Struggling Towards a Knowledge-based Society

By

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Introduction

Thailand has always been an agricultural-based economy. Even with the introduction of manufacturing industries into the country in the past three decades, agriculture is still a good and stable part of the economy. During the big economic growth (1980-1997), tremendous investments were placed for many physical infrastructure (transportation networks) and information and communication technology (ICT). Due to the unregulated speed of growth in the period, Thailand became one large consumer market for ICT applications.

In this report, an analysis of IT applications in Thailand is presented. The emphasis was given to the need to build up Thailand's National Information Infrastructure and key issues in bringing the country into a Knowledge-based society.

Vital Statistics of Thailand

Socio-Economic Indicators

Size		513	sq. km.[1]
Population (June 2000)		62.6	million [2]
Population Growth (June 2000)		1.5	%[2]
Population Density		120	persons per sq. km.
Gross Domestic Product Value		134.4	billion USD[1]
GDP growth rate (2000)		5.2	percents[2]
GNP per capita (2000)		1,949	USD[2]
Export 12 months (2000)		61.0	billion USD[2]
Current account balance (2000)		11.9	billion USD[2]
Life expectancy (1998)	*males*	66	years[1]
	females	72	years[1]
Adult literacy rate	*males*	3	%[1]
(above 15 years old)	*females*	7	%[1]
Infant mortality rate		26	%[2]
People per doctor		4,361	persons[2]
Government spending on education		4.4	% of GDP (1999)

Information Society Indicators (March 2000)

Available fixed line telephones	12.30	per 100 population (7.66 million)[3]
Connected fixed line telephones	8.41	per 100 population (5.22 million)[3]
Mobile phones in used	4.10	per 100 population (2.56 million)
Personal Cordless Telephones in use	0.43	per 100 population (0.27 million)
Total phone lines available	16.83	per 100 population (10.49 million)
Total phone lines in use	12.94	per 100 population (8.05 million)
Cost of a local phone call	0.08	USD per call, no time limit
Cost of Internet access (typical)	1.0	USD per hour
Internet users (February 1000)	1.6	per 100 population (1.0 million users) [4]
International bandwidth	203.75	Mbps[4] (June 2000)
Domestic exchange bandwidth	550	Mbps[4] (June 2000)
Computers connected to the Internet (hosts registered with IP numbers)	1.16	hosts per 1,000 population (72,000)[4]
Universities with Internet access		

(June 2000)	100	% of all universities
Schools with Internet access (June 2000)		
Secondary schools	21.1	% of all secondary schools (1,237 online)
Primary schools	1.2	% of all primary schools (368 online)
Number of secondary domains	3,846	names under ".th" country domain
commercial domains (.co.th)	82.4	% of all names (3,179 names)
academic domains (.ac.th)	7.9	% of all names (305 names)
Number of government web sites	177	government agencies
Total revenue of companies in Thailand which are connected to the Internet (1999)	22	% of GDP in 1999 (1.15 trillion baht)[5]
Provinces with local ISP access	100	% of all provinces (76 provinces)[6]

Notes:
[1] World Development Report, 1999/2000
[2] Asia Week, Vol 26, No. 25 (June 30, 2000)
[3] Telephone Organization of Thailand (www.tot.or.th)
[4] NECTEC Internet Information Research Center (www.nectec.or.th/internet/)
[5] Internet Thailand Company Limited
[6] Thailand Internet Service Provider Club

NECTEC

The National Electronics and Computer Technology Center (NECTEC) is a quasi-government organization under the National Science and Technology Development Agency (NSTDA), Ministry of Science, Technology and Environment. NECTEC was set up by the Thai government to perform research and developments in electronics, computer, telecommunications and information. It also provides research funding to universities in order to develop manpower and intellectual properties. Since 1995, NECTEC was assigned the secretariat duty for the National Information Technology Committee, the policy body for national IT development.

Applications of IT during 1987-1997

The financial sector was known as the large users of IT due to the relaxed regulation for the free flow of fundings into and out of Thailand. Driven by the vast difference between the domestic interest rate (above 18% for domestic loan interests) and the international rates, excessive borrowings were taken into the country, much of which were for ICT.

One notable example of these projects is the expansion of telephone networks by fixed line operators (Telephone Organization of Thailand, TelecomAsia and TT&T) and mobile phone operators (AIS, TAC). The other example is on the financial institutions and stock brokers which invested a vast sum of money to build the banking network and stock trading network.

