

Thailand

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.th

Overview

Thailand is situated in the centre of Southeast Asia. Its current national population is about 61 million in a total area of 513,115 square kilometres. Like many other countries in Asia, Thailand was affected by the economic crisis that began in 1997. Nevertheless, its economy has been recovering steadily in recent years.

GDP growth rates during 2001–2002 indicated considerable expansion. GDP grew by 5.1 percent in the second quarter of 2002, compared to 3.9 percent in the previous quarter. The growth experienced during the first half of 2002 was 4.5 percent, compared to 1.8 percent in 2001.

On the production side, growth was mainly contributed by the non-agricultural sector, which grew by 5.4 percent during the second quarter of 2002, compared to 2 percent in the agricultural sector. On the demand side, both private consumption expenditure and investment were strong contributors to domestic demand. Net exports expanded in volume, though not in value owing to lower export prices and an appreciation of the national currency, the baht. Imports also increased, particularly of capital and material goods.

In recent decades, Thailand's development strategy has provided a strong focus on education and knowledge building through human development. ICTs play a big role in this strategy. ICTs are considered as the major infrastructure for improving the quality of access and the diffusion of information to the citizens at large. Though many indicators, including international Internet bandwidth growth, reveal a considerable increase in the overall utilisation of ICTs in the country, the problem of the digital divide between the Bangkok metropolitan areas and the rest of the country is quite evident. Household computer ownership and Internet user profile indices confirm the divide.

It is obvious that in order for Thailand to become a knowledge-based economy, as described in the current national ICT policy framework ICT 2010, the issue of the digital divide must be tackled.

Content

Thailand has six free national television channels – Channels 3, 5, 7, 9, 11 and ITV – and numerous radio stations. Libraries are distributed across the country.

The country code top-level domain of Thailand is “.th”. As of September 2002, there were 10,504 domain names registered under “.th”. According to the Thai Network Information Centre, the number of domain names registered under each of the sub categories of “.th” in that month was as follows: ac.th (788), co.th (7,839), go.th (245), in.th (1,128), mi.th (12), net.th (27), or.th (465).

The popularity of co.th among Thai individuals and business owners is unmistakable. It is believed that quite a large number of Thai-owned websites are also registered under the US domain “.com”. Unfortunately, the exact number is unknown.

Web content research conducted periodically by Kasetsart University revealed that, as of November 2001, among the 1,019,071 HTML documents found under “.th” websites, only 229,448 (or 22.5 percent) were in Thai. The rest were mainly in English.

Important local sources of content

Truehits.net operated by the Government Information Technology Services Programme of the National Electronics and Computer Technology Centre (NECTEC), conducted a month-long web survey in September 2002 among 5,865 local websites. The survey identified the following top ten websites:

- <<http://www.sanook.com>> An entertainment portal targeting teens and young adults.
- <<http://www.mthai.com>> An entertainment site targeting teens and young adults.
- <<http://www.thaimisc.com>> An entertainment site providing information on software, ICTs and web technology.
- <<http://www.mweb.co.th>> An entertainment site for young adults.
- <<http://www.siamsport.co.th>> A sports newspaper.

<<http://www.songtoday.com>> An entertainment site offering music and songs.

<<http://www.thaiware.com>> An entertainment site providing information on software, ICTs and web technology.

<<http://www.jorjae.com>> An entertainment site popular with teenagers.

<<http://www.dailynews.co.th>> A newspaper.

<<http://www.matichon.co.th>> A newspaper focusing on politics.

Truehits.net also found that Google was by far the favourite search engine among Thai Internet users with a score of 74.46 percent, followed at some distance by Yahoo with a score of 8.38 percent and Microsoft Network at 7.72 percent. A Thai search engine, Siamguru.com, came in fourth with a score of 3.44 percent.

Online services

The second e-commerce website survey conducted by the Electronic Commerce Resource Centre of NECTEC during January–May 2001 found that, among the 6,460 co.th and Thai-owned “.com” sites included in the survey, only 3,765 sites were active (i.e. sites that displayed some information). Furthermore, among these active sites, only 11.4 percent offered some form of online services. The large majority were “basic” websites that merely displayed company or product information without any online services. The top five industries and categories publishing these websites were the tourism, computer and Internet, entertainment, webboard and “miscellaneous” sectors.

