Electronic • Computing • Telecommunication • Information • Technologies

ECTI-21 NECTEC

Thailand ICT Indicators 2005

Thailand in the Information Age

Policy and Legal Development Division
National Electronics and Computer Technology Center
National Science and Technology Development Agency

Thailand ICT Indicators 2005

February, 2005

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ISBN : 974-229-709-6
3,000 issues

Published by:

National Electronics and Computer Technology Center
National Science and Technology Development Agency
Ministry of Science and Technology
73/1 NSTDA Building, Rama VI Rd., Ratchathewi,
Bangkok 10400, THAILAND

Tel. +66-2-644-8150 ext. 620, 621 Fax. +66-2-644-6653
e-mail: info-pld@nectec.or.th
URL: http://www.nectec.or.th/pld/

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Introduction

When our first endeavor in gathering ICT-related statistics, Thailand ICT Indicators Series I, was published in 2003, we did not anticipate that our book would stir such a huge demand. As it turned out, we received positive and enthusiastic responses as well as comments locally and internationally. This reaffirms our belief that there is a need for a country to have systematic mechanisms in collecting as well as disseminating ICT indicators on a continual basis.

ICT Indicators are critical to the understanding of the status of ICT development in a country. They can also serve as benchmarking tools to allow relative assessment of development progress in comparison to others. Furthermore, they can be used as impact assessment tools to monitor ICT roles in economic and social development. Without relevant statistics, we cannot conduct objective assessment on the ICT situation of the country. During the past two years (2003 - 2004), our research team at the National Electronics and Computer Technology Center (NECTEC), Ministry of Science and Technology, has worked closely with the National Statistical Office (NSO), Ministry of Information and Communication Technology, in an endeavor to study, collect, and analyze several ICT-related statistics from many agencies in order to come up with a list of core ICT indicators to be gathered on a continual basis.

In gathering these ICT-related statistics, serveral approaches and methodologies were used. On the demand side, the NSO and NECTEC developed survey questionnaires related to ICT ownership and usage in 2001. These questionnaires were used as supplementary and were integrated into regular surveys, such as household and business establishment surveys. In early 2004, however, the NSO launched full scale IT surveys on household and business establishments, aiming to produce several baseline indicators. On the supply side, the statistics used are mainly from telecommunication operators as well as business associations such as ATCI (the Association of Thai Computer Industry).

Additionally, NECTEC has initiated a few other mechanisms to generate a set of ICT-related statistics which can be used as indicators to monitor the status of Thailand ICT development. We would like to highlight a few examples as follows:

- NECTEC conducts an online survey of Internet users on an annual basis to study their profiles. The questionnaire is posted on NECTEC web site and at least five more popular ones around September-October each year. The number of respondents has been increasing every year, up to more than 15,000 for the past two years.
- To complement with Thailand initiatives on e-Government, NECTEC has launched a readiness survey on government web-based services, whereby government agencies were asked to assess their ability to provide different types and levels of e-Services via the designated web site.

- NECTEC has developed an advanced web statistics service called "Truehits" (http://truehits.net) which receives cooperation from more than 7,000 web site owners. The statistics generated by "Truehits" can be used to monitor Internet users behavior-where and when they visit the web site. Through this, we are able to speculate the kind of web sites which were most frequently visited.

Considering the statistics presented in this book, there are notably three approaches in their selection. Firstly, we add the latest figures available to update the data presented last year, such as the telephone penetration. Secondly, we include the newly released figures, such as the ICT penetration among business establishments. Lastly, we decide to leave out figures, derived from a one-off survey, which were presented in the previous series. For those who are interested in the first series, the soft copy is available on our web site (www.nectec.or.th/pld/document/indicators2003.pdf).

Well, there is a common saying "a picture paints a thousand words". We believe figures and statistics hold the same truth. The infrastructure-related statistics show the prevalent digital divide in Thailand. Notwithstanding the government intervention to bridge the gap, it appears that people who live, learn, and work in the rural areas are socially and economically disadvantage.

The intensity and sophistication of usage, however, are more difficult to evaluate. Included here are statistics on, for example, the average online time, the kind of activities people conduct on the Internet, and the type of web sites frequently visited. The rate to which ICT was integrated into the Thai economy can also be estimated from e-Commerce value as well as government e-Procurement. On the other side of the coin, one might look at the size of ICT market as a reflection of intensity.

In addition, we put forward the set of indicators on fundamental components to ICT development and knowledge creation. These are research and development and human resources. From the statistics presented, it is obvious that Thailand would need to invest tremendously in these areas as she moves towards the Information Society.

To obtain the data for all indicators requires a titanic coordination effort. In this regards, we would like to thank all agencies, whose names were presented throughout the book, who make our tasks much easier. The National Statistical Office, Ministry of Information and Communication Technology, with whom we have jointly worked on a project to develop national ICT indicators since 2003, deserves our special appreciation.

We hope that this second series of ICT indicators is beneficial to all readers-being policy-makers, government planning agencies, market analysts, entrepreneurs, academia, researchers, and general public. We realize that this book is another stepping-stone on a long journey. It will be some time before we can reach a complete database on ICT statistics. NECTEC is proud to be one of the main contributors to materialize that goal in the future.

Thailand at a Glance

1	Geography	Land Area 513,115 sq. km.				
2	Neighboring Countries	Myanmar - west and north Lao P.D.R. - north and northeast Cambodia - southeast Malaysia - south				
3	Administration	76 provinces, each subdivided into "amphoe" (district), "tambon" (sub-district) and "muban" (village)				
4	Capital	Bangkok				
5	Language	Thai				
6	Head of State	His Majesty King Bhumibol Adulyadej (Rama IX of the Chakri Dynasty)				
		1999	**2000**	**2001**	**2002**	**2003**
7	Population, at year-end (Millions)	61.78	62.41	62.94	63.46	64.01
8	Literacy Rate (%)	-	90.8	-	-	-
9	Labour Force (Millions)	32.72	33.22	33.92	34.25	34.48
10	Unemployed Persons (as % of labour force)	4.2	3.6	3.2	2.2	2.0
11	Minimum Wage (Baht/day): Bangkok, Samut Prakan, Nakorn Pathom, and Pathum Thani	162	162	165	169	170
12	GDP at Current Market Prices (Billion US Dollars)	122.5	122.6	115.5	126.9	142.9
13	Agriculture (as % of GDP)	9.4	9.0	9.1	9.4	9.8
14	Non-agriculture (as % of GDP)	90.6	91.0	90.9	90.6	90.2
15	Per capita GDP (US Dollars)	1,985	1,962	1,834	1,999	2,196
16	Exports (Billion US Dollars)	56.8	67.9	63.1	66.1	78.4
17	Exports (% change)	7.4	19.5	-7.1	4.8	18.6
18	Exports (as % of GDP)	46.3	55.4	54.7	52.1	54.8
19	Import (Billion US Dollars)	47.5	62.4	60.6	63.4	74.2
20	Import (% change)	16.9	31.3	-3.0	4.6	17.1
21	Import (as % of GDP)	38.7	51.0	52.5	50.0	51.8
22	Exchange Rate (Baht/1 USD)	37.8	40.2	44.5	43.0	41.5

Sources: (1) - (6) and (11): Bank of Thailand (BOT)
(7) - (10): The National Statistical Office (NSO)
(12) - (22): Office of the National Economic and Social Development Board (NESDB)

I

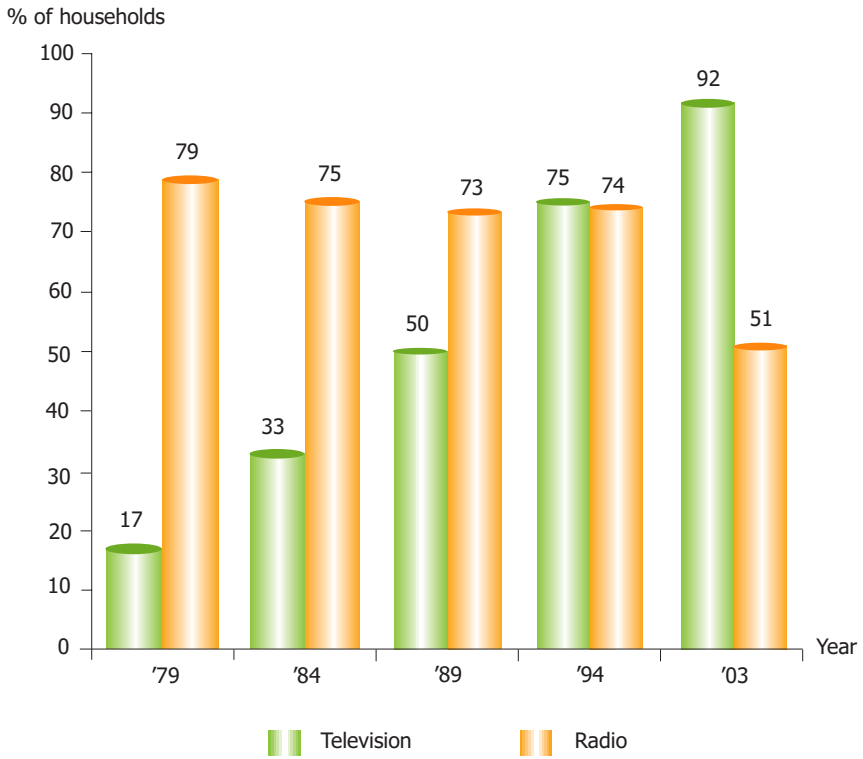
Broadcasting

In the wave of new information and communication technologies, particularly the Internet, "broadcasting" seems to be a forgotten sphere. However, in the recent World Summit on Information Society, we witnessed the movement of the media to accentuate their roles in shaping the Information Society as well as in information and knowledge creation and propagation in the 21st century.

The pace of diffusion of broadcasting technologies, often been compared unfavorably with the rapid diffusion of the Internet, takes a long time since its first inception to become adopted in most households. Nevertheless, the penetration of traditional media such as television and radio in most, if not all, developing countries, covers a wide audience--geographically as well as socially.

In this chapter, we scrutinize the diffusion of television and radio in the Thai society, using the data from the Mass Media survey, which is conducted every five year by the National Statistical Office. Television and radio have a much higher penetration rate when compared to the Internet (discussed in chapter VI). However, there was a reverse trend between television and radio. In 1979, merely 17% of households owned a television, but a positive growth has been observed since, with the figure reached 92% in 2003. The household ownership of radio, on the other hand, declines from 79% in 1979 to 51% in 2003.

Figure 1.1 Percentage of Households with Television/Radio



Source: Mass Media Survey, National Statistical Office (NSO)

Considering the geographical breakdown, there is an equal access to television among regions, with minor differences. The digital divide, between Bangkok and the rest of the country, seems to be more apparent with the diffusion of radio (Table 1.1).

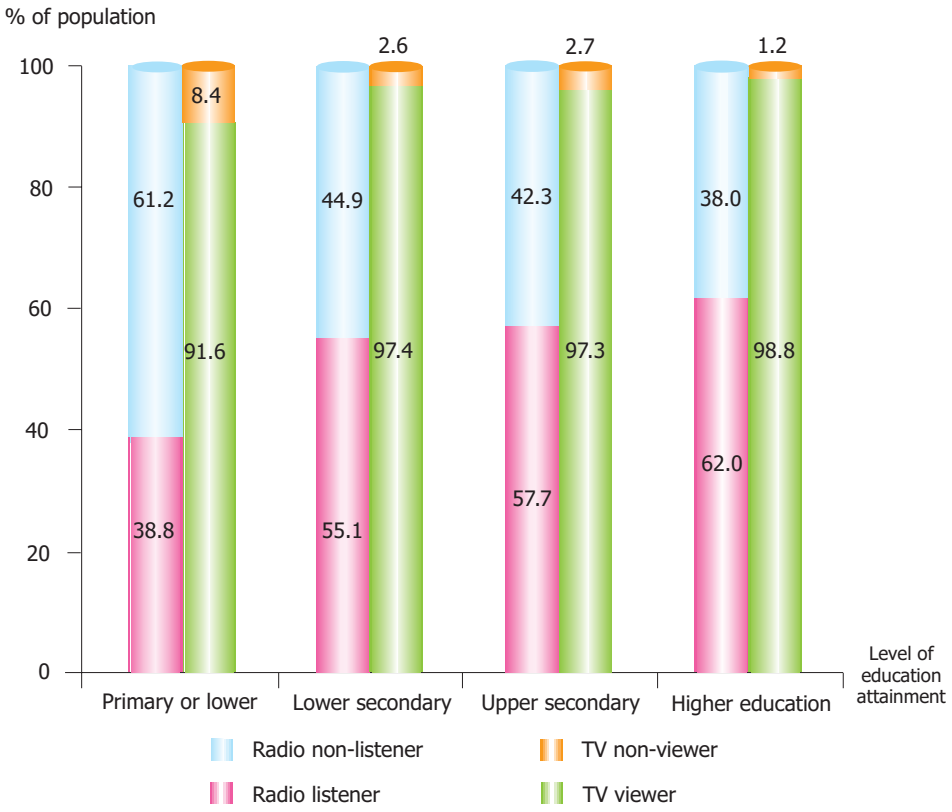
Table 1.1 Percentage of Households with Television/Radio by Region (2003)

	2003
Households with television sets	
Bangkok	94.2
Central	93.3
North	91.0
Northeast	93.1
South	90.0
Households with radio sets	
Bangkok	63.7
Central	48.4
North	57.1
Northeast	44.3
South	51.3

Source: National Statistical Office (NSO)

The survey further reveals the usage pattern. Nearly all population with the age of 6 years and over (94.5%) watch televisions, while less than half (42.8%) listens to the radio. Factors such as educational level, gender and occupation, were also examined whether they are influential to the usage pattern. For instance, Figure 1.2 shows that, for population who are 15 years old and over, educational level has little effect on television viewing, but greatly impinge on radio use. In the latter case, there was a reverse pattern between those who are least educated and most educated.

Figure 1.2 Percentage of Population Listening to Radio and Watching Television by Level of Educational Attainment (2003)



Source: National Statistical Office (NSO)

For television, the most popular program is entertainment (51.6%), followed by news (47.2%), general knowledge or documentary (0.9%), and others (0.3%). At present, there are six free TV channels (with commercial advertisement broadcasted) in Thailand. For cable TV, subscribers for United Broadcasting Corporation (UBC), the main operator in the market, reached 439,928 in the second quarter of 2004[1].

[1](ubctv.com/Aboutubc/thaiSubScriberNo_List_front_th.aspx)

II

Computer Usage

In 2003, the Ministry of Information and Communication Technology (MICT) launched a major initiative to make widely available "low-cost" PCs to the general public as well as civil servants. The PCs distributed through this project was bundled with the open-source software, i.e., Office TLE, which has equivalent functions to the Microsoft Office packages. Shortly after the launch of the project, Microsoft had announced a drastic price reduction, to approximately US$ 35, for an individual user who purchased a PC under this project. Moreover, a "low-interest" fund was also made available for those in need. This fairly "well-designed" package has generated much interest from those who were considering buying a home-use PC for the first time. It was reported that more than 200,000 units were purchased under this program, causing a big jump in the PC penetration rate in Thailand, as seen in Table 2.1.

The rise in the penetration, however, does not only result from the purchase of PCs under this project alone. What has been observed was that this project has also induced competition in the local PC market. In other words, manufacturers who did not participate in the project has cut down their price significantly in order to compete and get some marker share.

As a result, the PC penetration in Thailand has risen significantly over the past two years, with the percentage of households with computers arising from 5.1% in 2001 to nearly 11% in mid 2004. Nevertheless, the problem of digital divide still prevails, with household and business establishments in Bangkok having greater access to computers than those residing outside Bangkok (Table 2.1).

Table 2.1 Percentage of Households with Computers (2001-2004)

Year	2001	2003	2004
Overall	5.1	8.2	11.1
Bangkok	19.8	24	28.1
Central*	5.1	7.5	11.6
North	2.8	6.1	9.0
Northeast	2.0	4.5	6.3
South	2.3	6.1	8.6

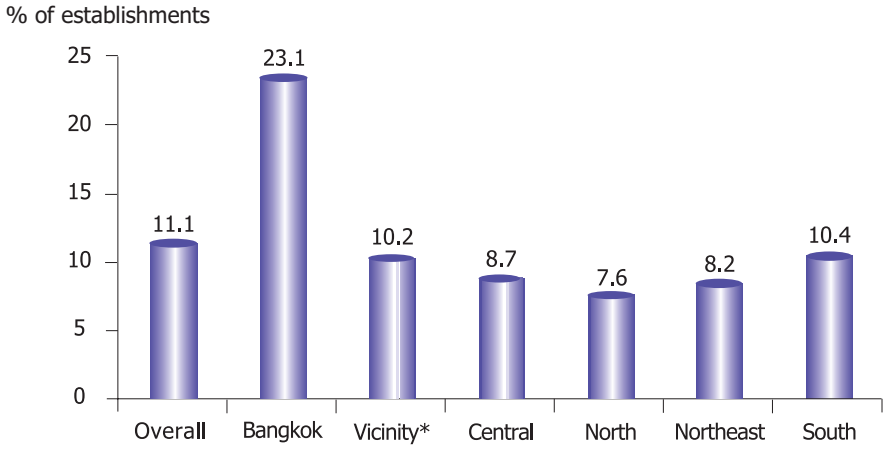
Remark: *Exclude Bangkok

Source: Report on the 2001 Survey on Information Technology, NSO

Report on the 2003 Survey on Information Technology, NSO

Report on the Information and Communication Technology Survey (Household) 1st quarter 2004, NSO

Figure 2.1 Percentage of Business Establishments with Computers (2003)



Source: Report on the 2004 Information and Communication Technology Survey on Business Establishment

Remarks: *Vicinity includes Pathumthani, Nonthaburi, Samut Prakarn, Samut Sakorn and Nakorn Pathom

The size of firms, classified by the number of employees, is related to the extent to which firms absorb new technology. By and large, the larger the firm is, the more likely it will own and use computer in its business (Table 2.2). In this respect, small and medium enterprises (SMEs), which are fundamental to Thai economy, have not widely adopted the new technologies. The National ICT Master Plan (2002-2006), therefore, has devised a strategy which aims to increase the use of ICT among SMEs.