Use of IT in education and health care were of smaller scale compared with the financial and telecommunication sectors, but they were also increased during the growth period. IT in manufacturing processes was hastily imported with small or negligible efforts on technology transfer process. All sectors seemed to care a lot less on building up local talents in IT to take care of the technologies once they were in place. Business decisions were made without risk analysis against the sudden shortage of funding or sudden lost of market.

Throughout the growth period, the disparity between the haves and the have-nots persisted. The poverty index of the country (access to roads, clean water, better healthcare, etc) were reduced at a rate much slower than the marketing intensity for luxury goods which make the people in the rural areas spent their valuable savings on non-productive goods.

The Long Road for Economic Recovery

The struggle for economic recovery has been a lengthy one and there are still a lot of work ahead of us in Thailand. The Stock Exchange of Thailand's SET index still requires a lot of stimulation and new stocks to bring back investors.

The IT market in the country during 1997 and 2000, records a big set back (-39%) in 1998, and a rebound of about 35% in 1999 (see Table 1). The immediate growth was partly due to the Y2K conversion of many businesses. According to Manoo Ordeedolchest, the honorary president of the Association of Thai Computer Industry (ATCI), the growth for 2000 is at least 15%, but this can be as high as 30% due to e-commerce. This would make the 2000 market value a rebound to the value of 1997 in Baht terms. In US currency, the figures are approximately US$ 1,672 million (in 1997) and US$ 1,050 million (in 2000).

Table 1. Thailand IT Market Growth Profile (in million baht)

Category	**1997**		**1998**		**1999**		**2000E**	
1. Systems	4,093	+34%	2,465	-40%	2,704	+10%	2,612	-3%
2. PC and workstations	23,503	+9%	11,132	-53%	17,406	+56%	20,573	+19%
3. Packaged Software	6,861	+22%	5,126	-25%	6,289	+23%	7,744	+23%
4. Services	8,200	+24%	7,229	-12%	8,738	+21%	9,384	+7%
TOTAL	**42,646**	+15.6%	**25,953**	-39%	**35,137**	+35%	**40,413**	+15%

Source: ATCI/ATSI/CAT-VG 1999 Note: 1USD = 39 Baht

The PC and peripherals market is the major share of IT market in Thailand (see Table 2). The growth of 17.7% is anticipated for the year 2000 (19,212 million baht in 2000 against 16,323 million baht in 1999). The high growth of Internet due to lowered access fees and more competition may drive the PC market in 2000 closing higher than what is forecast by ATCI.

Table 2. PC Peripherals Market in 1997-2000 (in units and values in million baht)

Category	**1997**		**1998**		**1999**		**2000E**	
	units	value	units	value	units	values	units	values
1. PC	289,000	13,988	174,000	7,522	300,600	12,373	363,950	14,700
2. Monitor	101,000	708	70,000	415	160,000	919	192,000	1,080
3. Printers	304,500	4,680	129,000	1,630	189,600	1,757	225,520	1,960
4. Data Storage	222,000	1,941	700,000	508	160,000	848	192,000	960
4. Services	135,000	349.7	81,300	195.4	156,600	425.5	193,400	512
TOTAL		**21,667**		**10,270**		**16,323**		**19,212**

Source: ATCI/ATSI/CAT-VG 1999 Note: 1USD = 39 Baht

Year 2000 Outlook

Since 1997, the growth of the International Bandwidth of Thailand was found to be against all other economic indicators: there was a small growth of the bandwidth in 1998, followed by a steady growth in Q4 of 1998. A Tremendous growth took place in Q3 of 1999, when a big record growth of 67.6%) was recorded.

Table 3. International Bandwidth of the Internet in Thailand

Ending Period	**Total International Bandwidth (Mbps)**	**Growth rate by quarter**
97 Q4	32.75	
98 Q1	34.25	4.6%
98 Q2	35.38	3.3%
98 Q3	36.38	2.8%
98 Q4	49.50	36.1%
99 Q1	58.88	18.9%
99 Q2	65.50	11.3%
99 Q3	109.88	67.6%
99 Q4	153.25	39.5%
00 Q1	203.75	33.0%

Source: NECTEC (www.nectec.or.th/internet)

In the year 2000, IT applications in Thailand shifted towards Electronic Commerce on the Internet. More than three commercial banks started Internet Banking Services. SET and its brokers started online trading through the Internet. Seven-Eleven convenient store chain now started its smart card project as e-purse application.

