam has companies participating in hardware production, software production, and ICT services. In hardware production, equipment and parts are exported from countries in the region such as Singapore, Taiwan, and China, and appliances assembled in Vietnam. In 1999, Vietnamese hardware companies met 65 per cent of the domestic market demand for computers, and the percentage has continued to rise. The software industry in Vietnam has been primarily engaged in the provision of applied solutions, which is only a component of the total software production.<sup>18</sup> ICT services, however, are still lacking in Vietnam. ICT has also seen limited use in banking, the financial sector, and commerce, but seen from another perspective this makes them a huge potential market for the ICT industry.

The *Internet* and *e-commerce* are important areas to be developed in Vietnam. In this regard, there are some issues to be considered. First, despite the fact that by the end of 1999, Vietnam had about 75,000 Internet accounts, the bulk of these were owned by individuals (55 per cent), with 24 per cent owned by organizations, and only 21 per cent by businesses or enterprises. Second, the Internet service is characterized by the low quality of its service accompanied by high costs. Download times are much longer in Vietnam as compared with other countries.

This is because of the limited bandwidth capacity of the Vietnam Data-communication Company (VDC)<sup>19</sup> as well as government regulations that limit the provision of Internet services by other Internet service providers (ISPs).<sup>20</sup> Third, the charges for Internet access in Vietnam are relatively high. A recent study by the VDC in Ho Chi Minh City has found that the Vietnamese pays an average monthly charge of US\$20 for Internet access, out of an average per capita monthly income of US\$50 - or 40 per cent of monthly income.<sup>21</sup>

Presently, the expansion of Internet application by organizations and enterprises in Vietnam is very slow. So far, among 50,000 enterprises in Vietnam, only 600 have websites and 1,000 have Internet accounts. In the public sector only a few government agencies have set up websites, and these include the Ministry of Foreign Affairs, the Government Office, the Hanoi People's Committee, and the Ho Chi Minh City's People's Committee. In contrast, all the newspapers already have websites in Vietnamese and partially in English. There are many reasons for the situation being such in Vietnam. First, Vietnamese enterprises and organizations are unfamiliar with the use of the Internet, and are unaware of the benefits that it can bring. Second, existing regulations require that website information be vetted by an authorized department before a website can be launched on the Internet, and this has prolonged the administrative process of web site establishment. Third, the cost of website maintenance is relatively high. Currently, most government agencies have to seek external funds for setting up and maintaining their websites on the Internet.

As discussed earlier, an *institutional framework* is needed for accelerating the rate of investment in the ICT industry and the rate of ICT utilization by businesses. An institutional framework should provide an environment for ensuring due rewards, resolving disputes, and protecting against intellectual property rights violation. Moreover, there should be a competitive spirit for ICT stakeholders.

The decision to give priority to the development of the ICT industry in Vietnam was first mentioned in the Communist Party's Resolution No. 2 in 1996. This was specifically addressed again in the new Party Directive dated 17 October 2000. However, it takes time and considerable effort to implement policies to actualize this.

There are several challenges to consider. First, software services are classified into a product group that is highly taxed, and the imported hardware equipment/computers are subject to taxes as high as that for imported consumer goods. For the ICT industry, telecommunication services and the Internet are regarded as important components that support the development of the software industry. However, the cost charged by the VDC for renting out bandwidth is very high. Currently, ISPs in Vietnam pay a service charge that is four times higher than in the United States for an equivalent service. Similarly, the costs of international calls are two to three times higher than in other countries. Together with several restrictions over Internet use, these facts present significant constraints for ICT service development in Vietnam.

Second, although the government has established regulations concerning intellectual property rights, they are not strictly enforced. Widespread illegal copying has robbed many software companies of considerable revenue, and Vietnamese consumers do not seem to be aware of their responsibilities when they buy cheap, unauthorized copies of software programmes.

