

**State Interventions in the Internet Market:
Lessons from Thailand**

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1. The Development of Internet in Thailand

The Internet was first adopted in Thailand in 1987. As in other countries, it was initially used as a communication tool for academics. Among early Internet users are the Asian Institute of Technology (AIT), the Prince Songkhla University, Chulalongkorn University and the National Electronic and Computer Technology Center (NECTEC). In 1995, commercial Internet was introduced into the country, when the Internet Thailand was established as the first Internet Service Providers (ISP). Other commercial ISPs joined the market in the following years. Currently, there are 18 providers operating as commercial ISPs and four as public service providers: School Net (school network), GITS (government information technology network), PubNet (academic research network) and UniNet (inter-university network). All these commercial and non-commercial networks are currently linked to the global Internet through a bandwidth of a speed over 500 Mbps in both the inbound and the outbound directions. They are also domestically interconnected through two public interchanges: NIX and IIR, which are operated by the Communications Authority of Thailand (CAT) and the NECTEC, respectively.¹

Today, the Internet has become a crucial part of everyday lives of many Thai people. According to a household survey by the National Statistical Office in the first quarter of 2001, there were about 928,000 computers in use in 16.1 million households. This is equivalent to 5.75 computers for every 100 households or 1.48 computers for every 100 people. The same survey also found that there were about 3.54 million Internet users, loosely defined as any persons who used the Internet at least once during the past year. This is equivalent to a penetration ratio of 5.64 percent of the population (See Table 1). The survey also revealed that about 21.5 percent of the household with Internet users

¹ More detailed treatments of the history of the Internet in Thailand can be found in (Palasri, et. al, 1999) and (Koanantakool, 2000). Further information on the commercial and non-commercial networks and the two exchanges can be found in the home page of NECTEC's Network Technology Laboratory (ntl.nectec.or.th/internet)

accessed the Internet from their homes, while the remaining 78.5 percent from Internet cafés, schools, and workplaces.

According to the NSO survey, about 48.3 percent of the Internet users are male and 51.7 percent female. In terms of age, the majority of users are between 15-24 years old. The survey also reveals that about 34.9 percent of the users are located within Bangkok, 23.5 percent in the Central region, 14.6 percent in the Northern region, 15.8 percent in the North-Eastern region, and 11.2 percent in the Southern region. In terms of education, about 34 percent are university graduates, 30.2 percent high-school graduates, 22.9 percent junior high-school graduates, and only 4.2 percent primary school graduates. Concerning occupations of the Internet users with ages over 15 years old, 44.6 percent have at least one job while about 41.5 percent are students and 3.0 percent are unemployed. Among the employed, 46.2 percent are private employees, 34.4 percent public employees and 9.7 percent non-paid home workers².

The provision of non-commercial Internet services through public funded projects, such as School Net and UniNet, helped promote the Internet usage in Thailand. However, other forms of state interventions, i.e., its monopoly in the international telecommunication market and its ownership in every ISP, have retarded the development of commercial Internet services.

Section 2 of the paper will describe the structures of the Internet markets in Thailand to provide background information to the readers. Section 3 will then analyze the impact of state monopolization of the international telecommunication market on retail prices, the levels of Internet and e-commerce adoption and the locations of web servers. It will also quantify the impact by estimating welfare losses incurred to the society due to the monopolization. Section 4 will assess the impact of the state intervention in ISPs' ownership and governance structures on prices and market

² The National Information Technology Committee (NITC) also conducts an annual survey on Internet user profiles since 1999, the latest version of which (NITC, 2001) is available from the NITC. However, the

development. Section 5 will conclude the paper.

2. The Structures of Internet Markets in Thailand

There are three market segments of Internet services in Thailand. The first segment is the market for international Internet access. The market is statutorily monopolized by the Communications Authority of Thailand (CAT), a state-owned enterprise. The second market is the market for domestic Internet service providers (ISPs). All commercial ISPs are required to apply for a built-transfer-operation (BOT) type of concession from the CAT. The third market segment is the resale market, which is composed of schools, universities and numerous Internet cafés. Operators in this market purchase access services from the ISPs and resell them to their clients.