The government is determined to transform itself into an e-government: a government that effectively and efficiently utilises ICTs for its operations and public service delivery. In recent years, a number of government agencies have begun to offer online services to the citizens in an attempt to contribute to the overall government mission to provide the so-called 4R (red-tape reduction, rapid response, rural coverage and round-the-clock services). These agencies include the following:

- **Revenue Department** <<http://www.rd.go.th>>, which offers online personal tax filing and tax payment services

- **Department of Commercial Registration** <<http://www.thairegistration.com>> which offers online juristic entity registration (currently covering only the Bangkok metropolitan areas with plans for expansion to other areas)

- **Department of Local Administration** <<http://www.dola.go.th>> which offers useful information and forms readily available for download

Besides these websites with online services, there are many government websites that serve as invaluable sources of information even though they do not provide any online services. They include:

- **Office of the Board of Investment** <<http://www.boi.go.th>> which offers a large volume of information, including

Thailand facts

Total population: 61.25 million^a

Rural population as a percentage of total population: 69.9%^b

Key economic sectors: Agriculture, mining, manufacturing, construction, public utilities, transportation and communication, trading, banking, insurance, public service and defence.^c

Literacy in the national language(s): 92.6%^b

Computer ownership per 100 inhabitants: 2.78^a

Telephone lines per 100 inhabitants: 12.6^e

Internet hosts per 10,000 inhabitants: 11.75^a

Internet users per 100 inhabitants: 6.7^b

Cell phone subscribers per 100 inhabitants: 12.33^a

National bandwidth within the country: 5,104.50 Mbps^c

National bandwidth to and from the country: 1,258.38 Mbps^c

Sources:

(a) ITU (2002). *Asia-Pacific Telecommunication Indicators 2002*. Geneva.

(b) National Statistical Office.

(c) National Electronics and Computer Technology Centre.

(d) NECTEC <<http://www.ntl.nectec.or.th/internet/int-bandwidth.html>>

(e) Telephone Organization of Thailand (2002)

the ASEAN Supporting Industry Database, information from the Thailand Provincial Investment Gateway, the Economic Warning Indices and much more.

- **Office of the Permanent Secretariat, the Prime Minister's Office** <<http://www.gprocurement.or.th>> which launched this website to provide procurement news and announcements and other related information

ICT industries and services

The ICT market in Thailand continues to expand, the result of increasing ICT use. The growth rate of the ICT market value from 1999 to 2001 was six times higher than that registered by GDP.

The total value of the ICT market increased from US\$817.14 million in 1999 to US\$1,510.81 million in 2001. The software sector rose by 18–20 percent. It was forecasted that by the end of 2002 the IT market would have grown by 14 percent. The software market would account for 28 percent of the total market value by that time. The strong

growth of the software industry indicates that this industry is promising for Thailand's economy.

Examples of innovative and key initiatives

Thailand has initiated and implemented many ICT-related projects intended to improve the welfare of its people by expanding their access to ICTs. The following are examples of these projects.

SchoolNet Thailand

This project was initiated by NECTEC in 1995. Its successful implementation was achieved with the cooperation of three other government agencies: the Telephone Organization of Thailand (TOT), now known as TOT Corporation Public Company Limited, the Communications Authority of Thailand (CAT) and the Ministry of Education (MOE). Each agency has an important role to play and a significant contribution to make to the project. NECTEC is responsible for technical matters, that is design, investment, maintenance and operation of the network and central computer systems. TOT sponsors domestic communications and hosting of network operation centres nationwide, while CAT provides the international Internet bandwidth. MOE coordinates, promotes and supports the use of the Internet in schools selected by the ministry.

Such multi-agency cooperation makes SchoolNet the first and only network that provides universal access to users (teachers and students) in schools, specifically schools throughout the country that can access the network via a dial-up mode using one easy-to-remember access number 1509. They pay only 3 baht per call, irrespective of where they are calling from.

In the first year of its implementation, SchoolNet met the target of connecting 20 schools. This number had since gradually increased to 1,500 by 1999, the maximum capacity of the access infrastructure for the first phase of the project.