Table 2.2 The Ratio of Business Establishments with Computers by Size of Firms (2003)

Firm Size	%
1-15 employees	10.1
16-25 employees	72.4
26-30 employees	68.7
31-50 employees	78.2
51-200 employees	90.1
more than 200 employees	97.4

Source: National Statistical Office (NSO)

Regarding the use of computers for education, the ratio of students per computer is rather high. That means computer resources have to be shared by among large number of students (Table 2.3). According to the National ICT for Education Master Plan (2004-2006) from Ministry of Education, the number of students sharing one computer in primary schools, secondary schools, and vocational institutions targeted at 120, 54, and 23 respectively. However, the figures in Table 2.3 show that such targets have already been achieved, especially in primary and secondary schools.

Table 2.3 Students to Computer Ratio (2004)

Educational Level	Number of Students	Number of PCs	Number of Students per 1 PC
Primary	6,595,828	73,292	90
Secondary	2,539,657	105,674	24
Vocational	686,737	25,699	27
Higher Education*	645,089	78,290	8
Non-Formal Education	2,342,751	3,311	708

Source: Office of the Permanent Secretary, Ministry of Education (MOE)

Remarks: *Exclude private universities

In early 2004, the MICT initiated an "ICT for Children" project. The main objective was to increase ICT diffusion in schools, especially those that serve the deprived areas. Other objectives were to introduce social-engineering measures to increase ICT awareness and adoption in the community and to establish a scalable and sustainable framework for helping schools nationwide. Under this project, used computers were provided to rural schools. In addition, the ICT skills training were provided for both users in schools at all levels and for unskilled or unemployed people in the community.

III

Telecommunications

The Thai telecommunication sector has just crossed the threshold. After long awaiting, the National Telecommunications Commission (NTC) was set up in October 2004. The market structure of the telecom sector in the absence of NTC remains unchanged from the year 2003, with the number of operators in both fixed-line and mobile sector the same as in 2003.

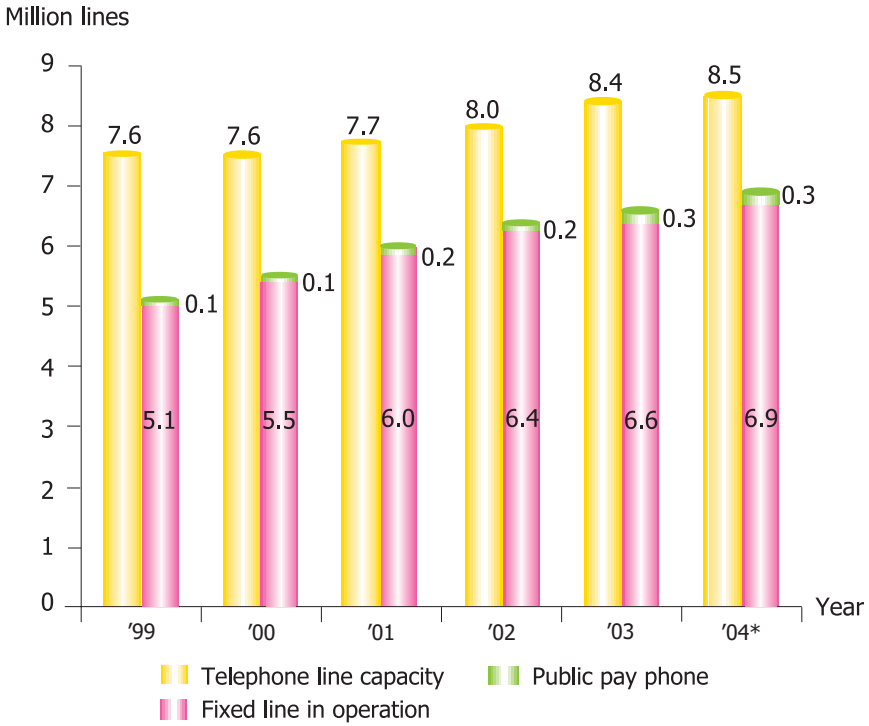
Fixed-line service providers include TOT Corporation Public Company Limited, True (previously TelecomAsia Corporation) and TT&T Public Company Limited. Solely international service provider is CAT Telecom Public Company Limited.

Mobile phone service operators are

- Advance Info Service Plc. (AIS): GSM 900-MHz and GSM 1800-MHz mobile phone
- Total Access Communication Plc. (DTAC): Cellular and digital 1800-MHz mobile phone
- TA Orange Company Limited: Cellular and digital 1800-MHz mobile phone
- Thai Mobile Company Limited: 1900-MHz CDMA mobile phone
- Hutchison CAT Wireless Multimedia Ltd.: CDMA mobile phone
- TOT Corporation Plc.: 470-MHz or cellular 470 mobile phone
- CAT Telecom Plc.: cellular AMPS 800 A-Band mobile phone

The growth in telephone penetration has been sluggish over the past couple of years, with number of fixed line subscribers increase only slightly. Although the fixed-line penetration in upcountry has been increasing at a greater rate than in Bangkok, the digital divide still prevails.

Figure 3.1 Number of Telephone Lines (1999-2004)

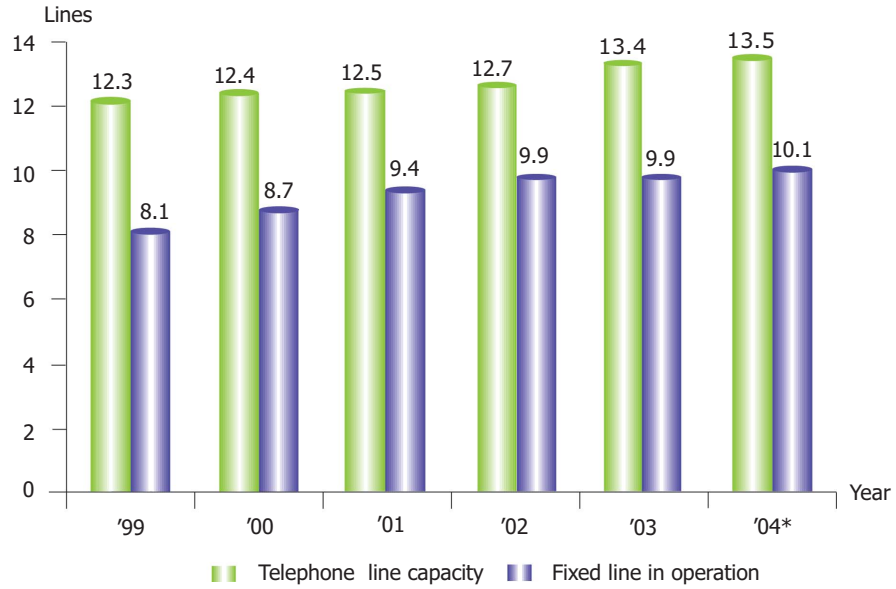


Source: TOT Corporation Plc. (formerly the Telephone Organization of Thailand)

Remarks: *as of March 2004

Note: All data presented in telecom section from 2002 onwards are collected in the calendar year. Previous data are in the fiscal year, which is the 12 months beginning October 1 of the year stated.

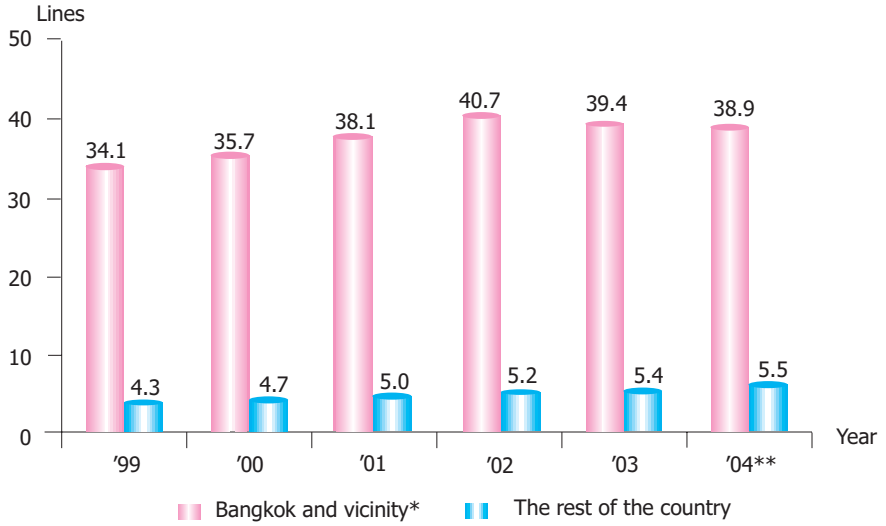
Figure 3.2 Number of Fixed Lines per 100 Inhabitants (1999-2004)



Source: TOT Corporation Plc. (formerly the Telephone Organization of Thailand)

Remarks: *as of March 2004

Figure 3.3 Number of Fixed Lines per 100 Inhabitants by Location (1999-2004)



Source: TOT Corporation Plc. (formerly the Telephone Organization of Thailand)

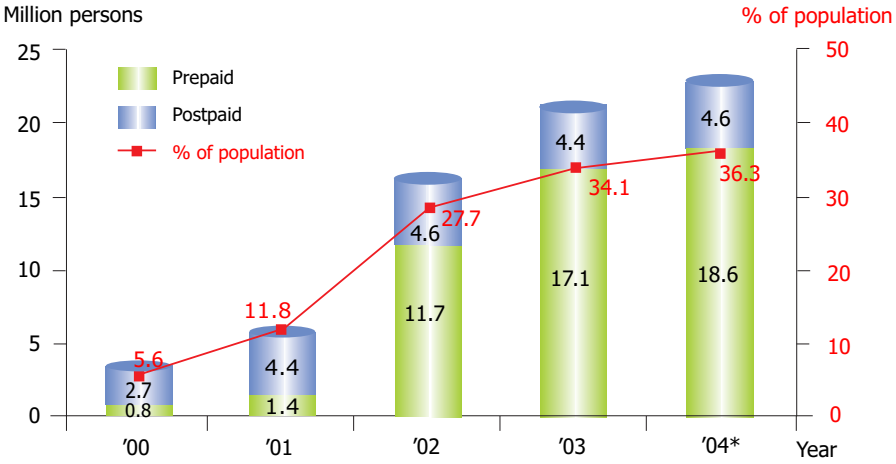
Remarks: *Vicinity includes Pathumthani, Nonthaburi and Samut Prakarn
**as of March 2004

The mobile market experienced an exponential growth in number of users from 5.8 million in 2001 to 16.3 million in 2002. The increase from 2002 to 2003, however, was merely half of that. The growth of mobile users in 2004 is expected to remain sluggish as the penetration has reached as high as 36.3%.

A rapid growth of mobile market in the past few years, nonetheless, has not yet solved the digital divide problem. As Figure 3.5 shows, only 13.3% of population in the Northeast region have access to a mobile phone, compared to 42.4% of population in Bangkok and vicinity.

The market is dominated by Advance Info Service Plc. (AIS) with 58.3% share, followed by DTAC 30.3%, Orange 8% and Hutch 2.5%. With regard to the system, 900 Mhz gains the highest 58.3%, followed by PCN 1800 (37.9%), CDMA (2.5%), AMPS 800 (0.7%), and 1900 MHz (0.6%) as presented in Figure 3.6.

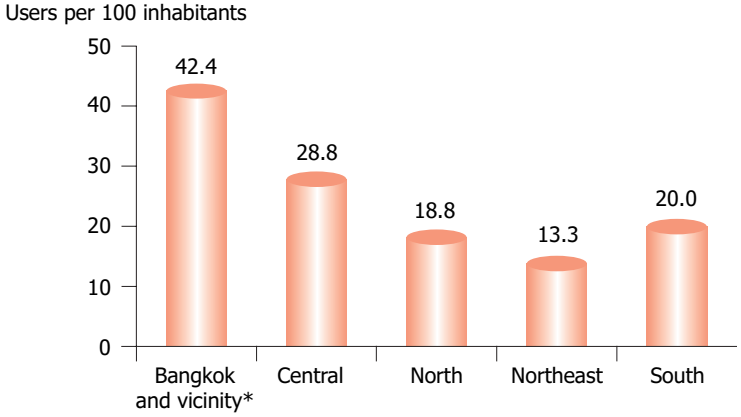
Figure 3.4 Number of Mobile Users (2000-2004)



Source: CAT-Telecom Plc. (formerly the Communications Authority of Thailand)
TOT Corporation Plc. (formerly the Telephone Organization of Thailand)

Remarks: *as of March 2004

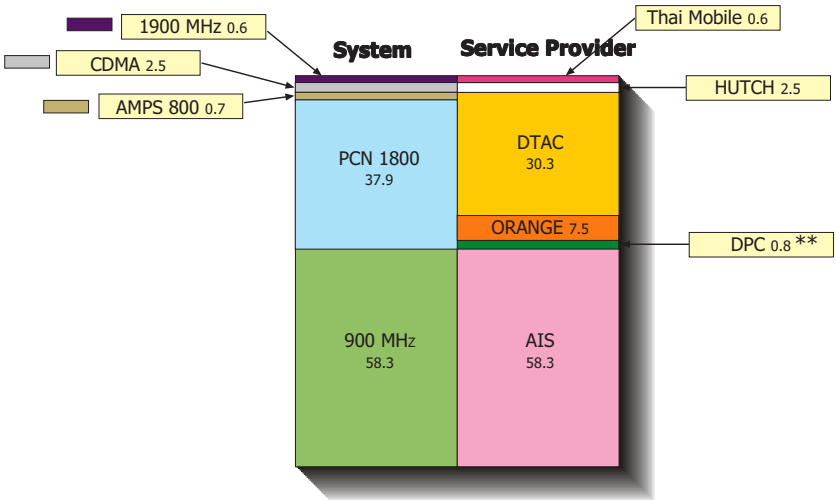
Figure 3.5 Number of Mobile Users per 100 Inhabitants by Location (2003)



Source: National Statistical Office (NSO)

Remarks: *Vicinity includes Pathumthani, Nonthaburi, Samut Prakarn, Samut Sakhon and Nakhon Pathom

Figure 3.6 Market Share of Mobile Phones by System and Service Provider (2004)



Mobile Users by System (2004*)

System	Number of Users	%
900 MHz	13,539,148	58.3
PCN 1800	8,815,356	37.9
CDMA	590,198	2.5
AMPS 800	150,220	0.7
1900 MHz	142,610	0.6
470 MHz	6,176	0
total	23,243,708	100

Mobile Users by Service Provider (2004*)

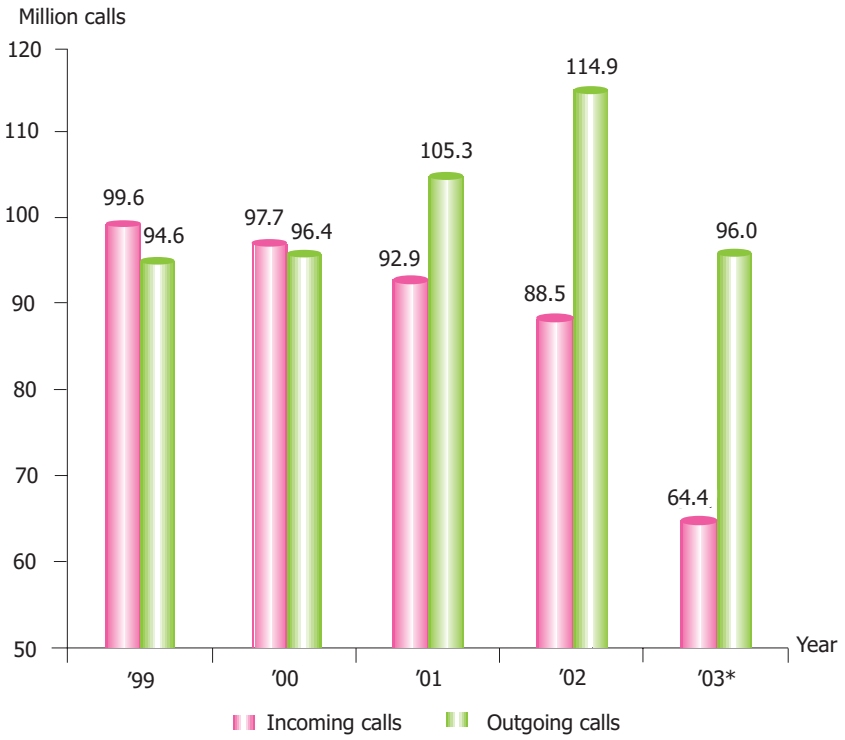
Service Provider	Number of Users	%
AIS	13,539,148	58.3
DTAC	7,029,979	30.3
Orange	1,743,384	7.5
Hutch	588,398	2.5
DPC**	192,213	0.8
CAT	1800	0.0
TOT	6176	0.0
Thaimobile	142610	0.6
Total	23,243,708	100.0

Source: CAT Telecom Plc. (formerly the Communications Authority of Thailand)
TOT Corporation Plc. (formerly the Telephone Organization of Thailand)

Remarks: *as of March 2004

** Digital phone Co.,Ltd (DPC) is 98.17% owned by AIS.

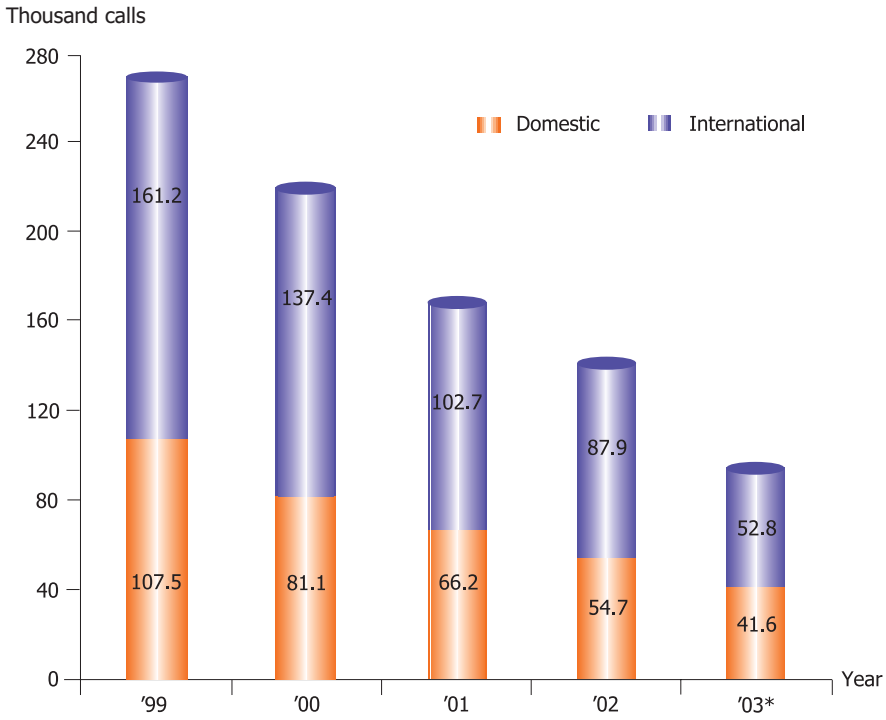
Figure 3.7 International Telephone Calls (1999-2003)



Source: CAT Telecom Plc., (formerly the Communications Authority of Thailand)
Remarks: *as of August 13, 2003

Previously, the competition in the telecom sector (fixed-line and mobile) tends to be on non-price area. Major operators, particularly mobile operators, compete using product differentiation through service quality, advertising and value-added services. However, price competition is now heating up. Fixed-line operators drastically cut down the price for long distance and international calls, reflecting in an increase in the ratio of outgoing calls to incoming calls as seen in Figure 3.7. For mobile, the price, particularly for pre-paid option, went down to as cheap as as one baht per minute.