The market segment most familiar to Internet users is the commercial ISP market. As mentioned above, there are currently 18 operators operating as ISPs. They can be classified into four groups. The first group consists of independent providers that are early movers. Most of the ISPs in this group have managed to acquire sufficient market shares to sustain their businesses. Examples of such ISPs are Internet Thailand, KSC Commercial Internet, Loxley Information Services and A-Net. The second group consists of independent operators that are late comers and have become marginal players. Examples of the ISPs in this group are Data Line Thai, Idea Net and E-Z Net. The third group is composed of the ISPs that are affiliated with telecommunication operators. Examples of such ISPs are Asia Infonet, a subsidiary of a fixed-line telephone operator in the Bangkok Metropolitan Area, and CS Internet, a subsidiary of a telecommunication conglomerate, Shin Corporation. Despite being late comers, the ISPs in this group have managed to penetrate the market by using their vertically integrated telecommunication infrastructures and financial clouts. The last group is composed of the ISPs with foreign shareholders that entered into the Thai market during the dot-com boom. Examples of the ISPs in this group are Pacific Internet (Thailand) and Cable and Wireless.

survey is considered less reliable since it is based on an Internet-based questionnaire, where systematic and

The total international capacity of the ISPs expanded rapidly from 20.9 Mbps in August 1997 to over 500 Mbps since mid 2001. At present, six companies have at least 45 Mbps of international bandwidth, the largest capacity currently available from the CAT (Table 2). The six-firm concentration ratio, defined as the ratio of international bandwidth of the six largest ISPs to the total bandwidth, has risen from 82 percent in June 1998 to 91 percent in June 2001. However, demand has not caught up with supply. As a result, there is a significant excess capacity among the six largest ISPs and competition in the market has heated up. Dial-up service for individual users has already become a commodity, with the cheapest prepaid access package priced less than 10 Bt (less than \$ US 0.25) per hour. However, prices in the leased-line market for corporate users are still high comparing with other Asian countries. This issue will be addressed in more detail in the next section.

3. Impacts of the State Monopoly

Comparing with other Asian countries of similar level of development, the penetration of the Internet in Thailand is relatively slow. In terms of Internet hosts per capita, Thailand is ahead of only Indonesia and the Philippines, but is lagging behind all other East Asian countries. This reflects the low rate of Internet adoption in Thailand. The problem is largely due to the monopoly in the telecommunication sector. As noted above, while the domestic Internet market is relatively competitive, the international Internet market is monopolized by the CAT. That is, all domestic ISPs must connect with the CAT's network in order to link to the global Internet and are charged with prices that are not subject to any competition.

3.1 High Access Prices for Leased Line

Table 3 compares average Internet prices for dial-up and leased-line services in

unbiased sampling cannot be achieved.

seven Asian economies. The prices shown are posted access prices charged by the ISPs in each economy exclusive of telecommunication connection charges. While the cost of dial-up Internet service in Thailand is comparable to that of other Asian countries, the cost of its leased-line Internet access is about 1.1 to 2.9 times higher.

The main reason for high leased-line prices in Thailand is the monopolization of CAT in the international market. Table 4 compares the half-circuit prices charged by the CAT and MCI WorldCom, an international ISP, for connecting between Thailand and the U.S. The monthly price of the CAT's half circuit at 45 Mbps is 159,167 Bt (\$US 3,581) per Mbps. The price is about 43 percent higher than that of MCI WorldCom. The difference would be more significant if prices offered by competitive regional operators, i.e., Singapore Telecom and Dacom, are used as benchmarks. The wide price gap is due to the fact that the CAT has always been slow to reduce its half-circuit prices. In fact, its prices were reduced only twice during 1997-2001: the first time in March 1997, the second time in January 2001. These reductions amount to an average rate of only 6 percent per year.

Given that the cost of international bandwidth contributes to about 50-60 percent of the total cost of a large ISP in Thailand, if the CAT's prices were lowered by 43 percent to the MCI WorldCom's level, the retail leased-line price in Thailand would be automatically reduced by 10 percent. This is because the domestic ISP market is already competitive and any reduction in cost will translate into price reduction.