In October 1999, the Cabinet approved the expansion of SchoolNet to cover up to 5,000 schools nationwide to commemorate His Majesty the King's Sixth Cycle Birthday. Under this plan, all secondary schools, except those without electricity and/or telephone lines, plus more than 1,000 primary schools, will be able to access the Internet. Presently, there are about 4,600 schools connected to SchoolNet, with about 1,500 of them publishing their own websites.

From October 2002, the access services of SchoolNet will be merged with the MOE's educational network (EdNet), which is responsible for the management of the education system in Thailand, to expand the network to cover all schools nationwide (approximately 34,000).

At this stage, NECTEC will place more emphasis on the development of quality content which students and teachers can use as a resource to create good quality learning and teaching materials.

NECTEC will also be working on e-learning standards and cooperating with institutions to share the production and use of learning materials, with proper intellectual property management as well as good authentication infrastructure to help curriculum management.

There is no guarantee that SchoolNet will succeed or fully accomplish its objectives in the long run. However, it is obvious that it has already made a significant impact on many schools in the country.

NECTEC should be viewed as just a successful incubator of early efforts to introduce the Internet to schools. It is clear that no single organisation in the country can accomplish this task alone. Thailand urgently needs to organise collaboration among the different government ministries if it wants to make sure that every student has an equal opportunity to get online. ICTs should also be reviewed constantly so that the most appropriate use can be made of the technologies to support the development of children.

Agriculture Information Network (AIN)

Agriculture lies at the core of the lives of the majority of Thais, as well as being the main source of income for them. More than 60 percent of the population lives in rural areas, and the majority of them are farmers. The rural communities, as the main producers of the country's food, earn only 11 percent of GDP.

NECTEC, in collaboration with the Ministry of Agriculture, has launched the AIN programme to meet the information needs of the agricultural sector. Farmers should benefit from the content provided by the network, which includes:

- risk assessment
- an agriculture warning system
- an agricultural knowledge base

The content aims to improve technology, productivity, income and the security of the agriculture sector. The project is now being implemented.

Community access telecentres

The government and the private sector are fully aware of the digital divide and are determined to alleviate the problem by offering some form of low-cost Internet access to the public, particularly to people who would otherwise be left behind. The following sections describe some of the projects being undertaken to meet this objective:

CATNET public Internet booths: In 1997, when the Internet was still new to the Thai society, CAT began a pilot project called CATNET. It provides prepaid Internet access at public PC booths installed at post offices. It was intended to provide low-cost Internet access in less profitable market areas which are of no interest to commercial ISPs. More importantly, it was also intended to enable those who could

not afford PCs to have an opportunity to use the Internet.

CATNET was expanded into a full-scale project in 1999 to mark of His Majesty the King's Sixth Cycle Birthday. There are about 1,100 CATNET booths spread across all the 76 provinces and almost all the districts of Thailand at the time of writing. Many of the booths are located in post offices and telecommunications service offices. A user purchases a CATNET smart card of 100, 300, or 500 baht to pay for usage of these booths. The Internet access charge deducted from the card is 3 baht for the first minute and 0.12 baht for every minute thereafter.

TOT public Internet and free Internet: To provide citizens an equal opportunity to make use of the Internet, TOT launched the TOT Public Internet Project a few years ago. Initially, 300 public Internet booths were set up in TOT service offices in major areas. This service is now available throughout the country. Each booth has a PC with a 56 Kps modem and a TOT web browser program to enable users to connect to the Internet. Users purchase a TOT card to use at one of the booths. The charge deducted from the card includes a connection fee of 3 baht plus a usage charge of 0.2 baht per minute and a printing fee of 3 baht per page.

In 2002, TOT introduced the TOT-Online Service, which provides free Internet access for all telephone subscribers in Thailand. Currently, any TOT subscriber can obtain free Internet access by dialling the number 1222. Each session is limited to a maximum of one hour to make sure that all subscribers share equal access to the service.