We may also observe that software business starts to pick up in two main areas. First is the heavy weight ERP software such as SAP and Oracle Applications, Second is middleware software such as databases, security such as firewall, and Internet related software. Network equipment market is expected to be up probably by more than 60-70%.

Building the NII

Starting in 1995, Thailand's IT Year, several initiatives were taken by NECTEC to address the national issues on IT development. Despite the limited budget and lack of consistency in government's local funding, several milestones have been achieved. For full report, please refer to the Bangkok Post Special Issue on Database, 11th Anniversary (June 21, 2000).

The areas developed for part of NII were grouped into three areas, according to the IT-2000 national plan announced by the government around 1996. These areas are: telecommunications infrastructure, human-resource development and good governance.

There are two major programs which address the digital divide problem. Both programs started in 1995:

- **IT Project of Her Royal Highness Princess Sirindhorn**: a special project to provide initial computer literacy to poor schools in the rural areas, IT for the disabled persons. The project also builds up a vast amount of knowledge contents on the Web in Thai language, including a mass digital archive on Thai Culture. (see Appendix A1).

- **SchoolNet Thailand**: a project to provide Internet connection to schools everywhere in Thailand. It aimed at completing 5,000 schools connection by the year 2000, in conjunction with content development for kids and teacher training. A promotion of Linux Operating system was also a successful case in SchoolNet. his project is a multi-agency project led by NECTEC. Cooperating agencies are NECTEC/NSTDA Ministry of Science, Technology and Environment, Ministry of Education, Telephone Organization of Thailand, Communications Authority of Thailand, and the private sector. (See Appendix A2)

To address the good governance issue, the following projects have been initiated:

- **Government Information Technology Services (GITS):** a project to provide high-speed secured communication network for all government agencies nationwide: Government Information Network (GINet). This project is intended to be the core of e-Government and the backbone for all secured messaging (using Public Key Infrastructure, or PKI) for the government. (See Appendix A3).

- **Government Chief Information Officer (CIO) Program**: a program to make sure that IT applications in the government can be improved and made more economical through sharing of resources through networking. The Government CIO program, in tandem with the GITS project, is a promising effort to create a unified GINet. (See Appendix A4).

The following projects have been initiated to address the problems of professional human resource development in the software industry and business:

- **Software Park Thailand**: a project to assist local software developer to access low-cost international market access, software quality assurance through the use of CMM (Capacity Maturity Model) developed by the Carnegie-Mellon University. World-class software companies also invested in Software Park Thailand in order to provide zero-cost access to world-class software tools running on high-performance computers. (See Appendix A5).

- **E-Commerce Initiatives**: A series of activities to create awareness for Thai business communities to get ready for the new opportunities. E-Commerce Resource Center was set up in Bangkok to help this happening. (See Appendix A6)

Equally important is the issue of legal recognition of electronic transactions, electronic signatures, computer crimes, etc.:

- **IT-Law Development**: a crucial infrastructure to build up trust and confidence on E-Commerce for Thailand. Six important laws are being drafted, with two of them are now entering the parliament (The Electronic Transaction Bill and the Electronic Signature Bill). One of the laws: The Universal Access Law, is a direct effort to provide equal access to information to the whole of Thai society. (See Appendix A7). Two of the laws are addressing public protection: the Computer Crime Law and the Data Protection Law. On financial transactions, the Electronic Funds Transfer Law is being drafted.

Issues on the IT Applications

There are notable issues which can be observed in IT Applications in a developing country like Thailand. There are several roadblocks ahead before a country can be a knowledge-based society.

1. We are still in need for basic telephone service for the rest of the population which is spread in the rural area. The service should be simple and low cost. There is a good possibility in Thailand that wireless local loop technology can be used to overcome the high cost of cabling system in the sparsely populated rural area. There is no problem in telecommunication services in urban areas in Thailand.
2. The cost of personal computers is still very expensive and is out of date very quickly. It is therefore very difficult to wire up thousands of schools and install millions of computers for developing country. Moreover, it is obvious that introducing computers without considering a proper content provisioning and teachers' training can result in a big waste of financial resource. There is a need to make computers easier to use and consume less electrical power. An innovative "information applicance" approach, together with the OpenSource movement is a promising solution for lowering the investment cost.
3. A strong investment in creating useful contents for teachers and students in the native language is required. This should go in parallel with making students more fluent in English, the language of the Internet of today.
4. Teacher training is a must. Without re-orientation the teachers, or direct penetration to the Teacher Training Colleges, it is difficult to turn the teachers into good coaches who will guide students to find useful information.
5. Upon introducing new IT laws, a lot of effort is required to give the society an understanding of the legal implications of many online activities. Moreover, invisible risks are not known by the users at large. This is certainly a worldwide symptom that we will see more of the problems like virus and computer crimes.