As discussed in Section 1, about 78.5 percent of users access the Internet from places outside their homes, i.e., Internet cafés, schools and workplaces, which usually require leased-line connections. Thus, high leased-line prices would seriously limit the use of the Internet. In fact, a survey by a market research firm in the year 2000 revealed that 37 percent of public agencies, schools and companies in the sample indicated that the high cost of leased lines was one of the key factors prohibiting their access to the Internet.

3.2 Low Penetration of Internet Use

A previous study (Tangkitvanich and Nikomborirak, 1997) confirmed that the CAT's monopoly also resulted in low Internet penetration in Thailand by analyzing the Internet markets in 14 Asia-Pacific economies that are founding members of the Asia Pacific Economic Cooperation (APEC)³. A regression analysis was used to study the relationship between the number of Internet hosts in an economy, its GDP and a dummy variable, *Monopoly*, representing whether the economy has a monopolistic (*Monopoly* = 1) or competitive (*Monopoly* = 0) international telecommunication market. The result of the study is as follows:

$$\begin{aligned} \text{Number of Host}_i &= 772.6 \text{ GDP}_i - 557.2 \text{ Monopoly} \cdot \text{GDP}_i \\ &\quad - 41,201 \end{aligned}$$

The regression has an adjusted R² of 0.484 and F-statistics of 7.11. T-statistics for the three variables are 3.74, -2.66 and -0.68, respectively. In other words, the analysis shows that, at a confidence level of 95 percent, an economy with a competitive telecommunication market will have additional 772.6 Internet hosts with an additional billion dollars of GDP, while an economy with a monopolistic international telecommunication market will have 557 fewer Internet hosts.

The same technique was used to analyze the impacts of the monopoly in the international telecommunication market on the number of servers with secured socket layer (SSL) protocol in each economy. Such servers are usually used to conduct secured

³ The economies included in the study are Australia, Canada, Chile, China, Hong Kong, Indonesia, Malaysia, Mexico, New Zealand, the Philippines, Singapore, South Korea, Taiwan and Thailand. Four APEC founding members are treated as outliers and excluded from the analysis. They are the U.S. and Japan, which are the two largest economies, and Papua New Guinea and Brunei, which are the two smallest economies among the founding members.

transactions in e-commerce. Thus, the number of SSL servers in each economy can be used as a proxy for the level of e-commerce development in the economy. The data set is that of the same 14 APEC economies used in the above analysis. Table 5 shows the data set. There are ten economies with competitive international telecommunication markets and three with partially competitive markets as classified by the ITU. Thailand is the only monopolistic market. In our analysis, the three economies with partial competitive regimes are treated as monopolistic ones, with the dummy variable, *Monopoly*, set to 1. However, the result still holds even if the dummy variables are set to 0.5.

The regression analysis results in the following relation.

$$\begin{aligned} \text{Number of SSL Server}_i &= 4.25 \text{ GDP}_i - 4.00 \text{ Monopoly} \cdot \text{GDP}_i \\ &\quad - 49.94 \end{aligned}$$

The regression has an adjusted R^2 of 0.327 and F-statistics of 4.16. T-statistics for the three variables are 2.78, -2.47 and -0.1, respectively. In other words, the analysis shows that, at a confidence level of 95 percent, an economy with a competitive telecommunication market will have additional 4.25 SSL servers with an additional billion dollars of GDP, while an economy with a monopolistic international telecommunication market will have 4.0 fewer SSL servers. It is striking that the effect of the monopoly on the number of SSL servers is almost as strong as the effect of the size of the economy as measured by GDP. In other words, the impact of market liberalization on the adoption of SSL servers in an economy is almost as strong as the impact of increasing the economy's GDP by one billion dollar. Similar conclusion still holds even though the dummy variables of economies with partial competition are set to 0.5.

3.3 Losses of Web Hosting Businesses

High Internet prices also result in the loss of web hosting businesses. To evaluate the degree of the loss, we trace the physical locations of 92 Thai web portals. The portals

are selected from the list of web sites that participated in *Thailand Web Awards 2000*, organized by the Nation Multimedia Group. There are two reasons for choosing Thai web portals as the objects of the study. Firstly, their contents are in Thai language since the sites are expected to serve local customers. Thus, there are no inherent needs to relocate the sites to foreign countries to speed up access. Secondly, portal sites are most sensitive to Internet access prices and thus can best demonstrate the impact of high prices on the choice of site locations. This is because few, if any, transaction-related activities, e.g., shopping and payment, are conducted in the portals.