TambonNet: *Tambon*, or subdistrict, comprises a group of villages. In Thailand, there are approximately 7,000 *tambons*. The Ministry of Interior plans to provide Internet access to all *tambon* administrative offices by 2003. This service was provided to 1,000 *tambon* offices in 2001, an additional 3,000 offices in 2002, and a further 3,000 offices in 2003. Initially, the project was intended to connect *tambon* offices to the Internet so that staff can communicate speedily with the ministry. The government has since encouraged all *tambon* offices to make the service available to members of the community as well. The *tambon* network complements the "One *Tambon*, One Product Project", which was introduced subsequently and is described below.

Telecentres for community product and tourism promotion: This is a pilot project supported by the government to develop sustainable e-commerce in rural areas. It is aimed at applying ICTs to leverage the economic and social well-being of rural communities by introducing the Internet and, at a later stage, e-commerce to them. Four pilot sites were planned.

After thorough research in a number of communities throughout Thailand, four communities differing in characteristics and locations were selected to participate in this pilot project. A community telecentre, equipped with a

set of ICT equipment including PCs with Internet connection, telephones, fax, photocopiers, printers and digital cameras, was set up in each of the four selected communities in March 2002.

It is hoped that the people's initial experience with the Internet, and the information and assistance provided by NECTEC, will encourage the communities to progress on to e-commerce. This will enlarge the market opportunity for their local goods, services and tourism. Lessons learnt from the pilot project will be helpful in planning any subsequent full-scale project or programme which the government may decide to pursue in relation to the implementation of the *National Information (or Universal Access) Law*, which are obligated under the *Constitution Law*, Section 78.

Information Centre for Community Organization and Civil Society Empowerment: The Community Organizations Development Institute (CODI), is a public organisation under the supervision of the Ministry of Finance, launched in 2001 its pilot project, Information Centre for Community Organization and Civil Society Empowerment.

The main purpose of the project is to strengthen the society at the grassroots level by empowering community organisations through the use of ICTs. The local community organisations propose their ideas and initiatives regarding how they want to use ICTs over the networks of community organisations in various regions of Thailand. These initiatives include connecting to the Internet where it is applicable. The project aims to promote the development of community organisations and to help coordinate the efforts of civil society within and between communities.

After thorough consideration at both the regional and national levels, four pilot sites from four different regions – the north, south, northeast and the central – were selected. CODI has already set up the necessary hardware requested by the communities (including PCs with Internet access) in two of the selected sites, while the other two sites were in the process of being established at the time of writing.

Thai-Canadian Community Telecenter Project: GAIA Corporation (Canada), TeleCommon Development Group (Canada) and Loxley Public Co. Ltd. (Thailand) This project, funded by the Canadian International Development Agency, began in 2001 to provide community telecentres to rural communities to meet their telecommunications needs at a low cost. Typically, a telecentre is equipped with telephones for public use, PCs with Internet access and a photocopier. Some centres also offer PC and Internet training courses. Six locations were selected. Hardware had been installed by March 2002 and the six telecentres are now in operation.

Automatic web translation services: Translation facilities for English and Asian languages will dismantle language barriers and help to eradicate the digital divide. NECTEC

staff, through their participation in the multilingual machine translation (MT) project of the Centre of International Cooperation for Computerization and neighbouring countries, have gained invaluable experience and knowledge and have developed databases that prepare them to carry out further R&D into practical uses of MT in Thailand.

NECTEC, working with an improved infrastructure and technical support from NEC (Japan), continues to develop English to Thai MT capabilities. At present, people can browse English webpages in Thai and translate short passages of English text into Thai via NECTEC's web-based service, called ParSit <<http://come.to/parsit>>. Although the system does not provide perfect translation, its current service does provide the gist of the text translated and therefore allows many Thai users to "read" English webpages. The ParSit service is expected to help increase the number of Internet users in Thailand.

Based on the success of ParSit, NECTEC plans to develop Thai to English MT so as to fully facilitate information exchange between the two language groups. This will help to disseminate and promote globally Thai culture and commerce.

NECTEC is aiming to establish a centre for MT with technological collaboration from Japan. The centre will be established with the purpose of transferring knowledge, providing technology information and service infrastructure on MT, setting up standards for information sharing, and contributing all necessary tools to promote MT R&D and services for the local languages in the region as well as English.