Figure 3.8 Number of Telex Services (Outgoing) (1999-2003)

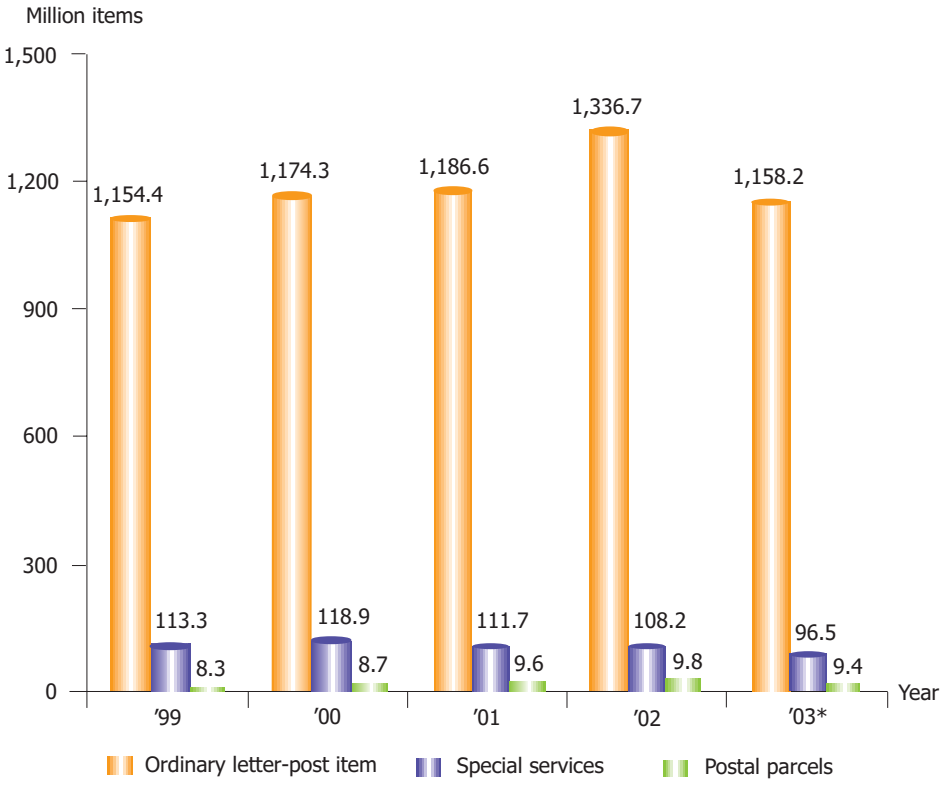


Source: CAT Telecom Plc. (formerly the Communication Authority of Thailand)

Remarks: *as of August 13, 2003

Telex service becomes the latest victim of ICT revolution as the number of outgoing calls went down sharply from 268.7 thousands in 1999 to 142.6 thousands in 2002. With just one quarter left in 2003, there is no sign of recovery since throughout the year only 94.4 thousand calls were made.

Figure 3.9 Number of Domestic Mails Received (1999-2003)



Source: CAT Telecom Plc., (formerly the Communications Authority of Thailand)
Remarks: *as of August 13, 2003

Although the emergence of ICT and the Internet as new mainstream communication tools has contained the use of telex service, postal service remains intact with the number of domestic mails received in the past five years constantly rising. Through three quarters of 2003, 1,158.2 million ordinary letter-post items and 9.4 million postal parcels have been delivered to the customers. These figures are well on course to break a 2002 record which both categories reached a high of 1,336.7 and 9.8 million items, respectively.

IV

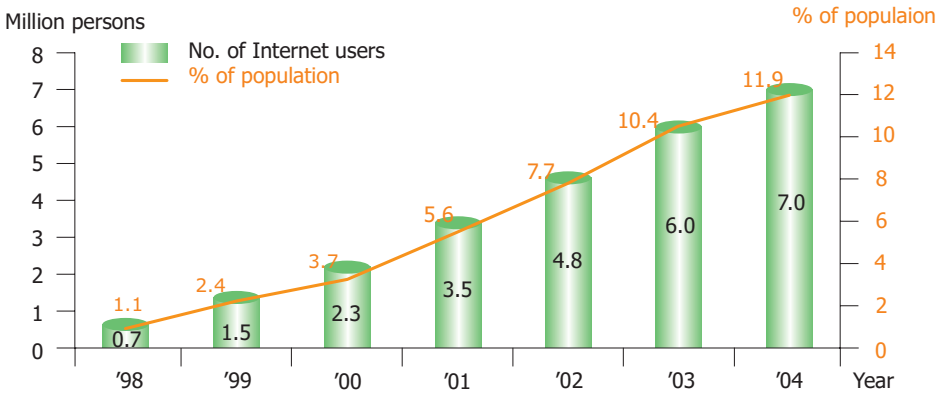
Internet

Internet is increasingly instrumental to information and knowledge access in the Thai society. It is also a vital infrastructure for business communication and transaction. The growth of Internet users is steadily increasing and reaches approximately 7 million users in 2004, equal to 11.9 users for every 100 population (Figure 4.1).

Internet users are concentrated in Bangkok and other big cities. Nevertheless, the proliferation of Internet users has recently emerged in all regions outside Bangkok (Table 4.1). There is no apparent gender divide in Thailand. Both men and women have nearly equal access to the Internet (Figure 4.3).

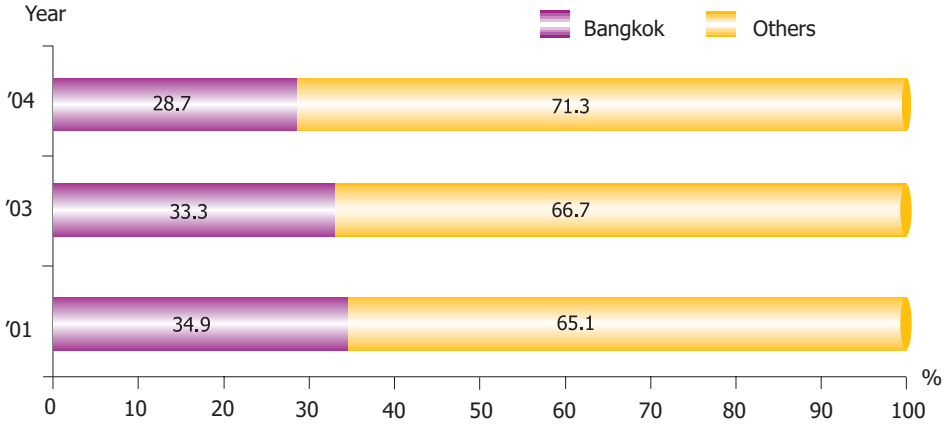
Another area where digital divide clearly presents is the distribution of users among different age group. Population at the age of 15-24 represents more than half of the Internet users. Elderly population (50 years old and over), on the other hand, represents only 3.2% of Internet users (Figure 4.4).

Figure 4.1 Number of Internet Users (1998-2004)



Sources: National Electronics and Computer Technology Center (NECTEC)
National Statistical Office (NSO)

Figure 4.2 Internet Users: Bangkok VS Others (2001-2004)



Sources: National Electronics and Computer Technology Center (NECTEC)

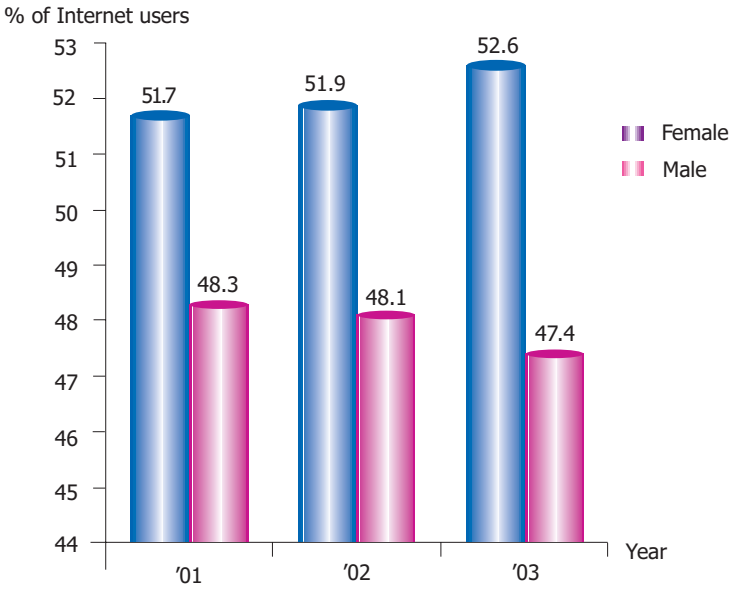
Table 4.1 Internet Penetration by Location (2001-2004)

Region	Number of users (million persons)			Users per 100 Inhabitants		
	2001	2003	2004	2001	2003	2004
Whole kingdom	3.53	6.03	6.97	5.6	10.4	11.9
- Bangkok and vicinity*	1.23	2.01	2.00	16.0	26.9	26.6
- North	0.52	1.34	1.52	4.6	10.1	11.2
- Central	0.83	1.00	1.21	5.9	9.7	11.4
- Northeast	0.56	1.07	1.49	2.6	5.6	7.7
- South	0.39	0.62	0.76	4.7	8.2	9.9

Source: National Statistical Office (NSO)

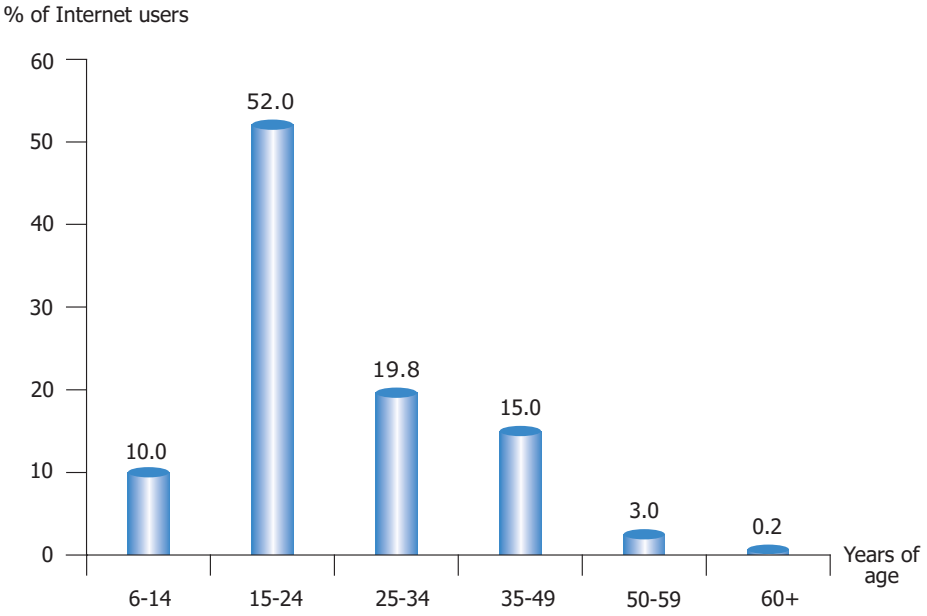
Remarks: *Vicinity includes Pathumthani, Nonthaburi, Samut Prakarn, Samut Sakhon and Nakhon Pathom

Figure 4.3 Internet Users by Gender (2001-2003)



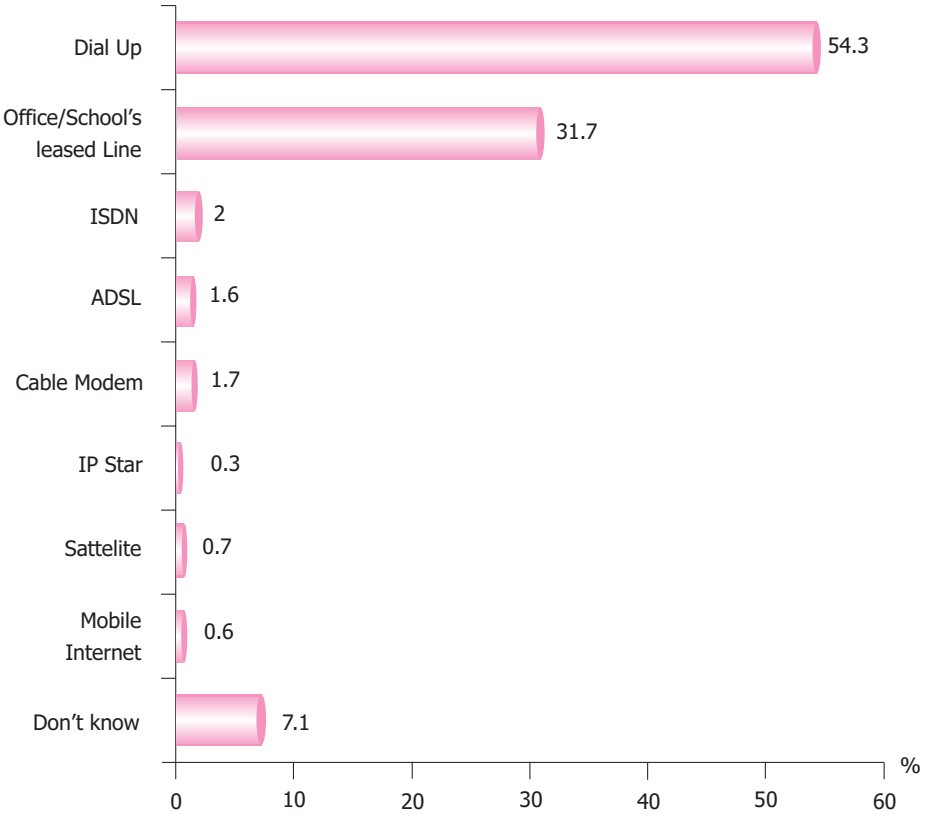
Source: National Statistical Office (NSO)

Figure 4.4 Internet Users by Age (2004)



Source: National Statistical Office (NSO)

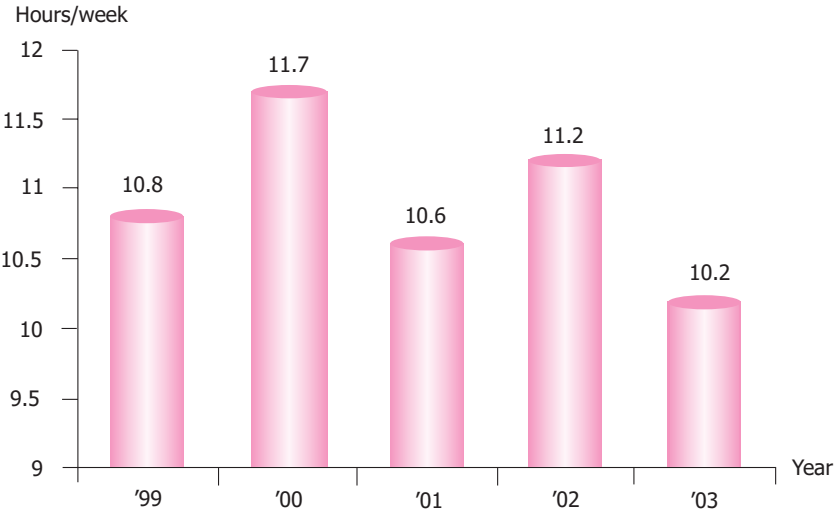
Figure 4.5 Mode of Access to the Internet (2003)



Sources: National Electronics and Computer Technology Center (NECTEC)

The government is actively promoting broadband development, with the aim to increase the number of broadband subscribers to 1 million by the end of 2004. Although there is no exact information on the number of broadband users, it is estimated that there are currently around 200,000.

