TARA SIAM

THE THAI COMPUTER
HARDWARE AND SOFTWARE MARKET

OCTOBER 1988

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Section 1 : Introduction to the Computer Market in Thailand

Computerization in Thailand started in 1963 with the introduction of the first two computers into the country. An IBM 1401 was installed at the National Statistical Office for census work and an IBM 1620 at Chulalongkorn University Bangkok for educational purposes.

Ten years after the first installations, there were still only a small number of computer installations in Thailand even though the Royal Thai Government realizing the desirability of coordinating computerization activities, had in 1973 created a National Computer Committee to supervise the procurement and use of computers in the public sector. Also established by this time (circa 1971) as a private sector initiative was the Computer Association of Thailand whose central objectives are to promote the efficiency of computerization and to disseminate awareness of computers to the general public.

At the end of 1973, there were a total of 39 installations of which 21 were in the private sector by companies such as Esso, Siam Cement, Borneo Co (Thailand), and Bangkok Bank.

During the first decade of computerization in Thailand, installations in Thailand were mainframes - big in both size and price.

In 1972, the IBM S/3 mini-computer was introduced to Thailand with the first two installations at Caltex Oil (Thailand) Ltd and Kodak (Thailand) Ltd. As in many other countries, the Thai business sector was not generally aware of the potential of the mini-computer until towards the end of the 1970s when it became recognized as the "office computer" with its size and flexibility rendering it suitable for business use, particularly in the medium size company.

Also extremely relevant to its increasing use was that the price of mini-computer hardware was much lower than that of large-scale computers and by 1983 mini-computers were well accepted as necessary office tools by large and medium size companies in Thailand.

Micro-computers were first imported into the country in 1980 for market tests although a number of them were brought in as "personal belongings". A year or so after, there were several makes of micro-computer available in the Thai market but many potential buyers were rather confused about brand and model choice and their varying suitabilities. This confusion was caused by lack of knowledge about micro-computers; high and often misplaced buyer expectations; and very frequently, misleading information from non-professional and unqualified salesmen employed by several micro-computer dealers.

The micro-computer market began to boom in 1983 essentially because of very low prices which increased interest among small businesses and slowly this interest generated greater knowledge of computer performances and limitations. Buyer expectations became more realistic.

Probably the single most important development in computers since the micro-computer itself has been the introduction of multi-user capability in micro-computer models. A micro-computer system that can be linked to a number of terminals, or to the larger system as mini or mainframe computers, is now available for a modern office.

As in other countries, the "look alike" or "compatible" computers have created a highly competitive market for micro-computers in Thailand. Many are assembled locally frequently with smuggled parts. The micro-computers sold in the Thai market today are, by customer preference, mostly 16-bit with microprocessor type 80286.

The rapid development of the Thai computer market was mainly a result of manufacturers and vendors striving to promote computerization by developing computers with Thai features and various Thai application programs. These are now absolutely essential to local market acceptance.

Section 2 : Analysis of Supply

According to the Computer Association of Thailand, growth in the number of companies in the Thai computer business has been as follows;

Year	Total Number of Companies
1982	71
1983	103
1984	175
1985	214
1986	200
1987	297 (e)

In 1986, extreme competition in computer vending particularly of micro-computers caused several vendors to cease operations. Small computer vendors have shown a tendency to expand to provide consultancy and programme writing services and/or to supply computer peripherals.

However 1987 saw a 50% increase in the number of companies in the sector reflecting buoyant conditions due to

* higher economic growth
* more efficient hardware at lower prices
and * wider range of software.

The number of companies grew to an estimated 297 in 1987 - of which 186 supplied computers, 62 engaged only in selling computer hardware and the remaining 124 in more than one activity.

For analytical purposes, companies in the Thai computer business can be categorised into 4 types as follows:

(1)   supplying computer hardware

(2)   supplying peripherals and accessories

(3)   training

and (4) providing consultancy and software development services.

One company can fall under more than a single category of activity. The number of companies by type of activities in 1987 were as follows.