The centre for MT will gather experience and technical information on MT to accelerate MT R&D in this region. It is hoped that automatic language translation services will eventually be developed using the new ICTs.

Rural telephone connection

Telephone lines, sometimes referred to as "the last mile" and at other times "the first mile" of telecommunications infrastructure, are one of the most important elements for developing any society. The cost of connecting sparsely populated rural areas of Thailand using copper cable is prohibitive. But, at the same time, it is very important that people in rural areas are served in the same way as their counterparts in towns and cities.

Fortunately, modern digital wireless technology can be the effective alternative solution to copper wire. Rural areas in developing countries such as Thailand stand a good chance of "leap frogging" into digital wireless technology. This technology also quickly connects communities living in areas with difficult terrain. There is no need to erect poles and hang cables across mountainous terrain.

In 1997, TOT began operating a rural telephone service using a wireless local loop (WLL) system. The country was divided into three zones for the planning and building of

this new system. Zone 1 adopted modified NMT 470 MHz, while zones 2 and 3 adopted PHS-WLL system.

The three zones provided services to a total of 17,150 villages with for 108,966 subscribers. Almost all the subscribers were public telephones of the Rural Public Long Distance Telephone Project.

WLL is an access system that uses a wireless link to connect subscribers to their local exchange in place of conventional copper cable. Using a wireless link shortens the construction period and reduces installation and operating costs. The PHS-based WLL, using the Japanese Personal Handy Phone System, has been adopted by the rural area public telephone network in Thailand. PHS has many advantages: affordable, satisfactory audio quality and good data transmission speeds. They are as good as fixed-line telephones.

Enabling policies

The government set up the National IT Committee (NITC) in 1992. It is a high-level policy body chaired by the Prime Minister. Its members comprise executives from the relevant public and private sectors. The mandate of NITC is to develop policies and plans to promote ICT development and utilisation in the country. NECTEC was assigned to host the secretariat office and to support the committee in carrying out its work.

IT 2000

In February 1996, the first national IT policy, IT 2000, was announced by NITC and endorsed by the Cabinet. IT 2000 provided the vision for the country to exploit IT to achieve economic prosperity and social equity.

The policy emphasized a three-prong development agenda:

- (i) To build an equitable national information infrastructure
- (ii) To invest in people, to accelerate the supply of IT workers and to develop an IT-literate workforce
- (iii) To achieve good governance through the use of IT in delivering services to the public and in government administration

To implement the policy, each government agency developed its own master plan to correspond with the direction defined in IT 2000.

Through the course of IT 2000 implementation, it was found that many development programmes were successfully implemented as planned, while many others are still far from meeting their goals, especially those concerning human resources and the government sector. This is mainly due to the economic recession which caused a decline in government investment in ICTs.

Thailand may soon embark on its second decade of ICT development with the economy now resuming a positive outlook and with the new leadership in place.

From IT 2000 to IT 2010

IT 2000 provided the framework and guidelines for ICT policies and initiatives for five years. Over that period, technologies changed tremendously, both in terms of advancement as well as their widespread application in virtually all sectors of the economy. Meanwhile, the Thai economy and society also evolved enormously, particularly as a result of the financial crisis, which started in 1997.

From IT 2010 to IT 2.0

Thailand is also affected by changes that have occurred at the international level, such as globalisation, borderless commerce and the creation of new non-tariff barriers. Although the principle of the three pillars of IT 2000 still prevails to a certain extent, NITC realised that there was a need to develop a second phase of the national IT policy, to give a boost to Thailand's shift into a digital economy.

Consequently, the NITC secretariat teamed up with the Policy Innovation Centre at King Mongkut University of Technology Thonburi to conduct research to develop a ten-year national IT policy for the period 2001–2010, or IT 2010. In the development of IT 2010 and its policy recommendations, important inputs that were considered included:

- An analysis of impact and lessons learnt during IT 2000 implementation
- The current situation in both IT production and IT consumption in various sectors of the country
- Policy development in other countries in order to understand the global trend
- Issues which are relevant to the future development of the country as specified in the Ninth National Economic and Social Development Plan and the recent development of the e-Thailand initiative

To ensure public participation in the policy development process, NECTEC, as the NITC secretariat, organised many public seminars in Bangkok and other regions in the north, northeast and south. People's opinions and comments were gathered, analysed and used as inputs into the design of the policy.