Figure 4.6 Average Online Time per User (1999-2003)



Source: National Statistical Office (NSO)

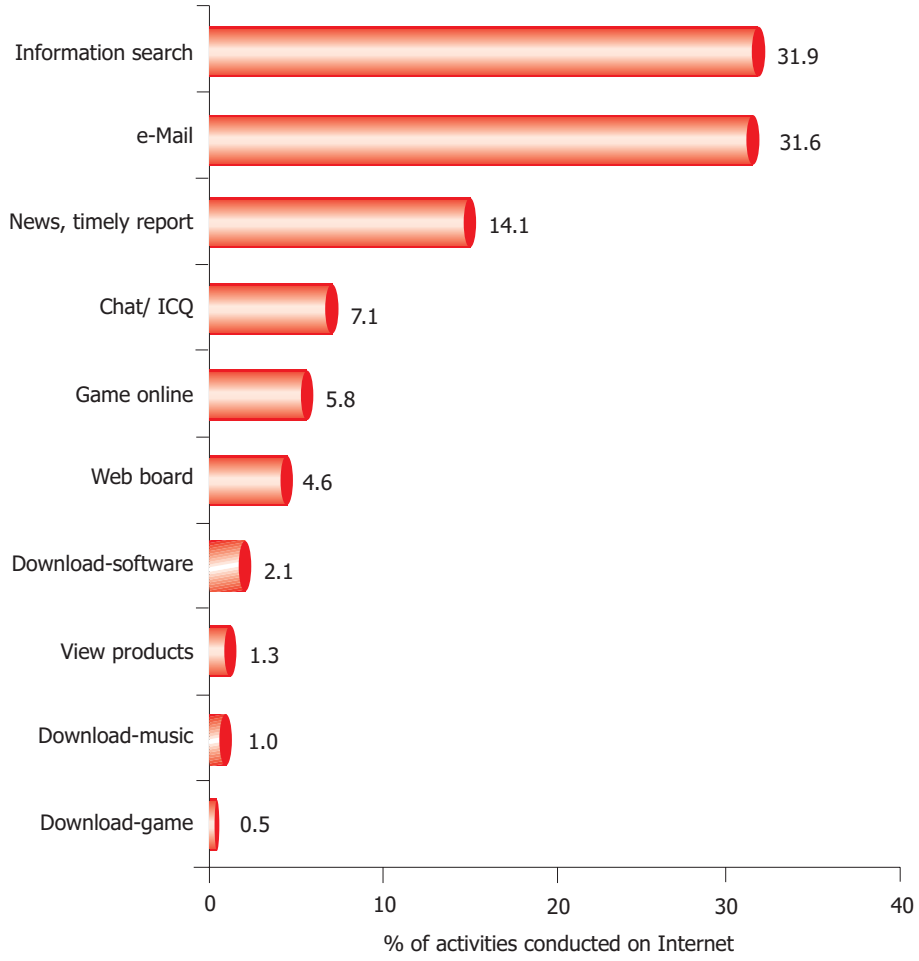
On average, users spend around 10-11 hours per week online. According to the latest Internet users survey (2003), most popular activities users conduct on the Internet are searching for information, using e-mail, and reading news and current issues (Figure 4.7). This pattern differs slightly from the previous years where e-mail was the most popular activity on the Internet. Nowadays the Internet is not just a communication channel but has become a common platform for information acquisition in the "Information Society".

In terms of entertainment, there was a rising popularity of "Online Games", which accounted for 2.3% and 5.8% of the activities on the Internet in 2002 and 2003 survey, respectively. Most players are younger than 20 years of age. The popularity of entertainment and games are confirmed by another statistics on the most frequently visited web sites in Table 4.2.

The popularity of online games has created a concern within the society for two main reasons: the excess amount of time being spent and the violent nature of some games. With the growing concerns that young people are becoming addicted to the online computer games, the Ministry of Information and Communication Technology (MICT) proposed the online gaming regulations, which was endorsed by the cabinet in November 2003. The new regulation would limit gaming among gamers under 18 years old to no more than three hours a day; ban online gambling; establish a new

registration process for places offering online gaming services; and run the awareness campaign on the negative impacts of game addiction. It will be sometimes before we can evaluate whether MICT approach is fruitful.

Figure 4.7 Top Ten Internet Activities (2003)



Source: National Electronics and Computer Technology Center (NECTEC)

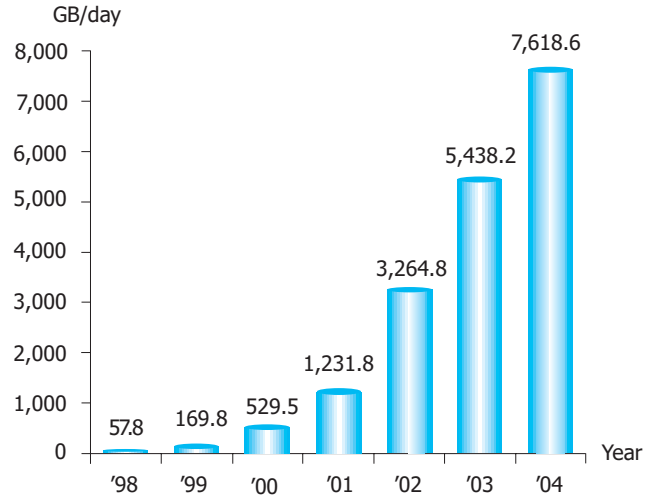
Table 4.2 Top Ten Most Visited Web Sites

Categories	% of Total Visited	
	Year 2002	Year 2003
1. Entertainment	33.1	29.6
2. Internet	24.9	26.0
3. Business	11.8	9.5
4. News	8.6	7.0
5. Person	6.0	6.0
6. Game	-	5.0
7. Shopping	-	3.3
8. Government	2.2	2.4
9. Computer	6.5	2.4
10. Education	2.2	2.1

Source: http://truehits.net, Jan-Dec average

The growth of Internet bandwidth is also impressive. However, since 2002, most ISPs have opted for high quality fiber links and symmetric satellite services. Hence, the figures presented are inbound and outbound capacities, reflecting the "infrastructure" more than actual use. The domestic Internet traffic has also increased considerably from a mere 57.8 GB per day in 1998 to 7,618.6 GB per day in 2004.

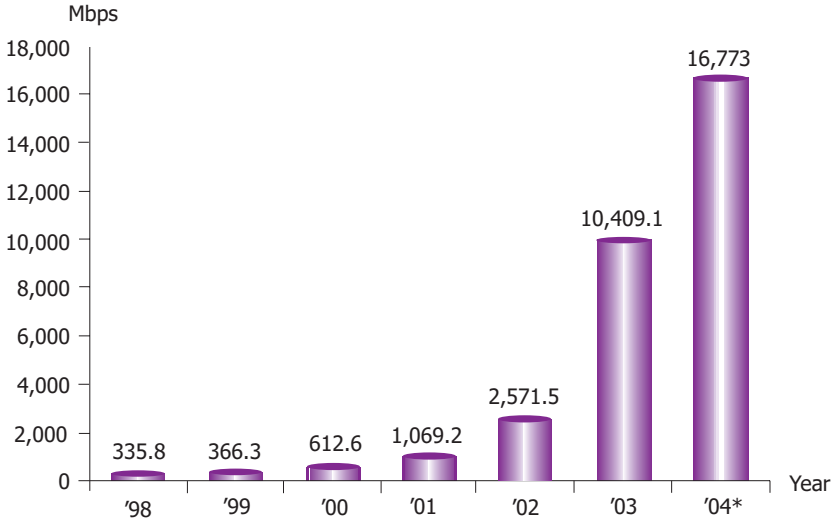
Figure 4.8 Thailand Domestic Internet Traffic Volume (1998-2004)



Source: National Electronics and Computer Technology Center (NECTEC)

Remarks: *as of March 2004

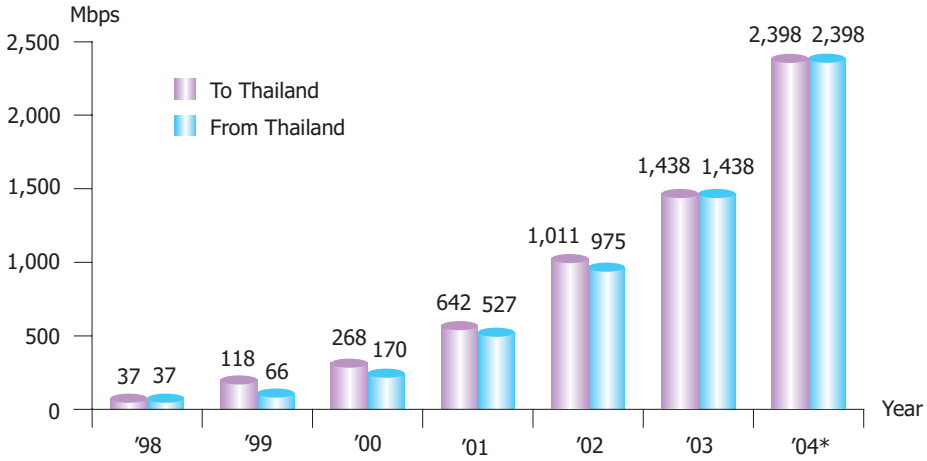
Figure 4.9 Total Domestic Exchange Bandwidth (End of Period) (1998-2004)



Source: National Electronics and Computer Technology Center (NECTEC)

Remarks: *as of June 2004

Figure 4.10 International Internet Bandwidth (1998-2004)



Source: National Electronics and Computer Technology Center (NECTEC)

Remarks: The international Internet bandwidth represents the capacity of the communication lines of the ISPs. During 1999-2002, many ISPs expanded their lines "simplex" satellite service in order to cope with their congestions in the inbound traffic. In late 2002, most ISPs opt for high-quality fiber links and symmetric satellite services. This resulted in equality between the inbound and outbound capacities.

*as of June 2004

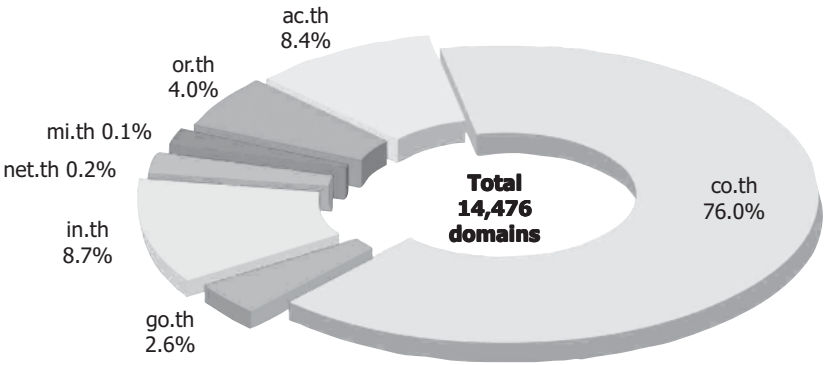
Table 4.3 Distribution of .th Domain Names (1997-2004)

Year	ac.th	co.th	go.th	in.th	mi.th	net.th	or.th	Total
1997	156	767	70	-	2	17	89	1,101
1998	230	1,730	88	-	4	18	160	2,230
1999	313	2,927	108	242	6	21	217	3,834
2000	423	4,774	210	804	7	23	312	6,553
2001	624	6,573	229	1,084	10	24	416	8,924
2002	839	8,354	265	1,181	14	27	484	11,164
2003	1,087	10,367	343	1,271	14	27	567	13,676
2004*	1,210	10,999	387	1,264	14	26	576	14,476

Source: T.H. NIC Company Limited

Remarks: *as of May 2004

Figure 4.11 Distribution of .th Domain Names (2004*)



Source: T.H. NIC Company Limited.
Remarks: *as of May 2004

In May 2004, there are 14,476 domain names under .th, representing an increase of 7.82% from 1997. The majority (76%) of .th domain names are business registration, i.e. under ".co.th" (Figure 4.0).

Over the past few years, many computer systems have been burdened by an increasing incidence of viruses and spam mails which represent a major threat to computer security. A Thailand Computer Emergency Response Team or ThaiCERT, for short, was established under NECTEC in 2000, to perform consultancy services and to quick respond queries as well as to take quick action on issues concerning computer security.

Table 4.4 shows the incidence of virus infected e-mails detected on 94 domains which were registered with the Government Information Technology Services (GITS) during September 2003 to August 2004.

It was found that the percentage of infected e-mails has been continuously increasing. This signifies the need to establish policies and/or measures to appropriately address the computer security issue. The task is now under the responsibility of the electronic transactions commission, through the sub-committee on e-security.

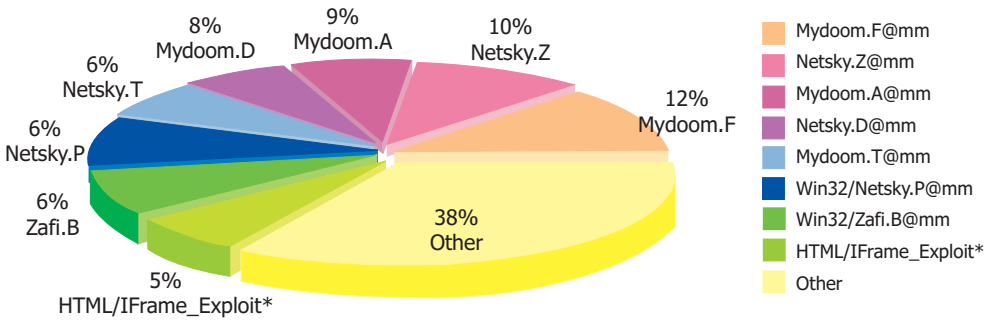
Table 4.4 Report of Virus Infected e-mails during December 2003 to November 2004

	Message	Infected	% of Infected e-Mails	Top Virus
Dec-03	1,336k	6k	0	HTML/IFrame_Exploit
Jan-04	1,946k	390k	20	Win32/Mydoom.A@mm
Feb-04	2,753k	961k	35	Win32/Mydoom.A@mm
Mar-04	5,337k	1,458k	27	Win32/Mydoom.F@mm
Apr-04	3,789k	1,359k	36	Win32/Mydoom.F@mm
May-04	4,309k	1,917k	44	Win32/Netsky.Z@mm
Jun-04	3,008k	2,084k	69	Win32/Netsky.Z@mm
Jul-04	5,613k	2,809k	50	Win32/Netsky.Z@mm
Aug-04	4,887k	2,657k	54	Win32/Netsky.Z@mm
Sep-04	2491k	1,750K	70	Win32/Netsky.Z@mm
Oct-04	2449k	1,697k	69	Win32/Mydoom.T@mm
Nov-04	5646k	3349K	55	Win32/Bagle.AS@mm

Source: http://mailcleaner.gits.net.th/mcstat/index, Government Information Technology Infrastructure (GITS)

Remarks: Statistics from 94 registered domains

Figure 4.12 Virus Distribution during December 2003 to November 2004



Source: Government Information Technology Service http://mailcleaner.gits.net.th/mcstat/index.php

The virus incident reported collection via Mailcleaner, virus and spam mail screening and cleaning service offered by the Government IT Services (GITS), during year 2003 to 2004 (as of November 2004) indicated that Mydoom.F was the majority type of infected virus in year 2004 with a share of 12%, whereas Netsky.Z and Mydoom.A came as the second and third major type of infected virus with a share of 10% and 9%, respectively. In addition, the report revealed that the highest infected rate has occured in September 2004.

V

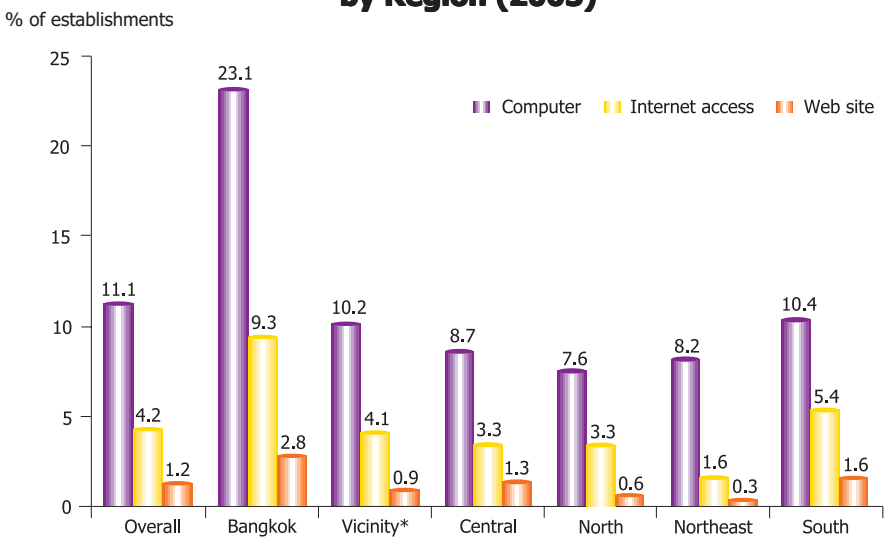
e-Commerce

The National ICT Masterplan (2002-2006) encourages business sectors, particularly small and medium enterprises which are the driving force behind the national development, to deploy ICT in order to boost up their competitiveness. ICT is to be applied in both manufacturing and marketing functions.

However, the diffusion of ICT among business establishments was limited and uneven. On average, 11% of business establishments have computers, whereas only 4.2% and 1.2% have access to the Internet and own web sites, respectively (Figure 5.1). The size of firms is related to the extent to which firms absorb new technology. By and large, the larger the firm is, the more likely it will own and use ICT in its business (Figure 5.2). Overall, computer is more widespread and commonly used than the Internet and web site.