6. Use of the Internet for Education is probably the key for utilizing the worldwide knowledge for development. IT should be used for enhancing education everywhere in the world in order to close the digital divide.

Other Special Recommendations

The digital divide problem will always be there if

- there many languages of the cannot be processed and stored by computers; or
- the personal computers with a decent set of software are still very expensive; or
- the the cost of bandwidth is still high in all parts of the world.

Three concrete recommendations are thereby recommended to the organizer of the symposium, with the hope that they are conveyed to the G8 leaders as well as funded by the multilateral organizations such as the World Bank, UNDP, OECD, EU, ASEAN or IDRC.

These recommendations are:

1. Funding for the development of a graphical user interface operating system and typical office application software (word processor, spread sheet calculator, presentation). Linux and OpenSource movements have been a good example of this world-class effort. However, the movements are made by volunteers and not ever funded any of the world-class multilateral organizations. The lower income countries can hardly afford to pay close to USD 600 for a commercial OS and office application for use with a USD 500 machine. Funding of this kind of project is likely to be smaller than USD50 million for the next 5 years.

2. Funding for urgent character coding standards for minority languages such as Myanmar, Mongolian, Laos, Lanna, Tai Yai, Tai Dum, Tai Ahom. There are probably many other languages in other continents which are not on the ISO-10646 or Unicode standards. The effort should cost less than USD2 million for 3 years

3. The G8 leaders should consider fixing the real Digital Divide of bandwidth financing. At present, every country is paying for the whole cost of building their Internet "bridges" (international leased circuits) across the Pacific and the Atlantic to North America. The "bridges" permits Internet users in North America to use freely. Traffic of North American users accessing information elsewhere are therefore fully subsidized by other countries! Without the effort to create a fair way to handle the Internet financing, the cost of using Internet everywhere cannot be as low as in North America.

Appendix

A1. IT Project of HRH Princess Maha Chakri Sirindhorn

While many of the IT initiatives aim at increasing the use of IT for economic competitiveness, the IT Project under the initiatives of HRH Princess Maha Chakri Sirindhorn emphasizes on utilizing IT to improve education, quality-of-life and to enhance opportunity for the under-privileges.

Five main programs, i.e., IT for Education, IT for the Disabled Persons, IT for the Sick Children, IT for Cultural Information Dissemination, and Computer Teaching for In-Mates, have been carried out through coordination between NECTEC (secretariat of the Project), and relevant agencies, such as Ministry of Education (Department of General Education, Department of Non-Formal Education, etc.), Ministry of Interior (Office of the corrections).

A significant spin-off from activities concerning the disabled persons is the official establishment of R&D Center on Assistive Technology, and the Service Center on Assistive Technology for People with Disabilities. Both initiatives have been approved by the NITC and is being submitted for the Cabinet for approval.

A2. SchoolNet Thailand Project

As one of the three main pillars of the IT-2000 plan, education is treated as the most important long-term investment for the nation. It is important to boost all schools to leap-frog their education technology with the Internet in order to tap the wealth of global knowledge available on the Internet. Without NECTEC's SchoolNet Thailand program, it is hard to say how 1,500 schools can be connected to the Internet in such a short time. The magic of this fast development was partly due to the existence of a wonderful information network we started in 1996 as the Golden Jubilee Network (http://goldenjubilee.or.th) which owns a comprehensive nationwide access service.

The Golden Jubilee Network, or Kanchanapisek Network in Thai, is another initiative of Her Royal Highness Princess Maha Chakri Sirindhorn. It is a place where NECTEC hosts mass of information in Thai language about His Majesty the King and his development projects. We ran the project in celebration of His Majesty's fiftieth years of accession to the throne in 1996.