The study was completed in September 2001, and the results were synthesized and compiled for submission to NITC in October 2001 and subsequently forwarded to the Cabinet for approval. On 19 March 2002, the Cabinet approved and endorsed IT 2010 as a policy framework for Thailand's ICT development during the first decade of the 21st century.

IT 2010: Towards a knowledge-based economy

His Majesty the King's concept of a "sufficiency economy" calls for a new focus in development which emphasizes the improvement of the quality of life of the people through

knowledge and greater self-reliance and to reduce social differences to a minimum.

Thus, IT 2010 adopted the key development objectives of exploiting the benefits of ICTs to move Thailand on to a knowledge-based society and economy (KBS/KBE). Development as such does focus not on "technology" but rather on the effective use of ICTs to drive overall national economic and social development.

To meet this goal, IT 2010 identified three cross-cutting principles to support the "ICTs for KBS/KBE" framework:

1. Building human capital
2. Promoting innovation
3. Investing in an information infrastructure and promoting the information industry

Under this framework, three specific development goals based on technological and social indicators were identified:

- To raise the technological capability of the country from the "dynamic adopters" group to the "potential leader" group by 2010, as defined by the UNDP Technological Achievement Index.
- To increase the proportion of knowledge workers in the country from 12 percent in 2001 to 30 percent by 2010
- To increase the share of knowledge-based industries within the overall economy to 50 percent by 2010

To achieve these goals, IT 2010 identified the following five main areas for development:

- **E-society**, covering issues such as the digital divide, quality of life, culture, health and public participation
- **E-education**, including issues of lifelong learning, computer literacy, human resource development and virtual education
- **E-government**, including electronic delivery of public services, employment, and legal infrastructure
- **E-commerce**, with a special focus on e-services including not only financial, tourism and IT services but also other industries.
- **E-industry**, focusing on e-manufacturing and IT-related industries, including issues such as standardisation.

The development of each of the above sectors must be synchronised and harmonised with all the other sectors. Furthermore, the development schemes in each sector must be hinged to strategies that are essential to a KES/KBE. In other words, the schemes must comply with the three guiding principles: enhancing human capital, creating innovation and strengthening the information infrastructure.

Regulatory environment

Six ICT laws have been developed (some enacted, others in the drafting stage) in Thailand:

- The *Electronic Transactions Law* recognises the legality of data messages by treating them as the functional equivalent of writing or evidence in writing, with a view to promote the reliability of electronic transactions.

- The *Electronic Signatures Law* legalises electronic signatures.
- The *Electronic Fund Transfers Law* facilitates electronic fund transfers.
- The *Computer Crime Law* criminalises new types of offences committed in cyberspace.
- The *Data Protection Law* protects the rights to privacy in the information society by safeguarding the personal data of individuals.
- The *National Information Infrastructure (NII) Law* (via the *Constitution Law*, Section 78), provides for an equitable information infrastructure and for universal access by promoting equitable and affordable rights and access to information and communications services. The purpose of the law is to reduce Thailand's digital divide.

The development of ICT laws is an initiative to nurture e-commerce activities in Thailand. At the same time, these laws will promote the confidence of foreign investors. The first two laws, *Electronic Transactions Law* and *Electronic Signatures Law*, were later combined into one called the *Electronic Transactions Act B.E. 2544*. The Act was drafted following the *Model Law on Electronic Commerce 1996* and the *Model Law on Electronic Signatures 2001* of the United Nations Commission on International Trade Law (UNCITRAL). It came into force on 3 April 2002.

The draft of the *Personal Data Protection Bill* and the draft of the *Computer Crime Bill* were recently approved in principle by NITC and was scheduled to be submitted for approval by the Cabinet at the time of writing. The draft of the *NII Bill* has been approved by the Council of State and was awaiting the approval of the Cabinet at the time of writing before its submission to the House of Representatives. The *Electronic Fund Transfers Law* was under consideration of the drafting subcommittee at the same time.