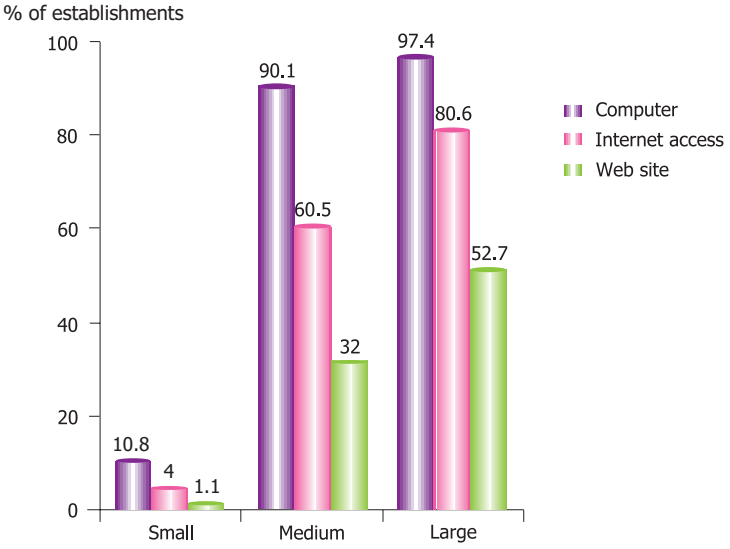
The disparity of ICT uptakes also exists among economic activities. Computer and related services is undoubtedly the most advanced sector, with 89.9% of its establishments having computers, 81.9% and 11.2% having Internet access and web sites, respectively. Research and development surprisingly comes in second with close records, 100% for computer usage and 79.2% for Internet access. However, none of the establishments in this sector has its own web site. For the rest, they are not much different, especially in the area of web site where the usage rate is minimal.

Figure 5.1 Percentage of Establishments with ICT by Region (2003)



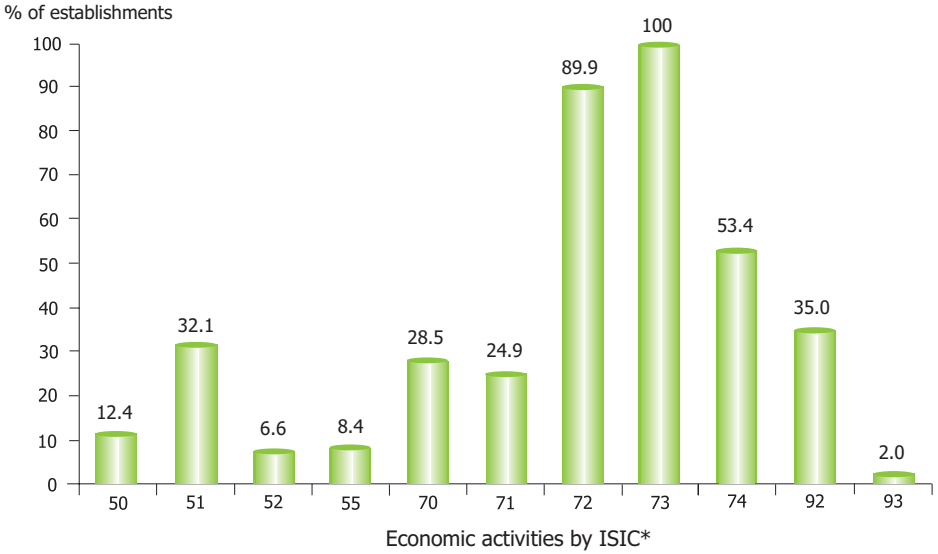
Source: National Statistical Office (NSO)
Remarks: *Vicinity includes Pathumthani, Nonthaburi, Samut Prakarn, Samut Sakhon and Nakhon Pathom

Figure 5.2 Percentage of Establishments with ICT by Size (2003)



Source: National Statistical Office (NSO)

Figure 5.3 Percentage of Establishments with Computers by Economic Activities (2003)



Source: The Report of the 2004 Information and Communication Technology Survey (Establishment), National Statistical Office (NSO)

Remarks: *List of Economic Activities by ISIC (International Standard Industrial Classification System)

List of Economic Activities

50 - Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel

51 - Wholesale trade and commission trade, except of motor vehicles and motorcycles

52 - Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods

55 - Hotels and restaurants

70 - Real estate activities

71 - Renting of machinery and equipment without operator and of personal and household goods

72 - Computer and related activities

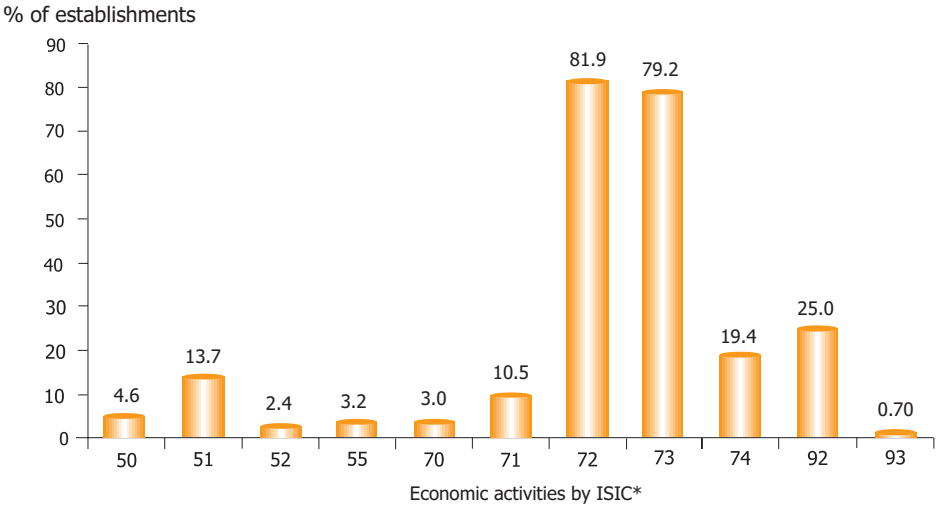
73 - Research and development

74 - Other business activities

92 - Recreational, cultural and sporting activities

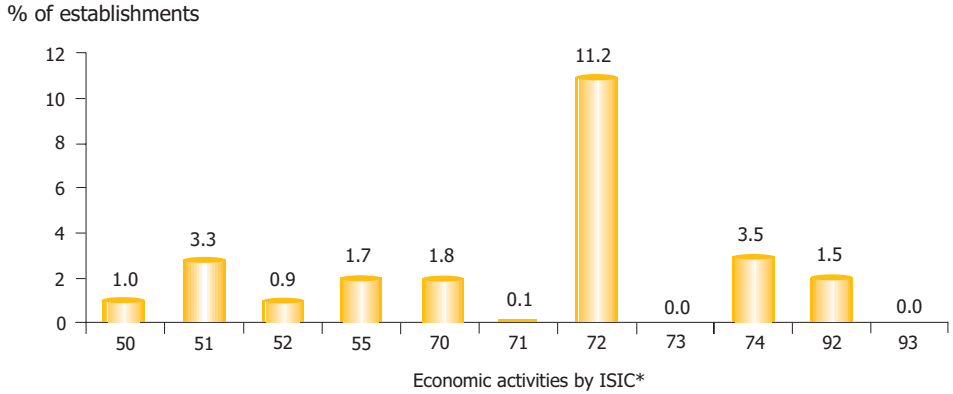
93 - Other service activities

Figure 5.4 Percentage of Establishments with Internet Access by Economic Activities (2003)



Source: The Report of the 2004 Information and Communication Technology Survey (Establishment), Natonal Statistical Office (NSO)

Figure 5.5 Percentage of Establishments with Web site by Economic Activities (2003)



Source: The Report of the 2004 Information and Communication Technology Survey (Establishment), Natonal Statistical Office (NSO)

The first ICT Indicator series discussed the difficulty in gathering information on e-Commerce. Since then, various government agencies have put further efforts in systematic data collection and analyzing statistics. The Department of Business Development, Ministry of Commerce, launched a program in May 2003 on Registration of E-commerce Entrepreneur which requires e-commerce entrepreneurs to register with the department in accordance with the Commercial Registration Act, 1956. Approximately 900 have registered 1,200 web sites so far. Three quarters of those businesses are located in the central region, and 77% are ".com" followed by ".co.th" and ".net" at 11% and 6%, respectively.

This registration program is not only a tool for data and statistics collection, but also a vehicle for e-Commerce promotion. The department will issue a Trustmark to qualified entrepreneurs by 2005. For consumers, this Trustmark provides them confidence in the credibility of the provider, thus, encourages them to purchase via e-Commerce.

According to a survey of 880 e-Commerce enterpreneurs, e-Commerce transaction value for B2B and B2C was estimated at 58,529.16 million baht. Meanwhile, as the government is driving towards e-Procurement, B2G transaction value has been rising from 182 million baht in 2002 to nearly 5,000 million baht in 2003.

Business-to-Consumer or B2C, on the other hand, is not well established in Thailand. According to the survey on Internet Users Profile of Thailand conduct annually by NECTEC, it is found that during 1999-2003, only 20% of Internet users have ever purchased goods/services via the Internet. When asked for the reasons to which users did not buy via e-Commerce, a number of issues came up. For instance, some users need to touch and feel the feelings to be confident in the quality of the products in question. Others were concerned with online security and fraud, particularly when they have to give out their credit card number on the Internet.

The year 2003 also witnessed the breakthrough of online trading, of which the value has reached 417,916 million baht, more than 600% increase from 2002. One of the main reasons behind the leapfrog was an enormous boost in the number of registered customers and active customers. The customers who registered to open an Internet trading account increased 140%, from 16,381 in 2002 to 39,882 in 2003. Out of this, approximately 25% was active customers who at least once ever traded online.

Figure 5.6 Registered e-Commerce Entrepreneurs (2004*)

Source: Department of Business Development (DBD), Ministry of Commerce
Remarks: *as of July 16, 2004

Figure 5.7 Registered e-Commerce Entrepreneurs by Location (2004*)

Source: Department of Business Development (DBD), Ministry of Commerce
Remarks: *as of July 16, 2004

Figure 5.8 Registered e-Commerce Web Sites by Domain Name (2004*)

Source: Department of Business Development (DBD), Ministry of Commerce

Remarks: *as of July 16, 2004

Figure 5.9 e-Commerce Transaction Value (2003*)

	Value (Mil. baht)	%
e-Commerce transaction value in total	63,436.42	100
B2B transaction value	57,812.23	91
B2C transaction value	716.93	1
B2G transaction value**	4,907.26	8

Question: What is your estimated value of transaction processed via e-Commerce or e-Marketplace?

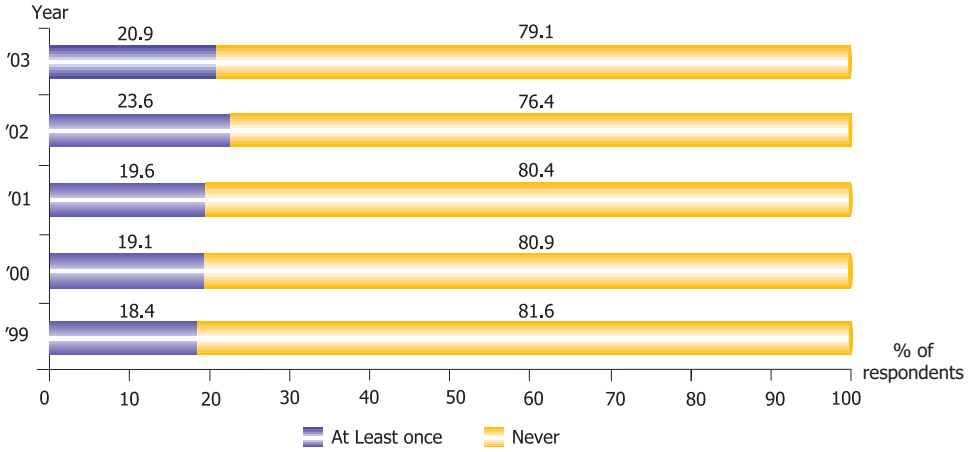
Sources: NECTEC, The Comptroller General's Department; Ministry of Finance

Based: A sample size of 60 e-Commerce key players in Thailand

Remarks: *Exclude transaction value of online trading. The value is compiled from two sources: NECTEC and the Comptroller General's Department

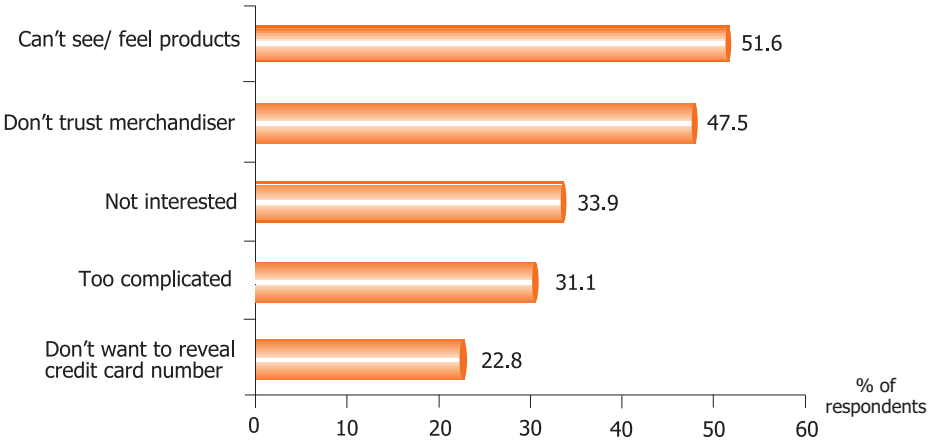
**The figure of B2G transactions is reported by the Comptroller General's Department

Figure 5.10 Internet Purchase Experience (1999-2003)



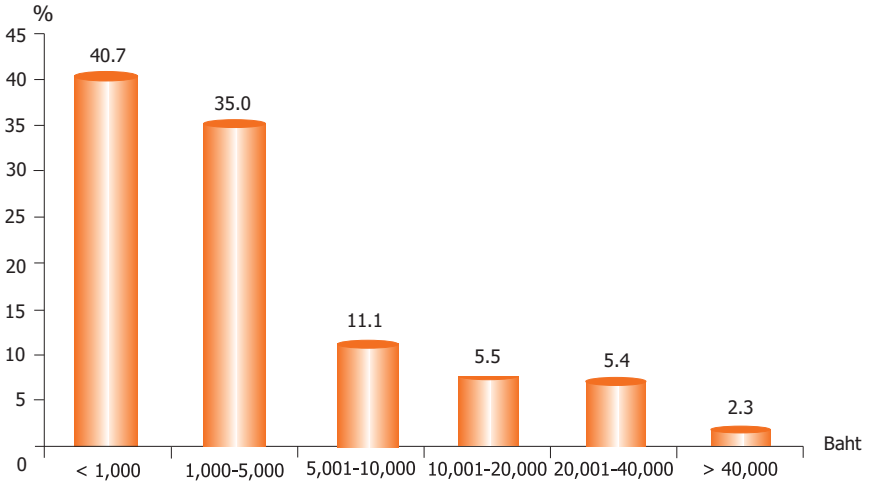
Source: National Electronics and Computer Technology Center (NECTEC)

Figure 5.11 Reasons Against Internet Purchase (2003)



Source: National Electronics and Computer Technology Center (NECTEC)

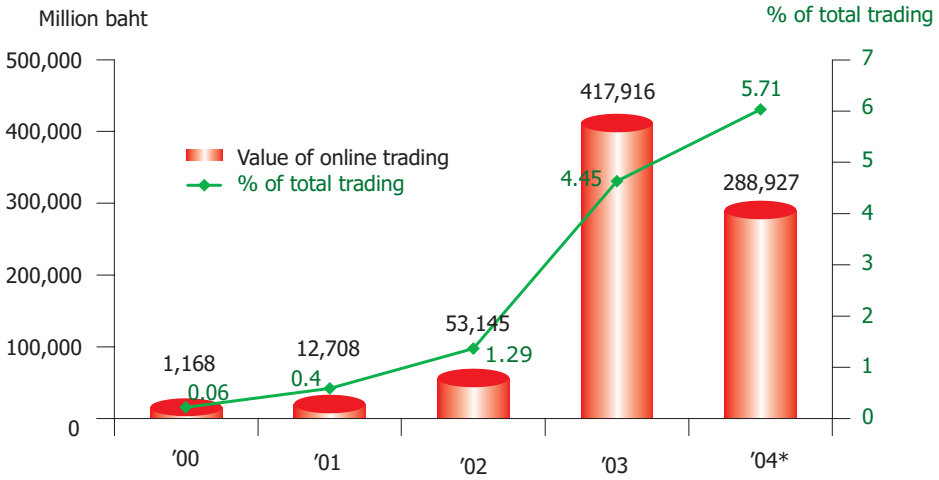
Figure 5.12 Online Spending (2003)



Question: What is your approximate online spending in the past year including online reservation? The payment can be either offline or online.