With the royal permission and the support from TOT and CAT (Communications Authority of Thailand), SchoolNet was made accessible from anywhere in the country without incurring the long-distance call charge. In addition, Internet access to SchoolNet was provided free of charge to 1,500 schools everywhere. As of May 2000, the project managed to get 1,605 schools online and more than 500 of them have web presence. Some of them became a very well-known and very popular websites. So does the project's website: www.school.net.th.

In October 1999, the government of Thailand approved a massive expansion of SchoolNet to cover 5,000 schools. This means that all secondary schools (grades 6 to 12) will be getting free Internet access, and so would be more than a thousand schools at the primary level and kindergarten. This ambitious project is now under implementation by NECTEC/NSTDA.

Network interconnection for schools is only part of a story. We need to invest more on contents and teachers. For many schools in the rural area, we do not even think of a computer because kids do not have enough food to eat and have no uniform to wear. Therefore other forms of assistance are provided through other projects.

SchoolNet content creation and promotion campaign

During the course of developing SchoolNet Thailand, it was found that major hindrance for schools in getting the benefit from the global knowledge is due to four factors. These are: the (lack of) computers, (lack of) access to the Internet, (lack of) relevant contents for schools in Thai language and the (lack of computer-fluent) teachers. While the Ministry of Education is solely responsible for the first factor, i.e., it has to equip the classrooms with computers and courseware, the other three factors are hardly provided by the ministry.

SchoolNet project identified these problems since 1998. The Internet access was quickly solved by the royal permission to use the Golden Jubilee Network to access SchoolNet. Almost all of SchoolNet budget at NECTEC, being very small, was directed to the contents creation program and teachers' training.

As from January 2000, a digital library for SchoolNet was successfully created. The digital library consists of more than 1,000 articles in Thai language which are classified and searchable from the Internet. The articles were collected and prepared by schoolteachers who joined in the course "Building Digital Library for SchoolNet" set up by Kasetsart University and the Institute for the Promotion of Teaching Science and Technology.

Apart from the digital library, several schools developed their web sites with useful information and excellent educational materials. NECTEC also promotes international cooperation projects such as the GLOBE program, ThinkQuest, and AT&T Virtual Classroom.

For teachers' training, NECTEC provided pilot courses and teaching materials for Rajabhat Institute, which, in turn, will teach schoolteachers in SchoolNet project. In addition to this normal Internet course, NECTEC also provides a special course on Linux-SIS, our own distribution of Linux for use as School Internet Server. SIS is very popular in Thailand due to its excellent documentation in Thai language, simple to install CD-ROM and web-based server management without the need to know UNIX commands. SIS training courses are always in constant demand from schools looking for reliable Internet server with the lowest cost.

A3. Government Information Network (GINet)

Good governance and serving its people would be the motto for modern Thai government services. Our ultimate goal is e-service to Thai citizen, and our immediate problem to be solved is to make sure that all government agencies are armed with good equipment, communication network and capable staff.

Year 2000 is the real beginning of the Government Information Network Service. As from April, the network is now available in in 20 provinces. A few government agencies with provincial branches have already contracted the service organization, Government Information Technology Service (GITS) Office, to handle their data traffic between Bangkok and their branches. After this test period of about six months, GITS will be a real production service.

The main network service is typically a type of one large-bandwidth link between the customer's headquarters (i.e. government agencies in Bangkok) and their multiple branches in Bangkok as well as in other provinces. Branch offices are connected to GITS points of presence (POP) by dial-up circuits. A virtual private network (VPN) value-added-service is provided for all users.

The initial bandwidth of the backbone of the network is 128kbps to every provincial POP, with immediate upgrade to E1 (2Mbps) wherever needed. The ultimate backbone speed of the project was planned to be STM-1 (155 Mbps) or STM-4 (622 Mbps).

In addition to the network connection service, GITS has initiated many other services for its customers such as daily news clipping, government directory service, and secure electronic mail (using digital ID), certification authority (CA) and cooperate with a partner. Through secure email, GITS demonstrates the importance of digital signature and PKI. A pilot CA has been set up to support the use of digital signature and made available to all GITS staff members and staff in the customer's organization.

A4. Government CIO Program

The decision of the government eighteen months ago to appoint all ministries and departments one Chief Information Office (CIO) per agency begin to show their effectiveness. Initially, many CIO's have diverse background and IT competency. Some of them are even shy for using IT. However, these senior officers seem to be good at their management work which needs some IT literacy program to make them more effective.