Copyright law and software privacy

Although Thailand has implemented the *Copyright Law* since 1995 and the Intellectual Property and International Trade Court has been operating since 1997, piracy in the country is rampant. In 2000, the piracy study made by the Business Software Alliance ranked Thailand as the top 12th country in software piracy in the world and the 5th among all Asia and Pacific countries.

The problem of piracy has become a great concern of the government. The high rate of piracy implies that Thailand lacks its own software and has to rely on expensive imported software, which deters people from buying legal software.

Not only are the prices high, there are also limitations placed on the use of imported original software, which create problems for users. The producers of original software frequently launch new versions of their software, thereby requiring users to regularly pay for upgrades. Furthermore, imported software is made for general application and is not customised to the requirements of each user. Therefore

imported software is not suitable for meeting all work requirements, but users of legal software are strictly forbidden to change, copy or improve the software that they buy.

After the enactment of the *Copyright Law* and the establishment of the Intellectual Property and International Trade Court, the country was driven to intensively develop its own technological capabilities, especially in computer software, so that it will not become dependent on expensive imported software. This concern has influenced the national IT plan, making the government emphasize R&D to strengthen the country's software industry.

A major restructuring of the Thai software industry took place during 1999 through the Software Park Thailand project set up by the government. Software Park Thailand initiated by NITC is the worldclass infrastructure that Thailand has built for the ICT industry. It aims to stimulate development of the software industry by attracting local and international partners in establishing a critical mass of software-related businesses. Thailand will benefit from both the growth of its software industry and the resultant strengthening of its technology base. Partners and investors in Software Park will benefit from low production costs, a convenient location in relation to regional markets, access to comprehensive infrastructure and support facilities, attractive investment incentives, and a pool of talented and adaptable employees.

Open source movement

The government has been attempting to eliminate software piracy by encouraging the use of legal software and by strictly enforcing the *Copyright Law*. Most proprietary software is expensive, which discourages people from buying legal software. NECTEC, which is responsible for computer software R&D, provides alternatives to users by promoting the use and development of open source software.

Recently, NECTEC announced a policy which emphasizes R&D open source software. The main objectives of the policy are the following:

- To develop open source software which fits the requirements of users in Thailand
- To familiarise users in the country with the development and uses of open source software
- To develop Thai experts in software development
- To develop reference sources to support self-learning of software by people in the country
- To develop a new trend of reducing reliance on foreign software

To implement this policy, NECTEC's Information, Language and Knowledge Laboratory has undertaken a project on open source software development. This project aims to establish a "Thai library" and standards for developing the use of the Thai language through open source software. It further aims to promote and support the

establishment of a strong open source community in Thailand.

NECTEC, in cooperation with the Thai Linux Working Group, has developed an operation system called Linux Thai Language Extension or (Linux TLE), and a suite of office applications called Open Office TLE. Linux TLE was first released for public use in 1999. It enables users to work in the Thai language by using Thai fonts and Thai language software. More details can be found <<http://linux.thai.net/linux-tle>>.

NECTEC has organised an annual event called Linux Application Day to promote the use of Linux TLE. Its objectives are to bring people interested in open source software together to share and exchange knowledge and information and to disseminate information about new alternatives available for Linux-based applications users. The event also aims to build researchers' confidence in open source software and to encourage them to continue developing their activities within the software industry. Participants in the event are classified into two groups: users and exhibitors. Each group consists of people from the private, business, industrial and academic sectors.

NECTEC has also undertaken activities to build expertise in open source software development. It has organised annual software development contests around the country. Scholarships are awarded as prizes to the winners.

Although Thailand is in the early stages of open source software development, a good start has been made to make the country more self-reliant in software production and deployment. The Thai open source software community consists of many groups, such as:

- Thai Linux Working Group <<http://linux.thai.net>>
- Open Source Thai Group <<http://opensource.thai.net>>
- Source Forge Group <<http://sourceforge.net>>
- Thai Linux Café Group <<http://www.thailinuxcafe.com>>
- Linux Board Group <<http://www.linuxboard.com>>
- Thai Linux Documentation Project <<http://ftp.nectec.or.th/pub/thailinux/docs>>
- Thai Linux Journals and Magazines <<http://www.ziif.com>>