Source: National Electronics and Computer Technology Center (NECTEC)

Figure 5.13 Value of Online Trading (2000-2004)

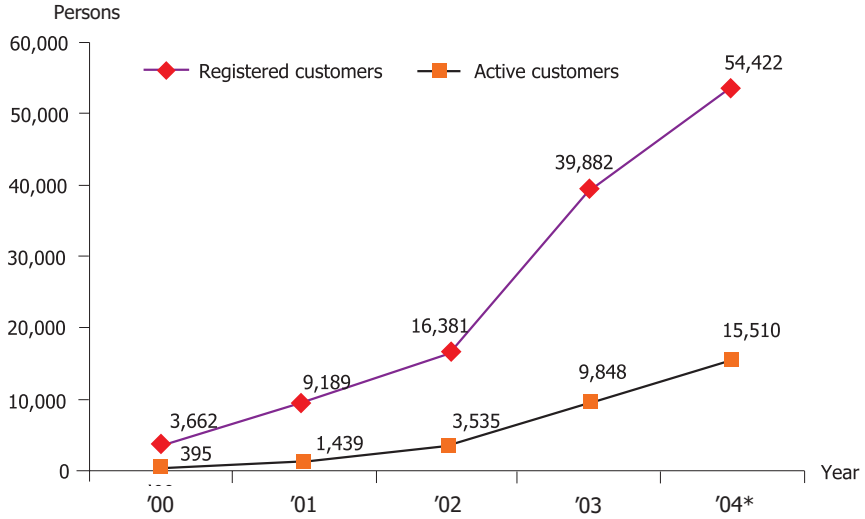


Source: Stock Exchange of Thailand (SET)

Remarks: *as of May 2004

(Exchange rate as of July 21, 2004, 1 USD = 40.89 Baht)

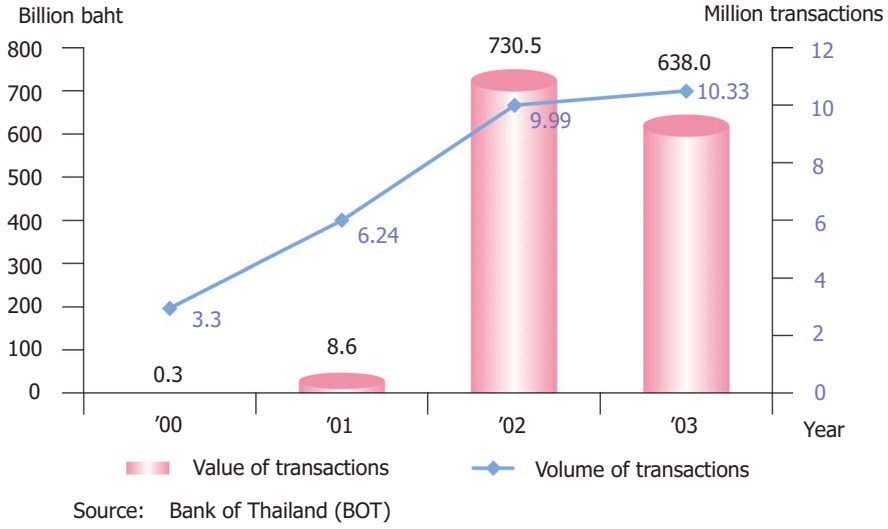
Figure 5.14 Number of Online Trading Customers (2000-2004)



Source: Stock Exchange of Thailand (SET)

Remarks: *as of May 2004

Figure 5.15 Value and Volume of Internet Banking Transaction (2000-2003)



Source: Bank of Thailand (BOT)

VI

IT Market and Industry

From year 1997 onwards, the Thai IT market is expanding continuously with an average growth rate of 17% annually. The total market for 2004 is estimated to be 103,191 million baht, with the share of hardware, software and IT services at 66% (69,193 million baht), 17% (17,934 million baht) and 17% (18,064 million baht), respectively. Over the past seven years, hardware market hold the biggest share at the average of 62%, followed by IT services at 20% and software market at 18%. In terms of growth, hardware market grows the fastest at 21%, while software and IT services grow at 17% and 12%, respectively.

From the demand side, during 1997-2004, the government, manufacturing, and telecommunications were among the major IT spenders. Their spending individually ranges from 14-16% of the market. From the household side, the home use accounted for 16% of the market, whereas health care and hotel appeared to be the least spenders, with the spendings together accounted only approximately 2% of total market.

The total value of software market in 2003 was reported at 14,129 million baht. The major source of spending came from a manufacturing sector and a government sector, each accounted for approximately 18% of the market, followed by an education sector (14%). Those sectors, with spending less than 5% were agriculture (3%), entertainment (2%), health care (1%) and transportation (1%).

However, this market value did not account for the pirated software. The study conducted by the Business Software Alliance (BSA) reported that, in 1994, the piracy rate was at 87%, which was equivalent to 17.06 million baht in revenue lost. From 1995 onward, the country has made a good progress and success in reducing the piracy rate to a level of 77% in the year 2001 and 2002, the lowest since 1994.

In the area of trade, Thailand has always been a net importer of ICT goods (Figure 6.4), with the value of imports approximately twice of the exports. In 2003, the import values accounted for about 5.73% of GDP, while the export values accounted for only 2.97%. Computer parts and computer accessories are among the top ICT imported items. Oftentimes, these parts and accessories were used in the local assembly plant and re-exported as finished ICT goods.

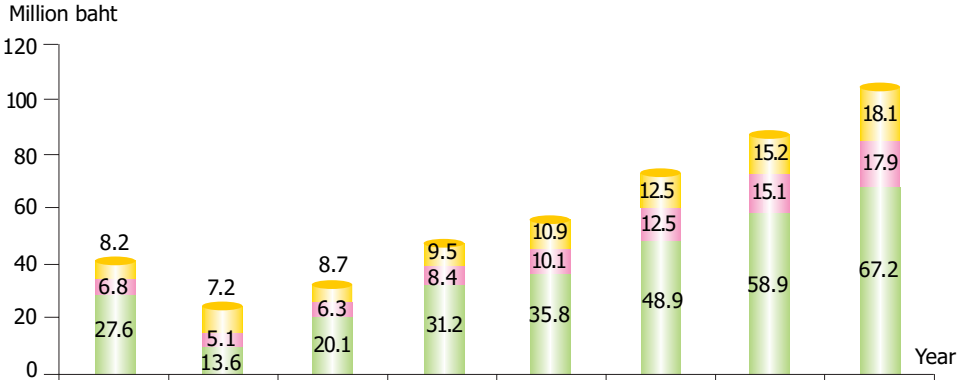
Table 6.1 Thailand IT Market by Category (1997-2004)

Million baht

Category	Year																Average Growth Rate	Average of Share
	1997		1998		1999		2000		2001		2002		2003		2004			
	Value	% change	Value	% change	Value	% change	Value	% change	Value	% change	Value	% change	Value	% change	Value	% change	(Y'97-'04)	(Y'97-'04)
Hardware	27,596	-	13,597	-51%	20,110	48%	31,275	56%	35,819	15%	48,879	36%	50,331%	3%	67,193	37%	21%	62%
(Mkt Share)	65%		52%		57%		64%		63%		66%		63%		65%			
Software	6,851	-	5,126	-25%	6,289	23%	8,378	33%	10,125	21%	12,530	24%	14,129	13%	17,934	27%	17%	18%
(Mkt Share)	16%		20%		18%		17%		18%		17%		18%		17%			
IT Services	8,200	-	7,229	-12%	8,738	21%	9,486	9%	10,993	16%	12501	14%	15,260	18%	18,064	18%	12%	20%
(Mkt Share)	19%		28%		25%		19%		19%		17%		19%		18%			
Total	42,647	-	25,952	-39%	35,137	35%	49,139	40%	56,937	16%	73,910	30%	79,720	8%	103,191	16%	15%	

Source : The Association of Thai Computer Industry (ATCI)

Figure 6.1 Thailand IT Market by Category (1997-2004)



	'97	'98	'99	'00	'01	'02	'03	'04
Hardware	8,200	7,229	8,738	9,486	10,993	12,501	15,160	18,064
Software	6,865	5,126	6,289	8,378	10,125	12,530	15,086	17,934
IT Services	27,596	13,597	20,110	31,275	35,819	48,879	58,792	67,193

Source: The Association of Thai Computer Industry (ATCI)

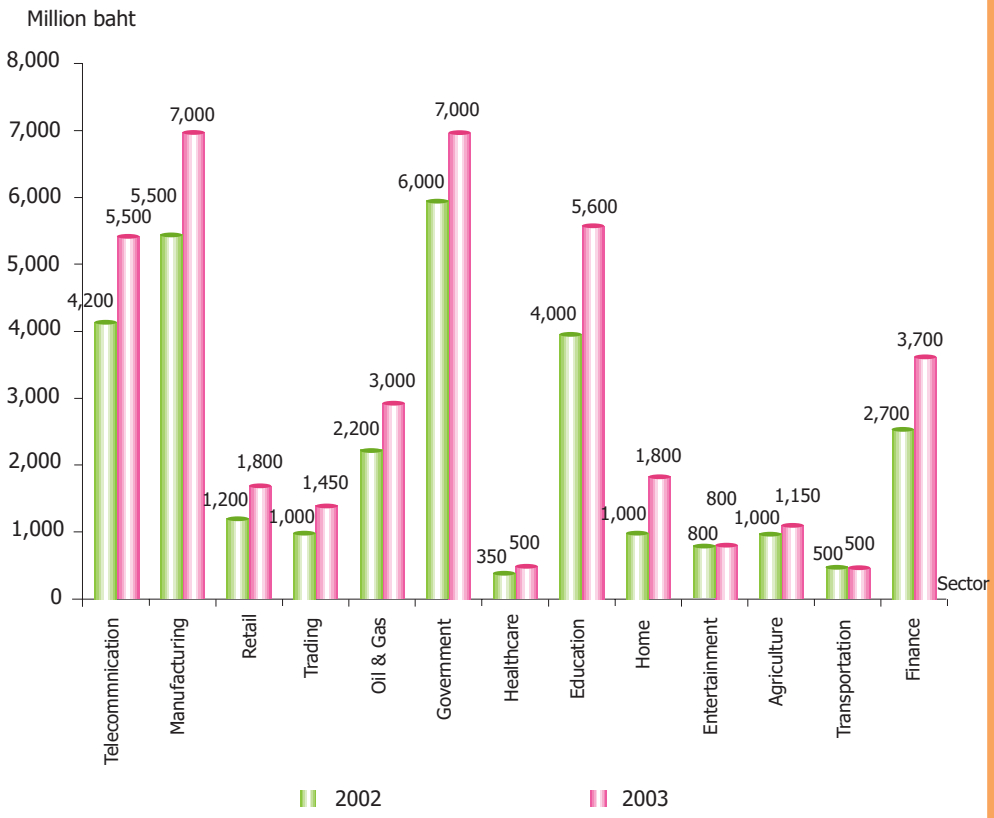
Table 6.2 Thailand IT Market by Industry Sector (1997-2004)

Value in million baht

Sector	1997		1998		1999		2000		2001		2002		2003		2004		Average
	Value	Ratio	Value	Ratio	Value	Ratio	Value	Ratio	Value	Ratio	Value	Ratio	Value	Ratio	Value	Ratio	Ratio
Government/State Enterprise	7,250	17%	3,374	13%	7,379	21%	8,845	18%	9,682	17%	11,384	16%	12,755	16%	15,300	15%	17%
Financial	5,118	12%	2,076	8%	3,162	9%	3,440	7%	3,987	7%	5,692	8%	7,175	9%	17,600	17%	10%
Manufacturing	6,823	16%	4,931	19%	6,325	18%	7,371	15%	9,112	16%	10,673	15%	11,161	14%	14,800	14%	16%
Health Care	1,279	3%	519	2%	703	2%	491	1%	570	1%	1,423	2%	2,392	3%	-	-	2%
Hotel	1,279	3%	519	2%	351	1%	491	1%	1,139	2%	2,135	3%	1,594	2%	-	-	2%
Telecommunications	5,544	13%	4,152	16%	4,216	12%	8,354	17%	10,252	18%	12,808	18%	14,350	18%	18,500	18%	16%
Education	5,544	13%	3,374	13%	3,865	11%	7,862	16%	9,112	16%	10,673	15%	11,958	15%	-	-	14%
Home Use	5,118	12%	3,633	14%	4,216	12%	8,354	17%	9,682	17%	11,384	16%	13,552	17%	22,000	21%	16%
Others	4,691	11%	3,374	13%	4,919	14%	3,931	8%	3,417	6%	4,981	7%	4,782	6%	14,992	15%	10%
Total	42,646	100%	25,953	100%	35,137	100%	49,139	100%	56,953	100%	71,153	100%	79,720	100%	103,191	100%	100%

Source: The Association of Thai Computer Industry (ATCI)

Figure 6.2 Software Industry Spending by Sector (2002-2003)



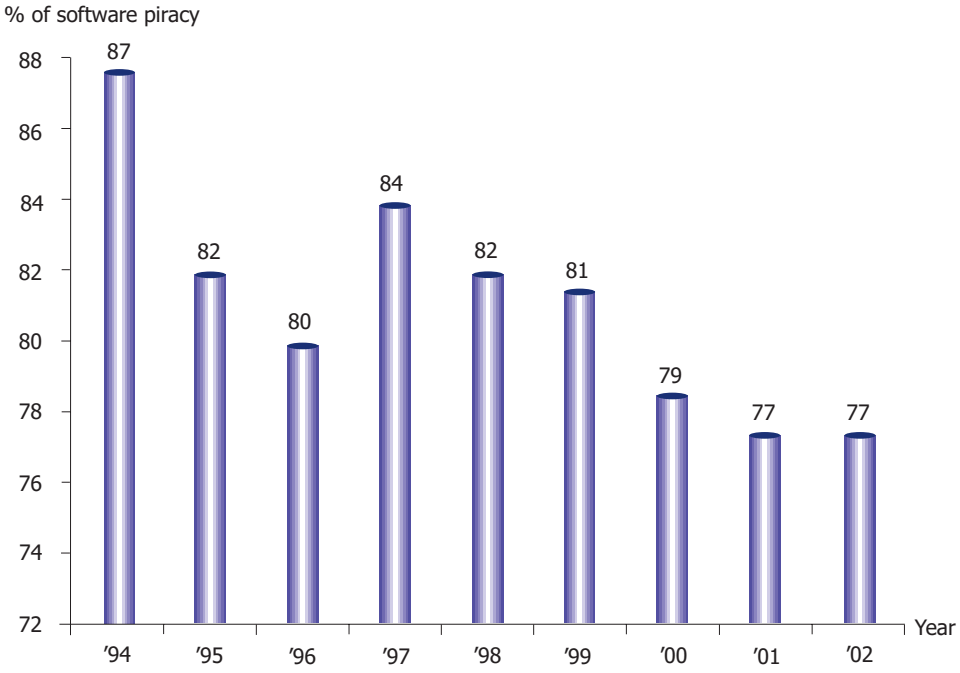
Source: The Association of Thai Software Industry (ATSI)

Table 6.3 Source of Software Revenue by Sector (2002-2003)

Sector	Share (%)	
	2002	2003
Government	20	18
Manufacturing	17	18
Telecom	14	14
Education	13	14
Financial	9	9
Oil & Gas	7	8
Retail	4	5
Home	3	5
Trading	3	4
Agriculture	3	3
Entertainment	3	2
Transport	2	1
Healthcare	1	1
Total	100	100

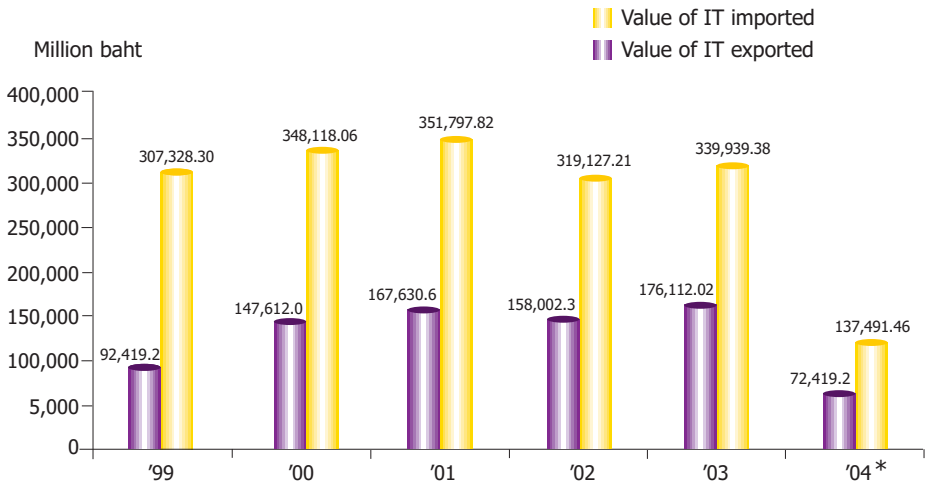
Source : The Associaton of Thai Software Industry (ATSI)

Figure 6.3 Software Piracy Rate in Thailand (1994-2002)



Source: Business Software Alliance (BSA)

Figure 6.4 Trade in ICT Goods (1999-2004)



Source: Customs Department, Ministry of Finance
Remarks: *as of May 2004

VII

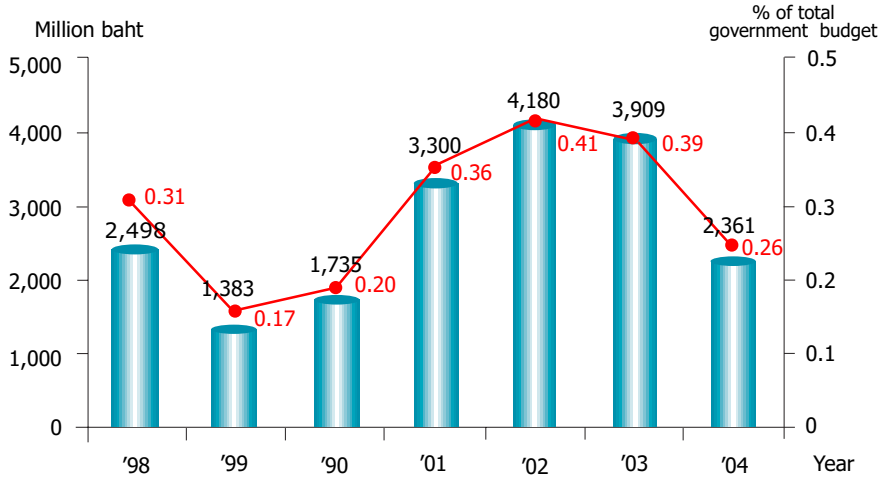
ICT in Government

The current Thailand ICT Policy Framework (IT 2010) and ICT Master Plan (2002-2006) calls for a promotion of ICT usage in the government or "e-government". Consequently, many initiatives/programs/projects have been implemented by various ministries, with the aim to achieve the "e-government" objectives and targets put forth by the MICT. According to research done by NECTEC, using the information provided by each ministry, the government has approved 1,095 IT projects with the total budget of 28,436.25 million baht in 2003. In 2004, the number of projects have dropped down to 1,078, while the total budget has significantly increased to 60,408.62 million baht.