Number of companies	Type of Activities			
	(1)	(2)	(3)	(4)
62	X			
54	X			
20			X	
30				X
36	X	X		
36	X		X	
21		X	X	
7		X	X	
4	X	X		
21	X			X
4	X			X
4			X	X
297				

Higher overall demand and greater user requirements will increase the number of computer vendors and simultaneously lead to greater specialisation as companies seek market niches.

The relatively small companies selling peripherals will expand more than the other groups as computer manufacturers try to enhance their products and overall market requirements increase.

More companies will concentrate on providing consultancy and services in programme writing as these activities will be closely related to increasing use of computers in Thailand for many years ahead. The number of software houses is accordingly expected to rise.

The growth in the number of training companies is however expected to slow down because of the addition of computer courses in school curricula.

There are a few large companies, both Thai and foreign-owned, with firmly established businesses in Thailand such as IBM Thailand Co Ltd and Datamat Co Ltd which are active in selling and leasing computers direct to users as well as engaging in the other three business categories.

These large firms are achieving steady growth in their business as opposed to others in much larger numbers which appear to be facing difficult times.

A list of major suppliers is presented in Exhibit 1.

An increasing number of foreign manufacturers began to move their production to Thailand which has a low cost labour base but where technology is relatively developed.

Thus, for instance, a major computer accessories manufacturer in Thailand is Seagate Technology (Thailand) Ltd, a subsidiary of Seagate Technology Corp of USA. Possessing the Thai Government's Board of Investment promotional privileges, the company manufactures and exports sub-assemblies for hard disc drives.

Micropolis (Thailand) Co Ltd, a subsidiary of Micropolis of USA, a manufacturer of hard-disc drives branded "Miniscribe", has set up in Thailand to manufacture sub-assemblies for hard disc drives.

Tavon Computer Co Ltd, established in 1982, is a major Thai computer assembler. It recently planned to invest Baht 20 million for the assembly of 32 bit computer with microprocessor type 80386 under the brand name "Tavon Turbo 386" developed in conjunction with the Ministry of Science, Technology and Energy, Kasetsart University and King Mongkut's Institute of Technology. The project received promotional privileges from the Board of Investment.

Due to the import duty structure (mentioned later in this study) presently prevalent in Thailand, the local assembly of computers would not appear feasible without promotional privileges from the Board of Investment.

At present, there are 20 manufacturers of computer accessories and related products approved by the Board of Investment. Their production is largely export oriented.

Company Name	Date of Start Up	Annual Production Capacity
Data General Thailand Co Ltd	30 Aug 74	PCB 220,000 units, ribbon cartridge assembly 60,000 units, keyboard mechanical 60,000 units, lemite top level assembly 15,000 units, terminator 70,000 units, IC 34.6 mil units
Seagate Technology (Thailand) Ltd	21 Nov 83	Lock sub-assembly 1.176 mil pcs, actuator assembly 936,000 pcs, "E" block assembly 3 mil pcs, head gimbal assembly 10 mil pcs
	* 15 Mar 88	Printed circuit board 33.992 mil pcs
	* 4 May 88	Sub-assemblies for hard disc drives: stepping motor 4.96 mil pcs, carriage/lock sub-assembly 1.32 mil pcs, actuator assembly 1.248 mil pcs, head gimbal assembly 16 mil pcs, E block assembly 5.4 mil pcs, mounted preload assembly 1.248 mil pcs, arm preload assembly 1.284 mil pcs, pole sub-assembly 1.248 mil pcs
	* 17 Mar 88	Band assembly 2.496, actuator arm assembly 1.248 mil pcs, printed circuit board for spindle motor 3.12 mil pcs
GSS Electronic (Thailand) Co Ltd	20 Nov 85	Electronic assembly 1.08 mil units, PCB assembly 2 mil units, cable & harness 750,000 units
GMI Electronics (Thailand) Co Ltd	20 Nov 85	PCB assemblies 2 mil pcs, cable & harness 750,000 pcs, coil & transformer 3 mil pcs, electronics control device 1.08 mil pcs
Fujikura (Thailand) Co Ltd	29 Nov 85	Keyboard cord 3.6 mil pcs, computer cord 200 tons, flat type cable 2,00 kgs, interface cord with/without connector 600,000 sets
	* 17 May 88	Keyboard cord 14.4 mil pcs, computer cord 1000 tons, interface & wire assembly 11.04 mil pcs
Minebea Thai Co Ltd	1986	Computer keyboard : mechanical type - key switch 60 mil pcs, keyboard without cover 600,000 pcs, covered keyboard 1.31 mil pcs, rubber type - key switch 240,000 pcs, keyboard without cover 330,000 pcs