Research in ICTs

There are a number of science and technology and R&D funding agencies in Thailand (e.g. Thailand Research Fund, National Research Council of Thailand, and numerous science and technology academic institutions). NECTEC, a large agency that focuses solely on ICTs, is both a research institute and a research funding body. NECTEC's R&D projects are clustered around the "ECTI" areas comprising electronics, computer science, telecommunications and IT. It has ongoing and completed R&D projects in-house, in the following areas:

Electronics

- IC design development
- Net-enabler chip
- USB-interface-based access monitoring system.
- Energy conversion technology
- Industrial prototype development of a pocket pH meter

Computer science

- GIS data management system for Internet GIS
- Distributed computation framework on data grids
- Back-up and recovery system development
- XML-based rice genome bioinformatics R&D centre
- Cluster management software

Telecommunications

- Development of prototype radio cell station for WLL
- Automatic meter reading control centre
- Voice dialling for PIN PHONE by Thai digits speech recognition
- Development of ICS and RAMS integration module

IT

- National font
- Open source software development
- Linux for Thai
- Thai speech corpus
- English-Thai machine translation

Besides in-house research projects, NECTEC also funds numerous projects, including R&D into the third generation mobile telecommunications system, image-guided motion of a humanoid robot, semi-conductor development using high vacuum electron-beam evaporation, Internet telephony, hardware development of PAL Thai-English closed caption television system, Thai speech dictation system, IPv6 testbed and many other projects.

Future trends

Thailand has prepared for its transformation into a knowledge-based economy through its Five-Year ICT Master Plan and several other major ICT development programmes.

The Ministry of Information and Communications Technology was established to oversee the development and promotion of ICTs in the country as part of the government's bureaucratic reform, which took place in October 2002. Prior to the reform, the IT and communications sectors were handled by two different ministries: the Ministry of Science Technology and Environment and the Ministry of Transport and Communications. It is envisaged that the new structure will allow Thailand to better respond to the global trend of technology convergence and will therefore lead to more effective governance.

The ICT master plan for 2002–2006 is an implementation of the IT 2010 policy framework. Under this plan, three

priority areas have been identified for implementation during the first two years: (i) promotion of the software industry, (ii) development of various e-government applications, and (iii) promotion of ICT usage in small and medium enterprises. Public-private partnership will be emphasized and encouraged in the development of ICTs.

The *Data Protection Law* and the *Computer Crime Law*, which are expected to be passed by Parliament, will serve as an important legal framework to give consumers and businesses with confidence to fully engage in the information age.

There are many challenges that have to be overcome if Thais are to be successful in forging ICTs into a powerful development tool. Foremost is human resource development. Education and training are very important for ensuring that people have both the technical skills to make effective use of ICTs as well as the skills to deal with large quantities of information. The ICT policy places e-education as a high priority area to be implemented in tandem with education reform. This is driven by the ICT master plan strategy to raise basic living standards and the competitiveness of the Thai economy.

Secondly, Thais have to improve their access to ICTs. As of 2001, Thailand has a teledensity of about 12.6 per 100 inhabitants and Internet penetration of about 6.7 per 100 inhabitants. New digital wireless technologies will help improve access at reduced costs, saving on the need to lay costly copper cable to homes. Public and private initiatives with regard to community access centres or telecentres will be encouraged.

And lastly, ICT R&D in both hardware and software (including content) has to be accelerated so as to make available less expensive access devices, equipment, software and content in the Thai language.

The first technology hub for Thailand started operations in April 2002. The Thailand Science Park is operated by the National Science and Technology Development Agency (NSTDA) <<http://www.nstda.or.th>>. The R&D complex is strategically located close to five technological universities and several industrial parks in the province of Pathumthani, north of Bangkok. The science park is a cluster of research centres for ICT, biotechnology and materials research. It is the largest concentration of knowledge workers in the country and has already attracted several knowledge-based industries to collocate with NSTDA. The cluster promises a significant improvement in R&D support, both for existing programmes as well as those to be launched.

The current leadership, a new governance structure and lessons learnt from the best practices of others provided good prospects for Thailand to move forward and join nations that are shifting into the knowledge-based economy.

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