Among those projects that were approved, it is worth to mention one large project that has received much interest from the media--the Smart Card Project. Proposed by the MICT, the project received the cabinet's approval in March 2004 with the total budget of over 7.9 billion baht. Such earmarked budget was to be used for producing and managing the distribution of 64 million smart cards to every Thai citizen. The first 12 million cards are expected to be ready for distribution in the fiscal year 2004.

One indicator that can be used to reflect government commitment on IT was the budget allocation. Figure 7.1 shows the government budget on computer equipment during 1998-2004, both in absolute term and as a percentage of the total budget, which indicates an increasing trend.

Figure 7.1 Government Budget on Computer Equipment* (1998-2004)



Source: The Bureau of the Budget, Ministry of Finance.

Remarks: *However, since the overall government IT budget is composed of several expenditure accounts, the expenditure on computer equipment can only reflect government spending on IT partially.

Table 7.1 Budget Approved for Computer in Fiscal Year 2005

No.	Ministry	Budget (Mil. baht)	%
1	Office of The Prime Minister	161.98	3.78
2	Ministry of Defense	133.17	3.09
3	Ministry of Finance	552.78	12.82
4	The Ministry of Foreign Affairs	51.38	1.19
5	Ministry of Tourism and Sports	26.68	0.62
6	Ministry of Social Development and Human Security	152.13	3.53
7	Ministry of Agriculture and Cooperatives	163.16	3.78
8	Ministry of Transport	182.06	4.22
9	Ministry of Natural Resource and Environment	8.46	0.20
10	Ministry of Information and Communication Technology	330.00	7.65
11	Ministry of Energy	35.28	0.82

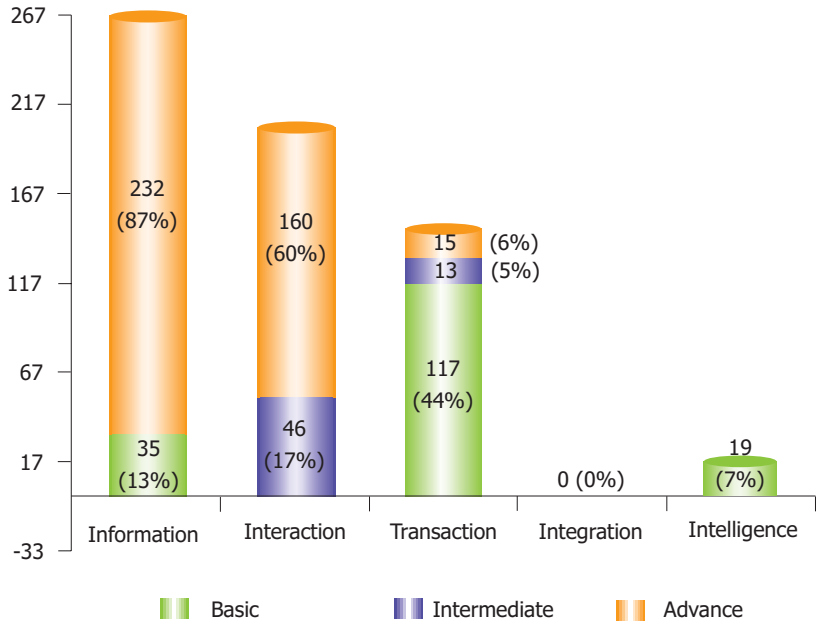
No.	Ministry	Budget (Mil. baht)	%
12	Ministry of Commerce	178.84	4.15
13	Ministry of Interior	282.59	6.55
14	Ministry of Justice	170.96	3.97
15	Ministry of Education	1,097.54	25.45
16	Ministry of Labour	41.62	0.97
17	Ministry of Culture	0.42	0.01
18	Ministry of Science and Technology	60.14	1.39
19	Ministry of Public Health	188.30	4.37
20	Ministry of Industry	35.37	0.82
21	Independent Public Agencies	172.13	3.99
22	Others	286.79	6.65
	Total	**4,311,786,500**	**100%**
	% of total government budget		**0.26**

Source: Report of the ad hoc subcommittee on the Budget Allocation on the Computer Procurement of the Government Agencies, fiscal year 2005, The secretariat of the House of Representatives

In early 2004, NECTEC has initiated the first on-line survey on government e-services called "Service e-Readiness Explorer" or SEE evaluation program (http://see.thaigov.net/actionPlan). The purpose was to evaluate the readiness of government web services, based on five-level of e-Government maturity, i.e., Information, Interaction, Transaction, Integration, and Intelligence, and to provide recommendations for future web service development to achieve high level of integration among various government agencies.

The survey revealed that all 267 government agencies have web sites (Figure 7.2) to provide information to the public. However, 13% of these sites were still at the basic level. A much lower percentage was found in the other four categories, i.e., Interaction, Transaction, Intelligence, and Integration, respectively. Especially in the integration, no web site with such features was reported. This may imply the lack of collaborarion among agencies or lack of systematic mechanism that encourages collaboration. Figure 7.3-7.5 shows the detail of service features under each category and the percentage of government e-services that have those features.

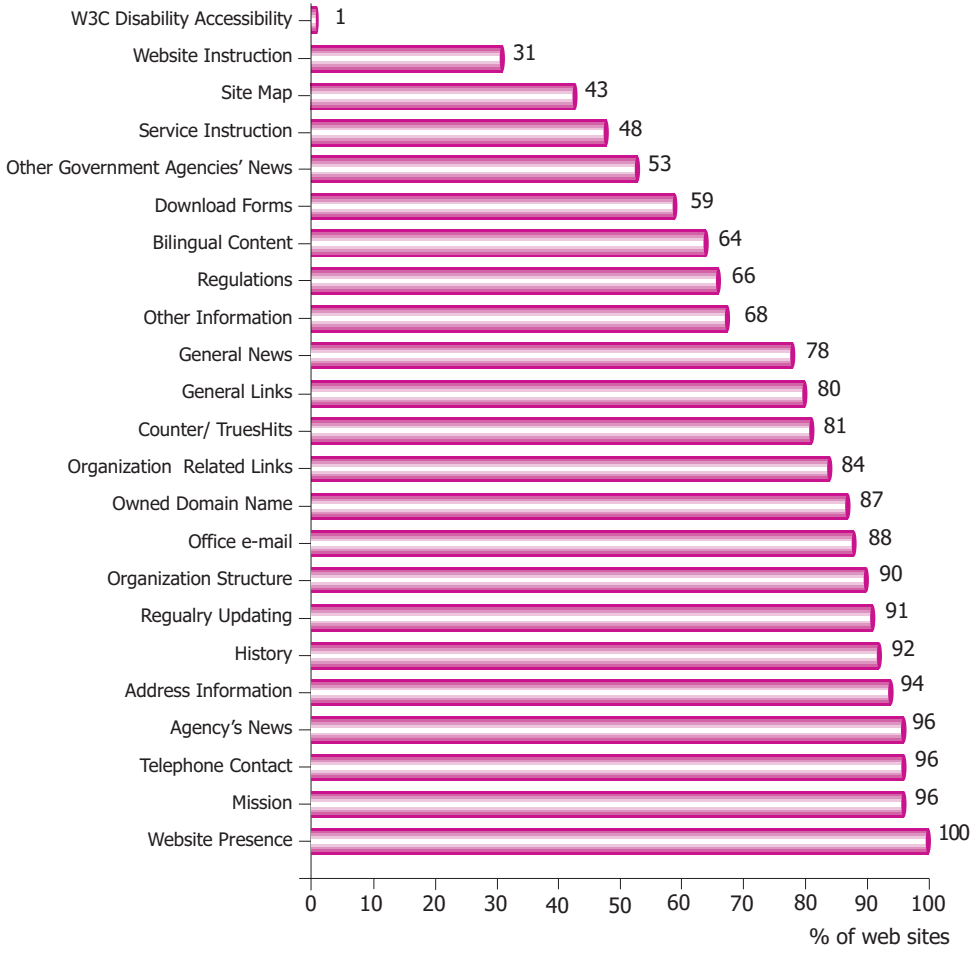
Figure 7.2 Number of Government Web Sites by Type of Online Services (2004)



Remarks: Total number of web sites surveyed is 267.

Source: National Electronics and Computer Technology Center (NECTEC)

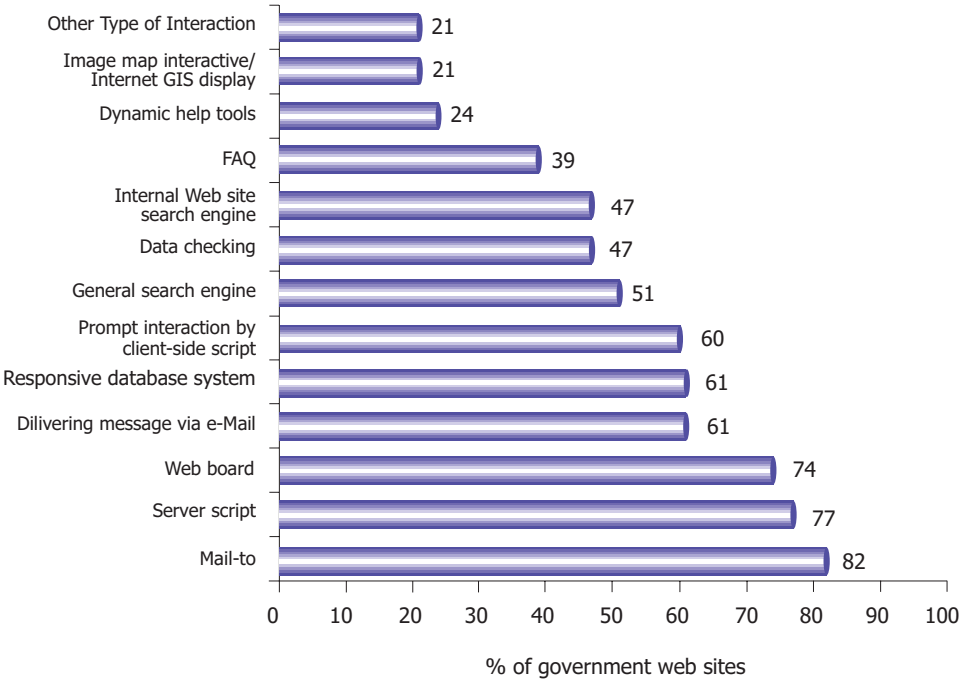
Figure 7.3 Basic Information on Government Web Sites (2004*)



Source : National Electronics and Computer Technology Center (NECTEC)

Remarks: *Survey of 267 government web sites during 16 January - 31 March 2004

Figure 7.4 Type of Interaction Feature on the Government Web Sites (2004*)



Source : National Electronics and Computer Technology Center (NECTEC)

Remarks: *Survey of 267 government web sites during 16 January - 31 March 2004

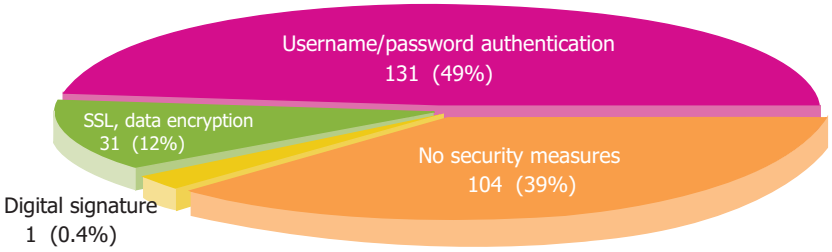
Figure 7.5 Type of Transaction Feature on Government Web Sites (2004*)

Source : National Electronics and Computer Technology Center (NECTEC)

Remarks: *Survey of 267 government Web sites during 16 January - 31 March 2004

Since security is among the most significant issue in the implementation of e-Government, we performed an assessment of the security system as currently found in the government web sites. The result was quite alarming. Out of 267 web sites surveyed, 104 web sites (39%) did not have any security system implemented, 131 (49%) used a simple security system, i.e., user name/password authentication, 31 (12%) used a more advanced system, i.e., Secured Socket Layer (SSL), and data encryption, and only 1 (0.4%) had imposed the strongest security measures, i.e., digital signature for encryption and authentication (Figure 7.6).

Figure 7.6 Security System on the Government Web Sites (2004)

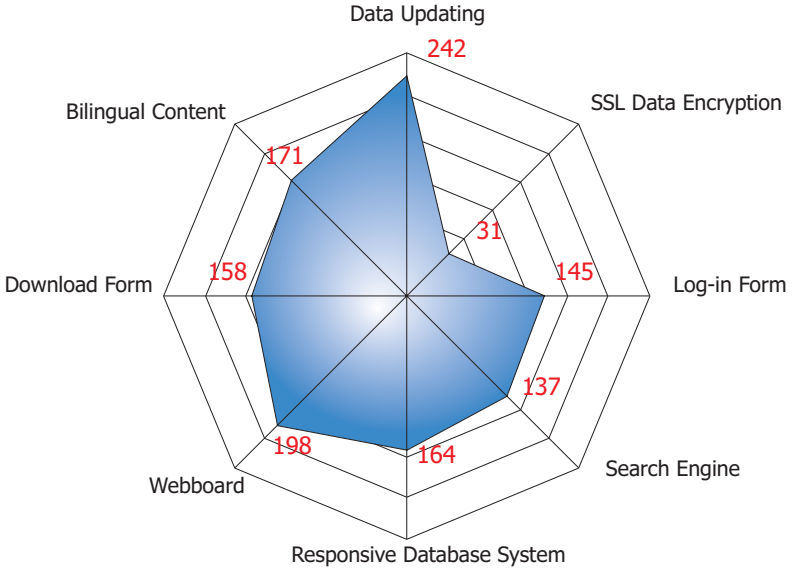


Source : Government Information Technology Infrastructure (GITI), National Electronics and Computer Technology Center (NECTEC)

Remarks: *Survey of 267 government web sites during 16 January - 31 March 2004

Apart from the security measures, we also performed an assessment of those 267 government web sites on seven other criteria, for example, having responsive database system, having webboard, having forms for downloaded, etc. The results were presented in Figure 7.7. The results confirmed the earlier findings that most web sites were fairly weak in the security aspect. This suggested that more efforts need to be put in implementing appropriate security measures to government e-services in order to provide more confidence to both service providers and users.

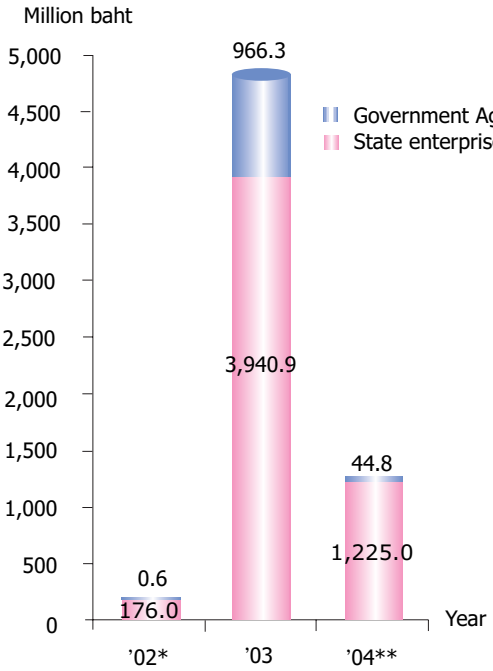
Figure 7.7 Main Assessment of Government Web Sites (2004)



Unit: No. of government web sites

Source: Government Information Technology Infrastructure (GITI), National Electronics and Computer Technology Center (NECTEC)

Figure 7.8 Value of Government e-Auction (2002-2004)



Source: The Comptroller General's Department

Remarks: *Project started October 2002
**as of March 2004

The 9th National Economic and Social Development Plan called for an increased provision of government services through ICT. To this end, the cabinet issued a measure on October 1, 2002 emphasizing that online procurement must be implemented in all government agencies. The target is to acheive the e-Procurement transaction value of 100,000 million baht by 2006. According to Figure 7.8, the transacation value in 2003 was approximately 5,000 million baht, or around 5% of the target set for the year 2006.

VIII

ICT Human Resources

Education plays a large part in building up the human capital. At present, the framework of education system in Thailand is based on the 1997 Constitution and the 1999 National Education Act, which provide principles and guidelines for the provision and development of the Thai education to prepare all Thais for the learning society.

In 2003, there was around 18.6 million school-age population, of which 14.2 million were actually enrolled in formal education. The gross enrollment rate for the year 1999 to 2003, at each level is presented in Table 8.1. In general, there was a slight decline in enrollment from the year 2002 to 2003.