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Company Name	Date of Start Up	Annual Production Capacity
	* 14 Apr 87	Floppy disk drive head 3.6 mil sets, paper feeder 158,000 pcs, fan motors 14.4 mil pcs, micro speaker 14.4 mil pcs, general speaker 288,000 pcs
	4 Apr 88	PBC assembly 5.4 mil pcs
Elec & Eltek (Thailand) Ltd	1 Jul 88	Printed circuit board 1.4 mil sq ft
	* 10 May 88	Computer system assembly 81,000 sets, PCB/electronic products 1,836,000 pcs modem/facsimile/telecom equipments 172,800 pcs
Kang Yong Electric Manufacturing (Thailand) Ltd	* 24 Feb 87	Carriage for floppy disk drive 270,000 sets
Hop Cheong Industrial Co (Hong Kong) Ltd	* 7 Dec 87	High precision computer relate 2.4 mil units, head gimbal coil winding 624,000 000 units
Chicony Electronics (Thailand) Ltd	* 14 Dec 87	Computer keyboard 1.8 mil pcs
Johoku (Thailand) Co Ltd	* 26 Jan 88	Terminal 1.5 mil pcs, wire harness 6 mil pcs, processed wire 24 mil pcs
D D K (Thailand) Co Ltd	* 2 Feb 88	Connector 30.2 mil sets, cable harness 1.2 mil sets
Tools Products (Thailand) Ltd	* 2 Feb 88	Hard disc drive component 3 mil pcs
Ji-Haw Industrial Co Ltd	* 10 Feb 88	Computer peripherals cable 2 mil pcs
SW & Sons Co Ltd	* 8 Jan 88	Printer & disk drive components 9.56 mil pcs
Tavorn Computer Co Ltd	* 28 Apr 88	Personal computer 45,000 sets
TLI (Thailand) Co Ltd	* 13 Jun 88	Disk drive head assembly 10 mil pcs
SCI System (Thailand) Co Ltd	* 13 Jul 88	PCB 800,000 pcs, computer cord 900,000 sets, semi-assembly computer component 50,000 pcs
Melco Manufacturing (Thailand) Co Ltd	* 17 Jul 88	Floppy disk drive 1.35 mil units
Micropolis (Thailand) Co Ltd	* 23 Aug 88	Head positioner 875,000 pcs, hard disc drive 125,000 pcs

* The Board of Investment approval date, operations not having commenced as yet

Source : The Board of Investment of Thailand

In addition to these manufacturers, there are over 20 companies either operating or planning to operate in the manufacturing or assembling of integrated circuit boards and other electronic components.

Section 3 : Demand Analysis

There are no statistics available either officially or unofficially which give a comprehensive and accurate picture of the size and dynamics of the market for computers in Thailand.

Some indication of the trends can however be formed from the import statistics calculated by the Thai Customs Department.

Import statistics, 1983 - 1987, are presented in Table 1.

Regrettably these statistics cannot give a wholly accurate picture because

1. Specific figures for types of computer are not available as the Customs Department statistics do not break down the number of imported computers into the various categories.

2. There have been a large number of micro-computer parts imported for local assembly under the classification of "parts & accessories for statistical machines including computers not elsewhere specified" which include parts of other types of machines.

   These locally assembled computers are mainly supplied to the local market. Only small volumes are currently exported. In 1987, Thailand exported 290 units worth Baht 34 million of complete computer sets compared to 164 units worth Baht 14 million in 1986.

3. In addition, more and more smuggled micro-computers and peripherals have appeared in the Thai market. This results from the import duty structure mentioned in the following section.

Prior to 1983, the Thai computer and related market steadily increased at a rate of approximately 20-25% pa. However, the increasing popularity of micro-computers in the last four to five years has caused the growth to rise to approximately 50-100% pa.