NECTEC, in cooperation with the Office of the Civil Service Commission (OCSC), has successfully trained nearly 200 Government CIO in 1999 in six two-week training courses. Most CIO's are now comfortable with IT.

Furthermore, a move was made to promote greater use of IT in the public sector with support from highest government executives. The cabinet, early this year, has approved the project to develop IT vision for high-ranking government officials, which proposed a mandatory half-day training for Chief Executive Officers (CEO's), i.e., the Permanent Secretary and the Director General.

Presently, a curriculum for CEO has been drawn up by NECTEC and OCSC. A series of training classes for CEOs, with approximately 30-40 attendants per class, should be started by August this year.

Also in the pipeline is the study to develop guidelines and standards for public information system, which will help

the government operate more effectively and efficiently. More specifically, the system and standards will enable each government agency can fetch the most up to date data records from other government agencies via the government information network. This concept enables sharing and exchange of information among government agencies, and thus make a seamless flow of public services possible. Through this "data consistency" scheme, Thai government will be ready for e-services to its citizen within two years or shorter for many agencies.

A5. Software Park

A major restructuring in the software industry in Thailand took place for the most of 1999 through the most successful project by Thai government, Software Park Thailand http://www.swpark.or.th). Initiated by NECTEC/NITC and supported by the Board of investment, the Software Park is the first and unique infrastructure Thailand ever build for this new industry.

Starting with a simple concept of common facility in the Software Park building, local software developers in Thailand can enjoy professional support for international marketing, a one-stop meeting point for potential customers both locally and from abroad, and high-speed networking. In addition, world leading companies like Intel, Informix, IBM etc. have invested in R&D infrastructure for local software companies to use at low or no cost. With the unified stream of supply for local talents, many multinational companies are now moving to Thailand to set up their development centers in Software Park.

In order to response to the need for high and consistent standard in software development, Software Park is also sponsoring a series of courses on Capacity Maturity Model (CMM) with a target that Thai software companies will attain CMM at least at level 2 as soon as possible.

Other supports from Software Park are in the form of the annual Software Fair, jointly organized with the Association of Thai Software Industry (ATSI); as well as some facilitation to join international software events such as COMDEX or CeBit.

A directory of Thai software directory is published annually by Software Park. The book gives a comprehensive view of the inventory of local talents, products, expertise in software.

A6. IT Law Development

Thailand determined to legislate six new laws to embrace information technology since December 1998. The cabinet then appointed NECTEC, being the secretariat office of the NITC, to coordinate and manage the drafting process. Prominent legal experts were invited to chair the six drafting committees, in which a group of NECTEC staff served as the technological experts and as secretariat. The laws are required in order to make sure that we will not be left behind in the old economy while the whole global economy are electronically connected.

On March 14, 2000, the cabinet approved the Electronic Transactions Bill and the Electronic Signature Bill. As of May, 2000 the Council of State of Thailand is now scrutinizing the bills for submission to the Parliament. After Parliament approval and His Majesty the King's signature, they will become Acts.

The two laws have been identified as the most significant legal infrastructure, which will expedite the development of e-business in Thailand. While many companies already moved ahead for e-business, the more conservative ones still think of the risks involved with the adoption of electronic data records instead of original paper documents.

Electronic Transactions Act defines the legal status of electronic records as being equal to paper documents, if they are properly handled. The Act also defines the scope of legal recognition of transmission and reception processes for electronic data records; time and place of occurrences of such transmission.

Electronic Signature Act defines the electronic equivalence of signature as a proof to identity of the signing party (i.e., authentication) and that the signer approves the content that is being signed. The law is neutral to the choice of technology used for electronic signature. It recognizes the well established trusted third-party system of *Certification Authority* (CA) and *public-key infrastructure* (PKI) based on encryption technology. At the same time, it also gives a freedom of choices for business parties to choose their own kind of electronic signature.

Of no less significant, drafting of the Universal Access Act (Bylaw of the Constitution Article 78) should be completed by September this year.

Other drafts in the pipeline are the Computer Crime Act, the Electronic Funds Transfer Act, and the Data Protection Act, which will be coming out by early next year. These laws should lay down sufficient legal framework for Thailand to enter the new economy with more confidence.

A7. Electronic Commerce Initiatives

The Electronic Commerce Resource Center was set up by the cabinet resolution in December 1998 as a unit within NECTEC/NSTDA. The ECRC has worked with experts to draft the *Electronic Commerce Policy Framework*. The framework outlines strategies and measures that Thailand should adopt to promote e-commerce as a tool to compete and survive in the new economy. This has gone through several public hearings, both in Bangkok and in all regions of Thailand.