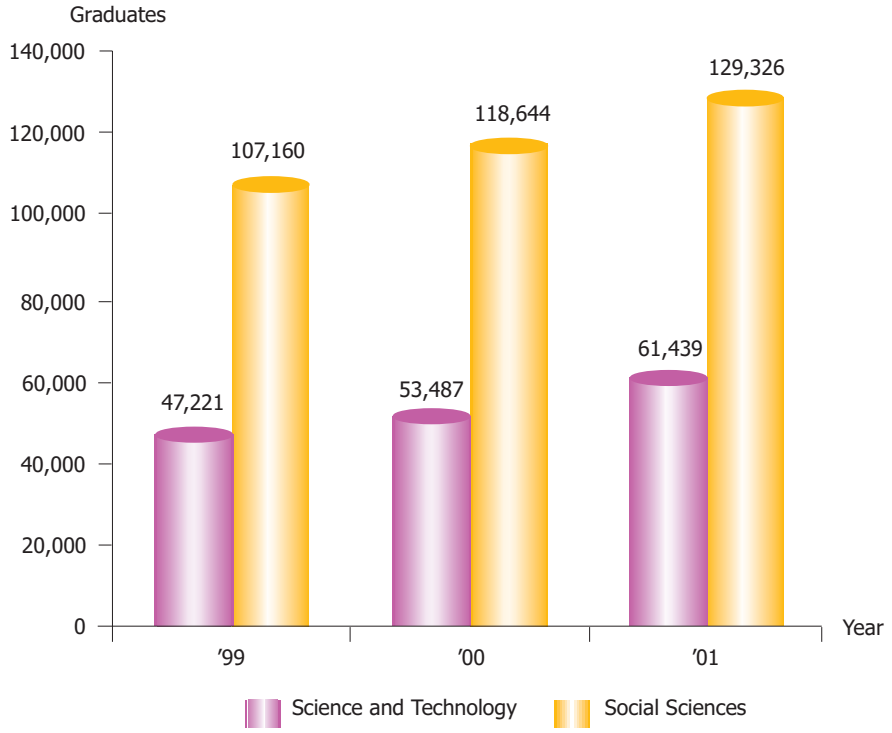
Table 8.1 Gross Enrollment Ratio

	1999	2000	2001	2002	2003
Pre-primary	96.2	95.7	93.1	90.6	87.7
Primary	102.3	103.2	103.8	104.8	104.4
Secondary	68.7	69.7	70.6	71.2	71.7
Lower secondary	83.4	82.8	82.2	82.2	84.6
Upper secondary	55.3	57.4	59.3	60.1	58.5
- General	33.2	36.7	38.9	38.8	37.5
- Vocational	22.1	20.7	20.4	21.3	21
Higher education*	22.5	23.7	26.1	42.9	29.5

Source: Office of the Educational Council (OEC), Ministry of Education
Remarks: Exclude students in open universities

There was an increase in the number of graduates from 154,381 in 1999 to 190,765 in 2001. However, the majority of graduates were from the field of social sciences, with the ratio of science and technology graduates to social sciences graduates at 31:69 (Figure 8.1). Currently, there are no data on the number of graduates in ICT field. The problem centered around the "obscure" boundary of what might be considered as "ICT courses/curriculum" due to the rapid evolution of the technology itself. In addition to traditional field of computer science, computer engineering and telecommunications engineering, there is a proliferation of applied courses such as business computing and e-Commerce which may have been classified by some school as "ICT-related" programs.

Figure 8.1 Number of Science and Technology Graduates vs Social Sciences Graduates (1999-2001)



Source: Thailand Science and Technology Profile 2004,
National Science and Technology Development Agency

Table 8.2 ICT Workforce (2001-2003)

ICT Workforce	2001		2002		2003	
	No. of Persons	%	No. of Persons	%	No. of Persons	%
Highly-skilled Job	**76,514**	**27.1**	**68,567**	**22.6**	**77,529**	**24.2**
Computer professional	21,099	7.5	19,888	6.6	20,241	6.3
Computer-related personnel	17,736	6.3	16,247	5.4	21,795	6.8
Optometry and electronics personnel	37,679	13.3	32,432	10.7	35,493	11.1
Low-skilled Job	**206,084**	**72.9**	**234,501**	**77.4**	**242,519**	**75.8**
Electrical and electronics technicians	206,084	72.9	234,501	77.4	242,519	75.8
Total	**282,598**	**100.0**	**303,068**	**100.0**	**320,048**	**100.0**

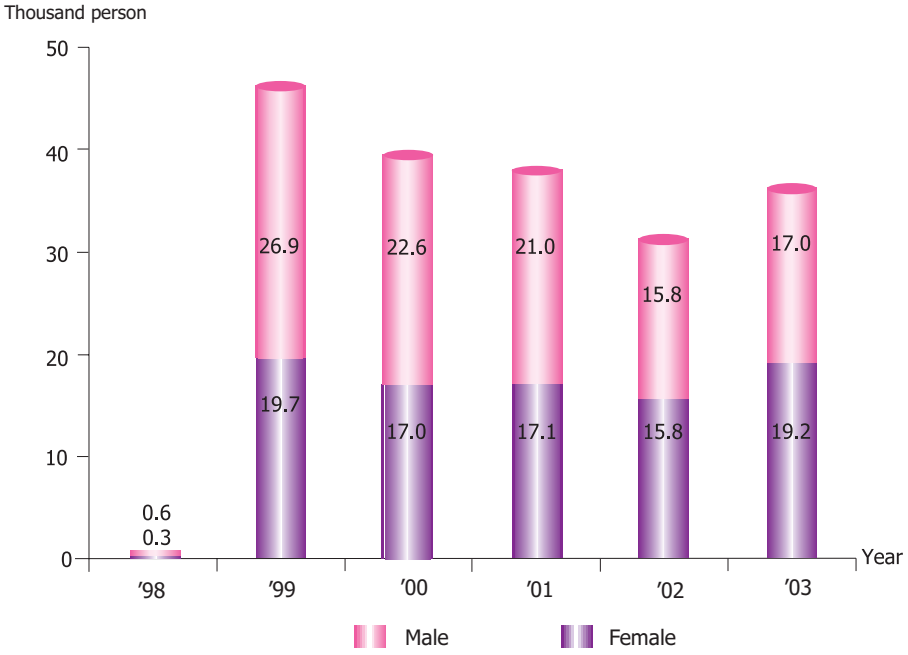
Source: National Statistical Office (NSO)

From the labour force survey conducted by the NSO in 2003, there were approximately 320,048 ICT personnel in Thailand or 9.5 ICT personnel per every 1,000 workforce. However, around three quarters of those (75.8%) worked in relatively low-skilled jobs (Table 8.2).

Among ICT personnel, the Thai government has paid considerable attention to software personnel. The Software Industry Promotion Agency (SIPA) speculates that there are currently around 30,000 software personnel in the market. The demand projected for the year 2008 is 100,000 persons, of which educational institutions are expected to be able to deliver approximately 40,000. Anticipating the personnel shortage, SIPA is working on the program to provide short courses and non-degree programs to convert non-ICT personnel into the field.

Other agencies also contribute to the development of ICT workforce and ICT literacy in the country. For example, NECTEC offers short courses for advanced users, while Software Park Thailand organizes a number of specialized courses aiming at high-end software developers. The Ministry of Labour has also embarked the program to train general IT knowledge for the workforce at large. The number of workforce trained by the Ministry of Labour is one of the indicators used to monitor the progress on social capability reinforcement activity which is one strategy indicated in the current ICT Master plan.

Figure 8.2 Number of Workforce Attended and Completed IT Training from the Ministry of Labour (1998-2003)



Source: Ministry of Labour

IX

Research & Development

Research and development is a foundation for knowledge generation and innovation, particularly in science and technology. Knowledge, in turn, is a vital production factor in the development of the knowledge-based society/economy. Indicators related to research and development can be categorized into two main types: R&D expenditures and R&D personnel. R&D expenditures are often classified by (a) sector of performance or (b) source of funding. R&D personnel include reseachers, assistant researchers (or technicians) and supporting/administrative staffs.

According to the National Research Council of Thailand, Thailand spent a total of 11,065 million baht on research and development, an equivalent to 0.22% of GDP, in 2001. Despite representing a small percentage in GDP, it was a large increase, approximately 100% from 1999 (Table 9.1).

Table 9.1 National R&D Expenditures (1991-2001)

Year	R&D expenditures (Million baht)	R&D expenditures/GDP (%)
1991	3,928.05	0.16
1993	4,473.41	0.14
1995	5,174.24	0.13
1996	5,528.13	0.12
1997	4,811.23	0.10
1999	5,021.76	0.11
2001	11,065.00	0.22

Source: National Research Council of Thailand (NRCT), 2001 National Survey on R&D Expenditures and Personnel of Thailand

Remarks: Public and Private expenditures are included

The figures from 2001 indicate that there was a high concentration of R&D activities in government, whether as a sector of performance or a source of funding. Notwithstanding different data collection approach, the government budget allocation for research and development activities for the year 2001 and 2002 also confirmed science and technology at the top of R&D spenders.

Table 9.2 Budget Allocation for Research and Development, by Field of Research (2001-2002)

(Million baht)

Field of Research	2001	2002
Science and Technology	3,761.4	3,251.8
Agriculture	3,026.0	2,919.7
Education	1,302.6	1,378.9
Health	418.7	485.1
Environment	127.6	296.5
Industry	70.3	25.5
National Security	35.1	34.8

Source: National Science and Technology Development Agency (NSTDA), Thailand Science and Technology Profile 2004

Remarks: The Figure from the Budget Bureau which devises the R&D budget into 7 areas.

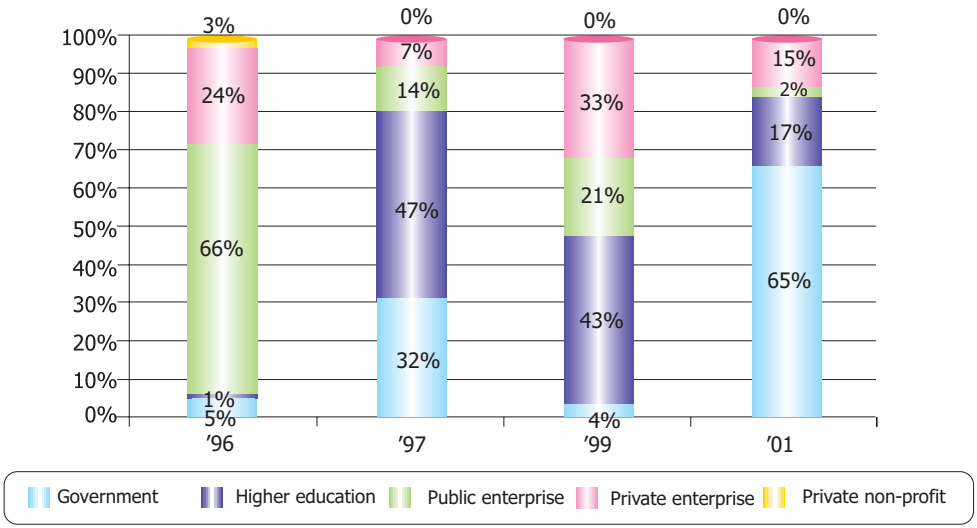
ICT R&D expenditures also experienced an impressive growth from approximately 108 million baht in 1997 to 406 million baht in 2001 (Table 9.3). However, it contributed only 3.68% of the total R&D expenditures in Thailand, with the majority (65%) being spent from the government sector. When looking at the distribution of expenditures across sector during 1996-2001, some fluctuations in ratio were observed. This might partly be a reflection in the change of methodology involved. A number of semi-autonomous organizations, including the National Science and Technology Development Agency, which had previously been classified as public enterprise has now been re-classified and grouped as "government" sector starting in the year 2001. The breakdown figure, therefore, should be treated with caution.

Table 9.3 ICT R & D Expenditures by Sector (1996-2001)

Sector	Year			
	1996	1997	1999	2001
Government	13,971,817	34,475,062	5,983,915	266,145,661
Higher education	4,141,566	51,459,362	66,263,798	70,725,274
Public enterprise	185,415,611	15,440,991	32,567,776	9,461,79
Private enterprise	67,954,862	7,118,000	51,076,815	60,617,914
Private non-profit	8,934,088	-	-	-
Total	280,417,944	108,493,415	155,892,304	406,950,647

Source: National Research Council of Thailand (NRCT)

Figure 9.1 The Ratio of ICT R&D Expenditures by Sector (1996-2001)



Source: National Research Council of Thailand (NRCT)

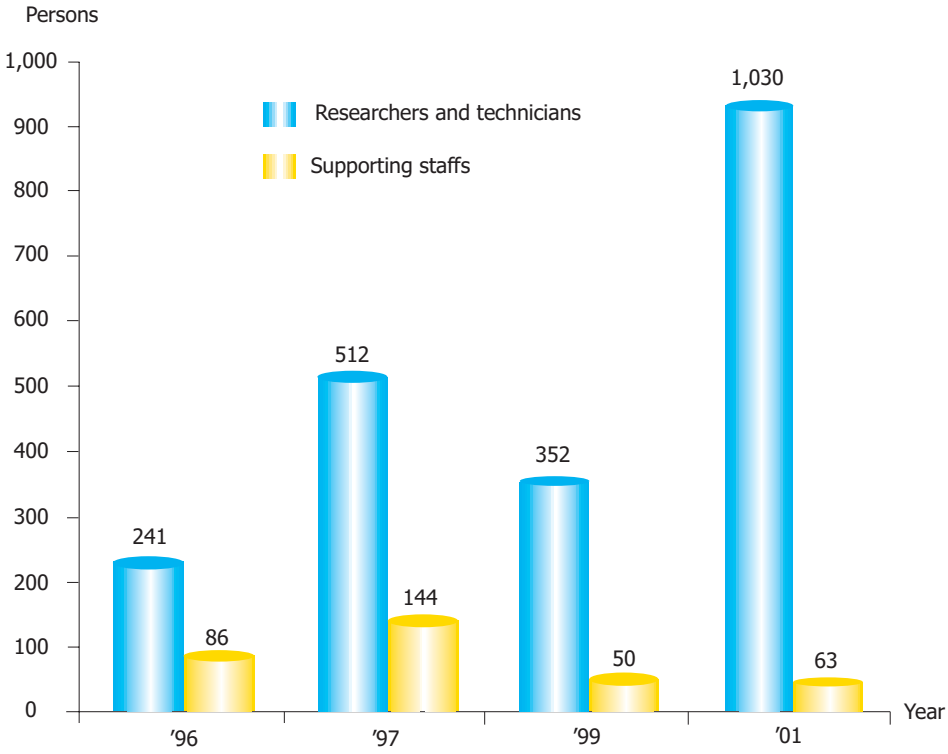
Regarding R&D personnel, the National Research Council of Thailand survey indicated that there were around 55,748 R&D personnel in 2001, of which 45% were researchers, 35.1% were technicians and the remaining 19.8% were supporting staffs (Table 9.4). However, the number of ICT R&D personnel was surprisingly low, accounted for only 1.96% of all R&D personnel. According to the survey, there were only 750 researchers and 280 technicians working in ICT field in 2001. The majority (42%) were working in educational institutions (Figure 9.3).

Table 9.4 R&D Personnel Classified by Occupation and Field of Research (2001)

Field of research	Occupation			
	Researchers	Technicians/ Research Assistants	Supporting Staffs	Total
Natural sciences	2,763	1,469	413	4,645
Computer and communication technologies	750	280	63	1,093
Engineering and technologies	5,673	4,257	2,172	12,102
Medical sciences	4,353	3,931	640	8,924
Agricultural sciences	5,222	3,836	6,852	15,910
Social sciences	5,296	5,004	797	11,097
Humanities	1,043	810	124	1,977
Total	25,100	19,587	11,061	55,748

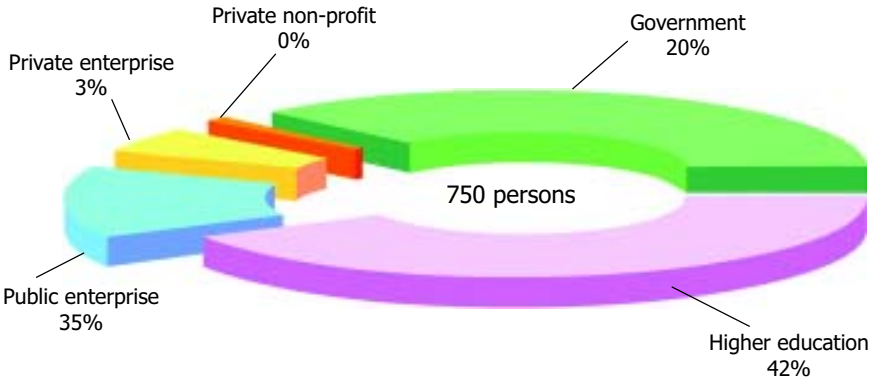
Source: National Research Council of Thailand (NRCT)

Figure 9.2 R&D Personnel in ICT Field (1996-2001)



Source: National Research Council of Thailand (NRCT)

Figure 9.3 ICT R&D Researchers by Sector (2001)



Source: National Research Council of Thailand (NRCT)

List of Contributors

Advisors

1. Thaweesak Koanantakool
2. Chadamas Thuvasethakul

Contributors

1. Kasititorn Pooparadai
2. Orachat Leingpeboon
3. Sirintorn Chaisakda
4. Phumisak Smutkupt
5. Jiraporn Tangpoolcharoen
6. Kardsiri Kantikittikun
7. Weerawan Charoensub
8. Kunakorn Charoenwong

List Of Abbreviations

ATCI	The Association of Thai Computer Industry
ATSI	The Association of Thai Software Industry
B.E.	Buddhist Era
BOT	Bank of Thailand
BSA	Business Software Alliance
CAT Telecom Plc.	CAT Telecom Public Company Limited
CGD	The Comptroller General's Department, Ministry of Finance
DBD	Department of Business Development, Miinistry of Commmerce
ECRC	The Electronic Commerce Resource Center, NECTEC
INA	The Information Networking Association
ISP Club	Internet Service Provider Club
MOC	Ministry of Commerce
NECTEC	National Electronics and Computer Technology Center
NESDB	National Economic and Social Development Board
NRCT	National Research Council of Thailand
NSO	National Statistical Office, Ministry of Information and Communication Technology
NSTDA	National Science and Technology Development Agency
OEC	The Office of the Education Council, Ministry of Education
SET	The Stock Exchange of Thailand
T.H. NIC	Thailand Network Information Center (T.H. NIC Co.,Ltd.)

TOT Corporation Plc.	TOT Corporation Public Company Limited
GITS	Government Information Technology Services
UBC	United Broadcasting Corporation
UNDP	United Nations Development Programme