Third, Vietnam lacks a transparent and consistent legal framework for ICT development. At present, the Ministry of Science, Technology and Environment (MOSTE) and the Vietnam Posts and Telecommunications (VNPT) are jointly responsible for supervising the development and management of the ICT network infrastructure. The Ministry of Culture and Information is tasked with supervising information provided on the Internet, while the Ministry of Public Security is responsible for the security aspects of IT activities. This leads to a complicated regulatory framework for supervising the ICT industry and has slowed the process of ICT expansion in Vietnam. For example, many Internet services - such as Internet telephony, Internet faxing, and Internetbased video-conferencing - are restricted in Vietnam because of security reasons. And the strict screening of information that is made available on the Internet has led to longer download time.

In addition, to spread the use of e-commerce in Vietnam, appropriate regulations should be put in place to ensure the legal position of trade transactions through e-commerce. However, Vietnam's existing legal framework lacks provisions to address disputes in transactions arising

from e-commerce. According to current laws, only economic contracts with "fresh seals" are legally binding, which is why enterprises in Vietnam use their websites on the Internet mainly for the purpose of marketing their products and not for handling e-commerce.

Fourth, the absence of a competitive environment for the ICT industry has adverse impacts on the development of the ICT industry. For security reasons, private domestic and foreign investment in the telecommunications infrastructure is restricted in Vietnam. At present, the VNPT is the only company that has a telecommunications infrastructure and, through the VDC, it controls the vital gateways that allow Vietnam access to the World Wide Web. As such, the VDC is given the best conditions both in terms of technical facilities as well as accessibility to the telecommunications infrastructure. Other existing ISPs have to cope with disadvantages such as slower bandwidths as compared with the VDC, a limitation in the number of services they are able to provide, and, in many cases, a longer waiting time to clear bureaucratic red tape.

Another important factor for ICT development is resources, which have to be mobilized and invested in buildings, machines, equipment, transport, and communications. However, in the nature of ICT, it is the telecommunications infrastructure that ensures connectivity, networking, and economies of scale. Without it, the potentials of IT cannot be realized.

During the last five years, Vietnam had made great strides in investing in ICT-related industries to expand its ICT *resource base*. For example, of the estimated US\$220 million that was invested in this sector in 1999, 60 per cent was ploughed into infrastructure and only 40 per cent was put into the development of software and ICT services. However, the government's Resolution No. 7 (see Appendix Box A11.1), issued on 5 June 2000, has made it clear that priority should be given to the development of the software industry in Vietnam over the period 2000-2005, and has indicated an estimated budget of US\$120 million for investment into this area.

While the impacts of the above-mentioned measures on ICT development can only be seen several years later, it is clear that the current status of ICT infrastructure in Vietnam remains underdeveloped. In

addition, most of the investment in ICT infrastructure comes from government budget (90 per cent), with little participation from the private sector.

In summary, the analysis of the current status of the ICT industry of Vietnam yields the following picture:

- The ICT industry in Vietnam today is not ready for the creation or innovation of new ICT products. In fact, Vietnam has so far been importing hardware and software products and adapting them for its own use.
- Although Vietnam has actively introduced and spread the use of ICT products and services in the national management system and has produced a number of IT experts, the *scope* and dimension of ICT application is still very limited.
- The current lack of an adequate *pool* of IT professionals limits the process of accelerating ICT application and assimilation in various economic activities.
- The underdeveloped telecommunications infrastructure is one of the main factors that makes ICT services less competitive in terms of time and cost.
- The current institutional and legal framework does not provide favourable conditions for accessing and using ICT services, and does not create a competitive environment for the development of the ICT industry.
- The existing domestic market for ICT products and services is small. But a more developed Vietnam in the future holds promise of a huge potential market for ICT, which is necessary to accelerate the development of the ICT industry.

#### **4. Policy Implications for ICT Development in Vietnam**

Compared with the other transitional economies in Southeast Asia, there are several factors that give Vietnam an edge in the development of its ICT sector, namely:

- The education of the work-force is accelerating, and Vietnam is producing bright young students and specialists who possess relatively high mathematical capability.