The procedure to locate physical locations of the selected web portals involves two steps. In the first step, we use *tracert*, a DOS-based program, to translate the portals' URLs into the corresponding IP addresses. Then, we query the *ARIN Whois* database (www.arin.net/whois) to find the location of the IP address found in the first step.⁴

Results of the survey are shown in Figure 1. The Figure shows that nearly 80 percent of the Thai portal sites are located in foreign countries. In particular, 68.5 percent are located in the U.S., 5.4 percent in Europe and 5.4 percent in Singapore. Only 20.7 percent of the sites are located in Thailand, even though most of their intended customers are in Thailand. This generates unnecessary international traffic and drives up the bandwidth costs of domestic ISPs. In addition, with a large number of web sites physically located in foreign countries, the domestic web hosting and data center service providers are losing their business opportunities.

3.4 Quantifying the Impacts of the Monopoly

Section 3.1 shows that a monopoly in the international telecommunication market leads to high leased-line prices. Sections 3.2 and 3.3 show that these excessive prices

⁴ Alternatively, we can use *Neotrace*, a GUI-based software that performs the same function in a single step. The software is a shareware that can be download from Download.com for use in a trial period of thirty days.

prevent some potential consumers from using the Internet or force existing consumers to move their business overseas. This creates losses in consumer benefits that are not fully captured by higher profits for the monopolist and thus results in net welfare losses for the society. How much loss is incurred by the CAT's monopolization of the Internet market in Thailand? Following (Cowling and Mueller, 1978), we quantify the size of welfare losses due to the monopoly in the Internet market by using the following formula:

$$\text{Welfare Loss} = \frac{1}{2} \Delta P \cdot P_m \cdot Q_m$$

Where P_m is the price charged by the monopolist. In this case, it is the price that the CAT charges domestic ISPs for 1 Mbps of its international half circuit.

ΔP is the difference between prices charged by the monopolist and that by a competitive operator normalized by the monopolist's price. In our study, the price that MCI WorldCom charges for 1 Mbps of its half circuit is used as the proxy for the competitive price.

Q_m is the quantity supplied by the monopolist. In this case, it is the international half-circuit bandwidth supplied by the CAT.

By substituting the relevant values into the above formula, we can estimate the welfare loss due to the CAT's monopolization of the Internet market. For example, if the average bandwidth supplied in the year 2001 is assumed to be 555.6 Mbps, which is the capacity supplied in July 2001, the welfare loss for the year is estimated to be:

$$\begin{aligned} \text{Welfare Loss} &= \frac{1}{2} \Delta P \cdot P_m \cdot Q_m \\ &= \frac{1}{2} (0.43) \cdot (159,167) \cdot (555.6) \text{ Bt per month} \\ &= 230.6 \text{ million Bt per year} \end{aligned}$$

In other words, it is estimated that the monopoly results in an annual welfare loss of about 230 million Bt. The loss will increase with the size of price differences between the CAT's price and the competitive market price, and the expansion of the Internet,

which is expected to grow at a rate of 33 percent during 2001-2005, assuming a GDP growth rate of 4 percent per year (Tangkitvanich, 1999).

It should be noted that the above welfare loss can be significantly underestimated. This is because only losses in static efficiency, those related to resource misallocation, are taken into account. There are also losses in dynamic efficiency, which is related to technological adoption. In this case, the dynamic efficiency is related to the use of the Internet to develop new or better production or sales methods, i.e., by means of supply chain management (SCM) or customer relationship management (CRM). Faced with high costs, many small and medium-sized enterprises (SMEs) are deprived of the opportunity to use the Internet for such activities and lost the opportunity to innovate themselves. Thus, if the monopoly is not abolished in due time, many enterprises in Thailand will have difficulties increasing their productivity by adopting new technology and lose their competitiveness.