The revised draft framework is now ready to be submitted to the *E-Commerce Policy Task Force,* a national committee chaired by the Deputy Prime Minister Dr. Trairong Suwankiri. The policy framework will subsequently be sent to the Cabinet, for approval and execution.

As parts of its mandates, ECRC prepares human resources for the business, industry and SMEs. ECRC has organized several training courses through its close alliances with many institutes and organizations. A few strategic industries that ECRC has placed high priority on are tourism, agriculture, and local handicrafts. These sectors are targeted as the most feasible for boosting their production, business process and markets if they join the electronic commerce "bandwagon" environment created by several supporting infrastructures.

In order to create the solid supporting infrastructure for Thailand, NECTEC started hosting data exchanges among all local ISPs via a multi-client research program called the "Internet Information Research Exchange" or IIRX (formerly known as the Public Internet Exchange). IIR program provides an up-to-date report on the status of Internet in Thailand.

In June 2000, IIRX has more than 550 Mbps of total bandwidth to all Internet service providers, academic hubs and other data exchange in Thailand. It circulates more than 230 gigabytes of information transfer in each day, and the volume is increasing. With the availability of fiber backbone connections to all telecommunications provider in Thailand, IIRX is the most suitable location for ISPs to wire up their broadband connection in order to place all servers closer to the backbone of the Internet in Thailand.

In fact, all telecommunications provider (fixed line and mobile) have installed their fiber optic infrastructure throughout Bangkok and Thailand, with multi-core fiber connection to the building in which where NECTEC runs

IIR project. To our last observation, the overlaid fiber network within Bangkok alone is probably five times that of the project Singapore-ONE. Such broadband connectivity to the central exchange like IIRX will be a natural development as many providers are starting ADSL and cable-modem services.

A critical e-commerce infrastructure project has been carried out by NECTEC's sister organization -- Internet Thailand Company, the first and largest ISP in the country (40% market share measured by actual traffic volume and by network size).

Instead of running its own e-commerce company as with many other ISPs, Internet Thailand positions its e-commerce effort as a stepping stone for Thai businesses to move forward on the e-commerce arena. Such an effort provides a unique combination of low cost and risk-free infrastructure service for bandwidth, secure payment, logistics, insurance and hardware/software platform for those businesses. The approach is aimed at preparing Thai businesses for the new commerce paradigm at the lowest business risks and investment.

As an ISP who provides connectivity for businesses with a combined revenue of one trillion baht (US$26 billion), Internet Thailand started a neutral yet highly diverse portal site called THAI-DOT-COM, http://www.thai.com/, with free commerce hosting provision to all business partners (merchants, banks, application service providers).

A number of commercial banks have already connected and begun automated secure payment services and a lot more banks are being tested in the pipeline.

With good brand, excellent connectivity, a diversity of products and services offered, a wide variety of secured payment options, and full operations under ECRC e-commerce legal framework, THAI.COM will be able to act as a very low cost, low risk e-commerce infrastructure for the local businesses. For this very reason, several application service providers offering outsourcing services are beginning to appear under the collective brand THAI.COM for their greater exposure to a matured e-commerce community.

Another infrastructure which NECTEC Software and Language Science Laboratory is working on is the "machine translation service". Through a long-term research, a preliminary machine translation service web site is being developed to help people reading English web sites in Thai language (and vice versa in the future). This service will basically help Thai people who are not very good at English to access information provided only in the English language.

In addition, a Thai-made word processor called "*KhianThai* 2000" will be released in June 2000 to allow people to edit texts written in Thai/English language easily with an integrated dictionary (English-Thai and Thai-English) to help them read and learn English faster. The service is expected to help the Internet users in general, which is also a part of E-Commerce.

Since June 1999, NECTEC launched the "Web-13" automated Telephone Directory Service at the web site http://phonebook.thai.net. The service is a collaboration between NECTEC and the Telephone Organization of Thailand. At this web site, any Internet user can easily search for telephone numbers in Thailand instantly. In June 2000, NECTEC launched "Parsit", a quick-look English-to-Thai automatic translation service on the web. This is a form of infrastructure which will enable many Thais to access English websites easily. The URL of the service is at http://www.nectec.or.th/services.