- The government of Vietnam is strongly committed to ICT and the knowledge-based economy, and has taken the first important steps to increase the people's awareness of the role of ICT in development and to upgrade the infrastructure for ICT.
- With a population of 79 million people (ranked second largest among the ASEAN countries), Vietnam has a large potential market for ICT services.
- Many of the approximately 3 million overseas Vietnamese are experts in ICT who are working in developed countries such as the United States, Australia, and France. Many of these are willing to contribute their ICT expertise to their homeland.

These factors should lead to a rapid development in ICT in Vietnam over the next few years. What Vietnam needs to do, however, is to have *good and favourable policies for ICT growth*. In this regard, *a master plan for ICT development* in Vietnam is urgently needed. This is because a segmented and piecemeal approach towards ICT development *policy* would not allow Vietnam to derive the maximum benefits possible from a well-coordinated development plan. To illustrate, the technological upgrading of the information infrastructure would permit cheaper and faster information access, and in turn, it should attract investment, improve efficiency, and increase economic opportunities for Vietnam. These potential benefits will be greatly reduced, however, if the overall incentive regime for economic activity is hampered by high transaction costs. Benefits will also be reduced if the human resources produced by the educational system are incapable of responding to and creating their own opportunities via the new information infrastructure.

It is important to note that using a systematic approach does not mean that everything should or can be done at once. The sequencing of reforms and policies is entirely consistent with the systematic approach. For example, Vietnam can decide, for the medium term, to undertake policies for ICT diffusion and then, for the longer term, to take further steps for ICT development.

For medium-term prospects, several policies for ICT development have been proposed. First, policies to *develop human resources* are central to ICT development and the diffusion of its applications. Although the

government continues to play an important role in providing basic education and skills, private-sector participation in computer education and schools should also be encouraged to provide easy and economical access to ICT. For Vietnam, it is important to teach its people the basic sciences, technology, and English language to enable them to understand, adopt, and adapt ICT in sector-specific applications.

Second, the establishment of a *legal framework that is supportive of the ICT industry* is another policy that the government is expected to undertake. This includes fiscal incentives to encourage the business sector to accelerate the diffusion of ICT applications, policy measures to create a competitive environment for the ICT industry, and appropriate regulatory, supervisory, and monitoring systems for intellectual property rights. It is important to note that *market institutions and a legal framework* for the operation of ICT products and services markets should be formulated as soon as possible.

Third, there must be policies to enable the *telecommunications infrastructure* to grow as ICT cannot grow in the absence of a dynamic telecommunications sector. As this would require a huge investment of capital, the government should remove all restrictions on the development of the telecommunications industry as well as mobilize private resources from both private domestic and foreign investors. In this regard, foreign direct investment (in particular, investment by overseas Vietnamese) can be useful in bringing in the necessary technologies, along with financial resources.

Fourth, there must be measures to accelerate the assimilation and diffusion of ICT in the various economic sectors. This would help many industries to obtain the benefits of ICT, which in turn would lower their production costs and make their products more competitive internationally.

Fifth, as 78 per cent of Vietnamese people live in rural areas, the policy of ICT industry development should look into how it might expand the use and benefits of ICT to these rural areas. The experiences of countries such as China and India on introducing schemes for diffusion include concentrating on well-proven technologies and offering assistance to farmers in ICT training with subsequent technical support. Such measures are well worth looking into.

Finally, for longer-term prospects, ICT development needs further government policies. These include first, the need to support higher education in science and mathematics because the development of ICT can hardly take place without an adequate number of trained and qualified personnel in the sciences and mathematics. The country's education reform policy should address this. Second is the need to promote R&D. In this regard, the government's policy has to guide R&D by developing beneficial linkages between research institutions and industries, and by providing incentives for specific areas of R&D.

Apart from the above policy measures, international co-operation is most welcome to help Vietnam learn and exchange experiences and expertise in the development of the ICT industry. Experience has shown that official development assistance (ODA) and other forms of international assistance during the past few years have helped Vietnam improve its ICT infrastructure. In addition, discussions at various international seminars have made significant contributions towards increasing the awareness of Vietnamese officials and the government of the role of ICT and its impact on the world economy. In November 2000, the World Bank organized an International Conference on the Knowledge-Based Economy in Vietnam, where ICT was one of the main topics discussed. More of such activities in the future will give Vietnam opportunities to exchange lessons and experiences on ICT development with other countries.