From interviews with knowledgeable parties (Thai Computer Trader Association, major multinational manufacturers based in Thailand, local traders, etc) it can be estimated that the total Thai market for computers and peripherals was approximately Baht 4,000 million in 1987, a 20% increase from 1986. This figure includes the value of legitimate software but excludes tailored or customized and pirated software as well as smuggled hardware.

Table 1
Importation of Computers and Related Equipments
1983 – 1987

(Volume: Units or otherwise specified, Value: Baht in million)

Description	1983 Volume	1983 Value	1984 Volume	1984 Value	1985 Volume	1985 Value	1986 Volume	1986 Value	1987 Volume	1987 Value
Computer Complete Set	130	260.7	918	222.7	5,926	452.3	6,774	561.4	15,626	726.4
Central Processing Unit	4,944	206.7	2,590	175.2	2,596	214.1	2,158	118.1	3,096	148.6
Magnetic Equipment	-	-	-	-	576	10.2	8,147	36.4	4,008	40.9
Direct Access Devices	-	-	4	1.8	99	10.9	20	21.3	21	11.2
Card Reader, Card Punch	5	0.3	10	0.3	376	3.9	536	3.1	1,399	6.9
Printers	89	1.1	455	7.7	4,900	126.7	9,522	185.5	18,572	306.5
Optical Readers	-	-	1	0.1	10	0.1	-	-	17	0.6
Other Peripheral Machines	1,835	51.5	11,977	251.7	117,801	813.5	129,479	637.0	305,638	695.4
Tabulators	4	19.2	25	3.1	102	5.2	-	-	158	0.3
Card Punching, Verifying Machines	26	0.7	-	-	-	-	-	-	-	-
Calculating Machines	117	1.0	4	13.4	148	0.2	-	-	6	0.3
Other Auxiliary Machines for use with Statistical Machines	52	2.2	3,805	19.5	241	18.6	21	2.0	83	2.9
Magnetic Tape for Computer	-	-	253,563	50.7	509,834	60.9	458,232	60.1	79,798	61.3
Magnetic Disc for Computer	-	-	-	-	23,427	4.7	1,912	2.7	1,036	1.7
Diskette or Floppy Disc for Computer	-	-	-	-	546,988	59.2	1,039,297	73.3	1,451,857	98.9
Total		543.4		746.2		1,780.5		1,700.9		2,101.9
Parts & Accessories for Statistical Machines including Computer not elsewhere specified (Tons)	305	554.4	865	1,645.3	437	2,132.4	1,518	4,588.2	2,303	7,953.1

Source : Customs Department

In 1988, the Customs Department has adopted the Harmonized Commodity Description and Coding System.

Import statistics, January to May 1988, are thus shown in an amended format as presented in Table 2.

Table 2

Importation of Computer and Related Equipment
January-May 1988

(Volume: Units or otherwise specified,
Value: Baht in million)

	Volume	Value
Analogue or Hybrid Automatic Data Processing Machines	1,492	28.4
Digital Automatic Data Processing Machines containing in the same Housing at Least a Central Processing Unit	8,934	254.6
Digital Processing Unit	4,263	83.9
Input or Output Units	49,976	256.8
Storage Units	355,797	33.6
Other Auxiliary Machines	17,951	204.4
Total		861.7
Parts and Accessories (Tons)	3,230	8,575.6

The major growth of the Thai computer market in recent years came from the micro and mini-computer segment while the mainframe segment was slow.

Mainframe Computer

The mainframe market in Thailand is limited with very few systems being installed mostly in big networks such as those operated by banks and Government bodies. The total population of mainframe computers in Thailand is estimated at under 100. Most installations in recent years have been for replacements and equipment upgrading. This is particularly true in the public sector.

The public sector, which normally accounts for a large portion of mainframe business, has slowed down since 1984. The market, however, was made up by the banking sector which has heavily invested to computerise operations in the last five years or so. A large portion of sales in this segment of the computer market came from auxiliary components, mainly in the form of data communication networks.

To a considerable extent declining mainframe sales are due to uncertainty and changes concerning government procurement policy.

Procurement of computers costing over Baht 500,000 has to be approved specifically by the National Computer Committee (NCC) which is said to be a cumbersome and time-consuming procedure.