4. Impacts of Share Transfer Requirement

As part of the BTO concession, an ISP must transfer to the CAT about one-third of its shares without any capital payment. The only two ISPs exempted from the condition are Internet Thailand and CS Internet. In the case of Internet Thailand, the company is the first ISP in the country and was allowed to operate before the condition was set up. In the case of CS Internet, the company operates as part of its parent company's satellite concession. In both cases, the CAT actually contributed to the companies' equity. In this section, we will estimate the impact of the CAT's share transfer requirement on Internet retail prices and ISPs' corporate structures.

Let P be the retail Internet price charged by an ISP, in the absence of the share transfer requirement.

P' be the retail Internet price charged by the ISP, in the presence of the share transfer requirement

C be the cost of the ISP in providing the service

x be the rate of return that the ISP expects from its operation.

X be the absolute value of profit expected by the ISP.

From the definition of profit,

$$P-C = X \quad (1)$$

To maintain its profit at X , the ISP has to adjust its price upward when it is required to give the CAT one-third of its share without any capital payment.

$$2/3(P'-C) = X \quad (2)$$

Since (1) = (2),

$$3P = 2P' + C \quad (3)$$

$$(P-C)/C = x \quad (4)$$

$$C = P/(1+x) \quad (5)$$

By substitute (5) into (3), we get

$$3P = 2P' + P/(1+x) \quad (6)$$

Or equivalently,

$$P'/P = (2+3x)/(2+2x) \quad (7)$$

According to the above analysis, an ISP with an expected rate of return of 30 percent ($x=0.3$) will mark up the price of its Internet service by 20 percent to cover this condition.

However, the real world is more complicated than what the model may suggest. Table 6 shows the revenues and profits during 1998-2000 of 16 active ISPs as reported to the Ministry of Commerce. Even during the period when the Internet market experienced

a very high growth rate, at least half of the companies in operation made losses. The numbers of companies that showed profit in 1998, 1999 and 2000 are 7, 8 and 4, respectively. The only two companies that were consistently profitable were Internet Thailand and KSC Commercial Internet.

While some companies may have incurred losses as reported because they could not compete in the market, others may under-report their profits in order to avoid full profit sharing with the CAT. In economics terminology, this is a manifestation of the principal-agency problem, with the principal (the CAT) having difficulties monitoring its agents (the ISPs). Apparently, some ISPs have tunneled profits out of the companies. One obvious way of doing that is through transactions with connected companies. Thus, it came as no surprise that many ISPs have set up complex share-holding structures. Figure 2 shows such an example where a holding company and two subsidiaries were used to tunnel profits out of the ISP.

As a result, the CAT was not able to share one-third of the profits it has expected. Excluding Internet Thailand and CS Internet, the two companies to which the CAT has contributed real equity, the CAT was entitled to only one-third of the Bt 42.9 million profit from three profitable ISPs in 2000. This is equivalent to a share of merely 0.8 percent of the total revenue of Bt 1,646.5 million.

The concession also requires the chairman of the ISP's board of directors to be a representative from the CAT. In addition, the chairman is empowered to cast a veto vote against any business plans proposed by the ISP's management. Even though such power has never been exercised in practice, the condition makes it difficult for ISPs to find foreign partners even during the dot-com boom. Although some ISPs managed to find foreign partners, it was likely that significant discount in share prices were needed to compensate for the risk related to the CAT's interventions.

From the above analysis, both the CAT and the ISPs turned out to be losers from the CAT's interventions in the ISPs' ownership and governance structures. The problems

are now recognized and re-negotiation of the contracts between the CAT and the ISPs are going on. However, no tangible results have been achieved during the past few years and the problem is likely to remain unsolved in the foreseeable future.

5. Conclusion

Despite undesirable state interventions in the Internet market, the adoption of the Internet in Thailand has expanded steadily. Thanks to many public projects, a number of schools, universities, central and local governmental agencies have been connected to the Internet. Broadband Internet services through ADSLs and cable modems have finally arrived, although the prices are still not affordable for most users. Unlimited access services were recently launched by ISPs. Free Internet is about to be provided by the Telephone Organization of Thailand, another state-owned enterprise. Without distortionary interventions, however, the country would have been much better off.