## NOTES

This chapter was written in collaboration with Mrs Vu Xuan Nguyet Hong and Mrs Dinh Hien Minh of the Central Institute for Economic Management.

1. The G-8 consists of Canada, France, Germany, Italy, Japan, the United Kingdom, the United States (G-7) and, most recently, Russia.
2. This was adopted on 25 November 2000. More information on the e-ASEAN agreement can be obtained from the Task Force's official website (<http://www.easeantforg>).
3. The so-called CLMV transitional economies of ASEAN.
4. For a detailed elaboration of this theoretical framework, see the chapter by Wong and Singh in this volume.

5. This is corroborated by other chapters in this volume. See, in particular, the contribution by Wong and Singh, as well as the country studies presented by Toh (Singapore), Singh (Malaysia), and Montreevat (Thailand).
6. The figures were calculated with the average GNP per capita of Cambodia, Laos, and Vietnam (Myanmar was excluded due to lack of data), and utilized nominal values.
7. The HDI for Vietnam, and that of comparative ASEAN countries, are given in Appendix Figures A11.2 and A11.3.
8. Technological capabilities refer to firm-level as well as national technological capabilities. *Firm-level technological capabilities* consist of investment, production, innovation, and linkage capabilities. *National technological capabilities* are not simply the sum of thousands of individual firm-level capabilities. Despite individual characteristics, there is a common element of response of firms to the policy, market, and institutional framework.
9. Technological development refers to a successful transfer of technology, technological mastery, technological acquisition, or technological promotion. The term refers to a process of learning that can generally be viewed as comprising three main stages: selection/purchase, absorption, and diffusion.
10. It should be noted that anti-trust regulations can present a unique set of problems of their own, as evidenced by the recent Microsoft-Netscape case. However, in the context of developing countries, the removal of state-run monopolies in the telecommunications sector is generally regarded as an important step towards promoting equality and improving the level of ICT development in the country.
11. Here, ICT infrastructure is limited not only *physical* infrastructure (reflected in the first five indicators), but also *intangible* infrastructure such as the quality of the research environment (as reflected in the final indicator).
12. The specific case of Vietnam is examined in the second part of this chapter.
13. For instance, the Hoalac High-Technology Park in a northern province, the Quangtrung Software Park in the south, and a new high-technology park in Danang.
14. *Asian Development Outlook 2000 Update* (ADB 2000, p. 66).
15. As indicated in Table 11.2, the number of scientists and engineers involved in R&D per million persons in Vietnam is even higher than that in Thailand and the Philippines, which are countries that are in a more advanced stage up the development ladder.
16. Most of these belong to the ministries or the state's general corporations.
17. However, this may be a matter of constraint rather than choice, as R&D activities are usually engaged in only by large organizations that can afford the long incubation period between investment and payoff.

18. The software industry can be divided into three sub-sectors: systematic software development, provision of instruments for applied development, and provision of applied solutions. Production in the software industry made a dramatic increase in 2000, with an output of US\$50 million, as compared with US\$21million in 1999.
19. The VDC is the sole backbone network provider in Vietnam, and is a state-owned company managed by the YNPT.
20. Government regulation allows ISPs to provide only three main Internet services: email, website hosting, and file transfer.
21. Contrast this with Australia, where the ratio is 1.25 per cent, and the United States, where it is 1.2 per cent.

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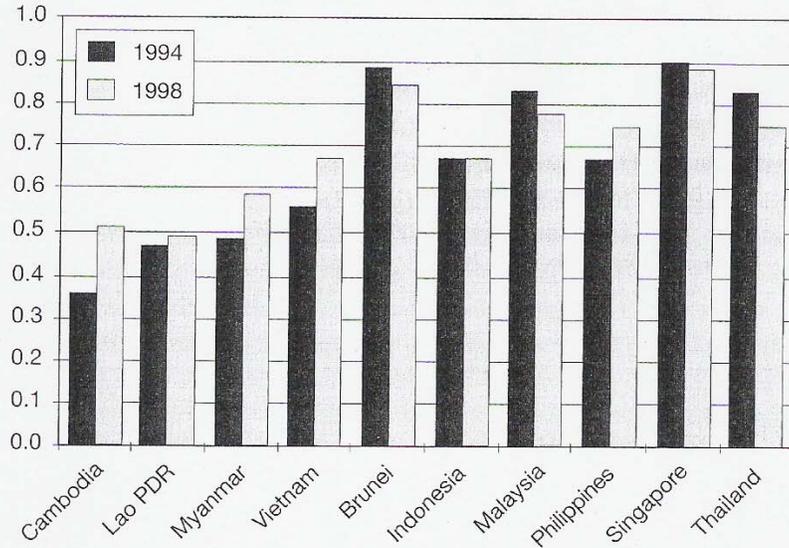
**Appendix Box A 11.1**  
**Vietnamese Government Resolution No. 7 Issued on 5 June 2000**

In June 2000, the Vietnamese government promulgated the Resolution on "software industry development for the period 2000-2005". This Resolution set a range of objectives for software industry development in the next five years, including:

1. To take advantage of the knowledge potential of the Vietnamese people, especially the younger generation in developing a software industry with a high growth rate, actively contributing to the modernization process and the development of economic sectors.
2. To achieve an export value of US\$500 million for the software industry by the year 2005, through measures such as focusing on exporting software experts, processing software products, providing services for foreign companies, and substituting imported software products for domestic ones.

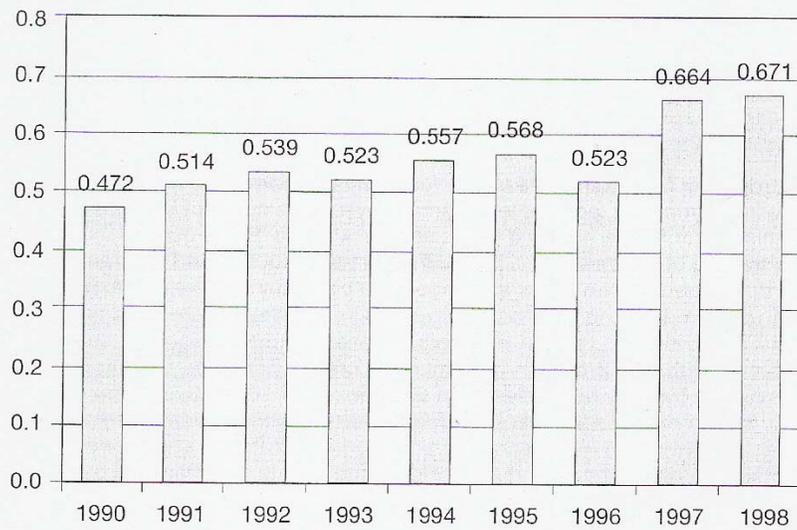
In order to achieve the above objectives, several policies have been proposed. These include: first, government plans to invest an amount of US\$120 million in this sector for the next five years; second, the promotion of education and the training of experts specialized in the software industry and programming; third, the introduction of tax exemptions on company income and export for software products; fourth, the provision of the best favourable conditions for both domestic and foreign investors to invest in developing the software industry; fifth, the provision of favourable credit conditions for enterprises involved in the software industry. In addition, other supportive measures for this industry have also been considered, such as the establishment of an international-standard telecommunication infrastructure in the two high technology parks, the amendment of legal documents on intellectual property rights, and more active enforcement of regulations.

Appendix Figure A11.2  
Human Development Index: ASEAN Countries



Source: UNDP, *Human Development Report* (various years).

Appendix Figure A11.3  
Human Development Index: Vietnam



Source: UNDP, *Human Development Report* (various years).