To promote the use of the Internet, Thailand obviously needs a competitive and undistorted telecommunication market. The best way to achieve these goals is to allow more competition from new entrants, both domestic and foreign, and to set up an independent regulatory body that works in the interests of consumers. The lesson of the past mistakes should be well recognized and other developing countries should be warned against repeating similar mistakes.

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Table 1 Internet and IT Equipment Ownership/Usage in Thailand
(As of January-March, 2001)

IT Ownership/Usage	Total Number	Penetration per 100 people	Penetration per 100 households	Households with ownership/usage
PC Ownership	927,875	1.48	5.75	812,565
Internet Usage	3,536,000	5.64	3.04	490,158
Facsimile Ownership	264,052	4.21	1.64	259,528
Mobile phone ownership	2,442,821	3.89	15.14	1,894,100

Source: National Statistical Office

Table 2 International Bandwidth of ISPs (Mbps)

ISP	Jun 2001	Jan 2001	Jun 2000	Jan 2000	Jun 1999	Jan 1999	Jun 1998
CS Com	83	46	14	10	4	3	0.75
Loxinfo	69	36	22	15	7.5	5.5	4
KSC	58	50	50	42.5	12	6	4
Internet Thailand	55	44	42	42	10	10	8
Asia Infonet	54	29.5	9.5	7.5	2.5	2	2.5
A-net	45	45	4	8	4	3	2
JI-Net	8	8	6	2			
Samart	8	8	6	2	4.5	2.5	2
WorldNet	5	5	2.5	2.5	2.5	2	2.5
CWT	4.5	2.5					
Idea Net	2	2	0.25	0.25	0.25	0.25	0.5
SGA	2	4	3.5	2.5	2.25	0.75	0.75
Data Line Thai	2	0.4375	0.1875	0.1875	0.125	0.125	0.0625
Asia Access	2	3	1	1	0.5	0.5	0.75
CWN	0.5	0.5	0.5	0.5	0.5		
Roynet	0.5	2	2				
Far East	0.5	0.75	0.75	0.25	0.25	0.25	0.125
EZNet	0.375	1	0.5	0.125			
Total	399.375	287.6875	164.6875	136.3125	50.875	35.875	27.9375
Bandwidth share of the 6 largest ISPs (%)	91.1	87.1	87.1	91.7	82.6	83.6	82.3

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

Table 3 Internet Access Prices in Asian Economies
(As of September 2001)

Economy	64 Kbps Leased Line		20-Hour Dial Up Service	
	ISPs	Price (\$ US/month)	ISPs	Price (\$ US)
Thailand	KSC, Pacific Internet, Roy Net, Idea Net, Asia Access, CS	780.3	Internet Thailand, KSC, Loxinfo, CS Internet	4.5
Hong Kong	Cyber Express, Chevalier Internet	267.3	Pacific, Global Link, iChannal, Cyber Express	15.3
India	Balasai Net, Southern Online	627.5	Pacific Surf, Sigma Online, Bharat Connect	3.3
Indonesia	Indosat Net, Central Online, GlobalNet, D-Net, Centrin Online	419.3	Indosat net, UniNet, CBN, RadNet	8.1
Malaysia	Jaring, Malaysia Online, Timenet, Tmnet, The Putra.net	524.5	Jaring, Tmnet,	3.2
The Philippines	Asia Gate, Nsclub	705.2	Pacific Surf, Manila-Online, MilStation Net, Iconnex, PhiWorld Online	10.7
Singapore	-	NA	SingNet, Pacific Surf	6.8

Source: the author

Table 4 Comparing CAT's and MCI WorldCom's Half-Circuit Prices
for Thailand-USA Routes (July 2001)

International Bandwidth (Mbps)	CAT's Discount Rate (Bt/Month)	MCI WorldCom's Rate (Bt/Month)
2	716,250	567,000
4	1,289,250	1,125,000
8	2,220,375	1,710,000
16	3,939,375	2,700,000
45	7,162,500	4,050,000

Note: \$ US 1 = Bt 45

Source:

1. CAT's rates are from CAT's Announcement (Sixth Revision, January 2001).
2. The MCI WorldCom rate is from the company's quotation

Table 5 the Relationship between the Number of SSL Servers,
Real GDP and the Level of Competition in Selected APEC Economies

Economy	#SSL Servers in Jan 2001	Real GDP in Year 2000 (\$ billion)	Level of Competition in International Market
Australia	3,423	393.70	C
Canada	5,055	678.70	C
Chile	141	70.54	C
China	184	1,080.01	P
Hong Kong	538	163.27	C
Indonesia	60	136.87	P
Korea	345	457.22	C
Malaysia	146	85.57	P
Mexico	259	575.50	C
New Zealand	609	49.80	C
Philippines	68	75.18	C
Singapore	525	92.26	C
Taiwan	372	310.10	C
Thailand	116	124.91	M

Note: M = Monopoly, P = Partial Competition and C = Competition

Source: 1. Numbers of SSL-Servers are from Netcraft (www.netcraft.com).

2. GDP data are from (IMD, 2001)

3. Competition levels are from Regulatory Table 6 in (ITU, 2001).

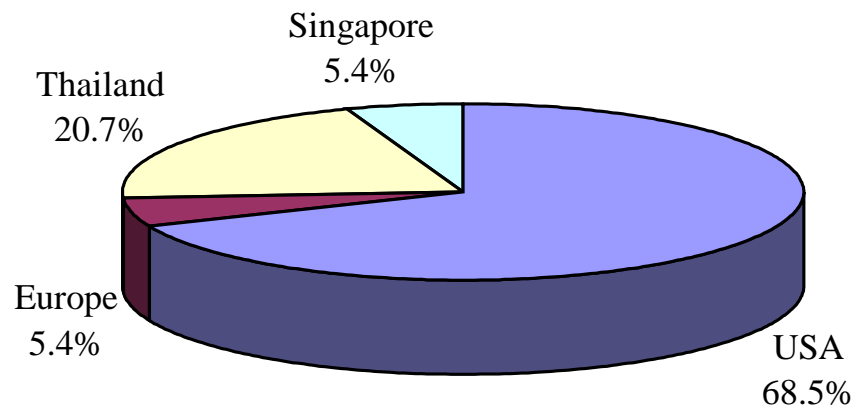
Table 6 Total Revenues and Net Profits of Thai ISPs during 1998-2000

(Unit: million Bt)

ISPs	1998		1999		2000	
	Total revenue	Net profit	Total revenue	Net profit	Total revenue	Net profit
A-Net	56.4	4.9	134.2	7.4	205.4	(7.0)
Asia Infonet	53.1	(29.8)	126.5	8.4	150.4	16.0
Chomanan Worldnet	1.7	(7.1)	3.5	(8.8)	-	-
C.S. Communications	211.7	7.5	243.9	(144.6)	495.1	(71.7)
Data Line Thai	3.7	(2.8)	5.1	(2.7)	8.8	(0.2)
E-Z Net	-	-	0.1	8.9	-	-
Idea Net	9.1	0.9	8.0	(2.7)	3.9	(13.1)
INET (Thailand)	29.7	(7.8)	39.6	4.2	48.3	4.1
Internet Thailand	140.1	24.6	214.2	52.8	310.0	51.2
Jasmine Internet	18.2	(7.5)	29.2	(10.0)	80.0	(14.7)
Loxley Information Services	224.3	7.2	331.6	(15.5)	445.0	(146.8)
Pacific Internet (Thailand)	-	-	26.5	3.0	71.1	(94.9)
Roynet	0.8	(1.4)	1.9	(4.1)	8.9	(8.9)
KSC Commercial Internet	149.7	12.1	292.2	16.4	438.9	22.8
Samart Infonet	55.8	(29.2)	90.2	(33.7)	150.9	(12.3)
Siam Global Access	29.0	2.7	41.7	1.3	34.9	(5.1)
Total	983.3	(25.7)	1,588.4	(119.7)	2,451.6	(280.6)

Source: The Department of Business Registration, the Ministry of Commerce

Figure 1 Locations of Thai web portals



Source: (TDRI, 2001)

Figure 2 An Example of a Share Holding Structure of an ISP