Approvals (based on general guidelines laid down by the NCC) for procurements less than Baht 500,000 are much easier to obtain and this has encouraged greater use of smaller systems in government agencies.

The NCC announced that 997 public sector computer purchases worth Baht 4,000 million out of 1,052 requests worth Baht 4,400 million were approved during October 1984 to September 1987. During October 1987 to May 1988, 200 projects were requested while 100 projects worth Baht 1,000 million have been approved. However, these figures include all sizes of computer systems.

Another factor which has lowered mainframe sales in Thailand is the development of the so-called super-mini computer. As the mainframe is expensive and has complicated steps in application, the market turned to favour the large mini-computer.

The value of the mainframe market was estimated at Baht 800 million in 1987. Estimated market shares in the sector are

IBM	60%
Burroughs *	10%
Univac *	8%
Others	22%

* Now merged under "Unisys" name

Although obviously still a "guesstimate" it is believed that the corresponding figure in 1988 was in the region of Baht 900 million.

The most active mainframe dealers are IBM Thailand Co Ltd and Yip In Tsoi & Co Ltd (Unisys) which also deal in the mini and micro markets.

Mini-Computer

The Thai mini-computer market will continue to grow in the
foreseeable future at a steady rate of 15-20% pa and the
number of installations is estimated at over 700 in 1987.

As mini-computers require technical support from suppliers
and the establishment of software and hardware engineer
teams relatively high expenditure is involved.

The leader (which have already incurred this investment) in
this market is IBM with a market share of 40%.

The remaining 60% of the market is shared among:

Brand	Distributors
NEC	Datamat Co Ltd
DEC	Bangkok Data Center Co Ltd
	Micronetic Co Ltd
Wang	Innovation Corp Ltd
NCR	NCR Thailand
	(Kian Gwan Commercial Co Ltd)
Unisys	Yip In Tsoi & Co Ltd
	Summit Computer Co Ltd
Data General	General Data Co Ltd
Concurrent	Loxley (Bangkok) Ltd
Prime	Digital Information Associates Ltd
Texas Instruments	Computer Technology Co Ltd
CDC	Control Data (Thailand) Ltd
Norsk Data	Norsk Data Thai Ltd
Datapoint	Systomat Co Ltd
Philips	Philips Electrical Co of Thailand Ltd
Nixdorf	T N Business System Co Ltd
AT&T	Action Computer Co Ltd
Honeywell	Siam Telteck Co Ltd
Hewlett-Packard	Unimesa Co Ltd

In 1987, the mini-computer market was estimated at Baht
1,200 million,an increase of 20% from 1986, with new brands
in the market such as Convergent distributed by Computer
Management Co Ltd, Fortune System by Digital Data Co Ltd,
and Supermax by Sinobrit Co Ltd. The 1988 estimate is
approximately Baht 1,500 million.

Micro-Computer

The micro-computer market in Thailand has followed world-
wide trends by out-distancing the other two categories in
the last 3-4 years. This is obviously due to enhancement
capabilities and cheaper prices.

While the Thai micro-computer market has been very buoyant in absolute growth terms, very fierce competition amongst a host of vendors in the presently rather limited market has forced a number of businesses into a troublesome situation. There have been numerous small "one-product" market entrants selling "look alike" or compatible computers which create price-cutting competition. Most distributing agents for original manufacturers announced that less than half their sales targets were achieved in 1985-1986. Sales however have improved in recent years.

Buyers of the low-price compatible type of computer are mostly small businesses, educational institutes and individuals for personal use.

In order to solve the price-cutting situation created by compatible computers, the major manufacturers have released new models applying higher technology - the 32-bit micro-computers using a basic standard of Microprocessor 80386. The new release models of 32-bit micro-computers introduced in 1987 include IBM System/2 model 80; Compaq Deskpro 386; Wang PC 380; NEC Powermate 386; Mitec 386; ALR 386 and Multitech ACER 1100.

The value of the Thai micro-computer market in 1987 was estimated at Baht 2,000 million, 40% increased from 1986. In 1988 it is believed that market grew approximately 40% to around Baht 2,800 million. IBM is estimated to have a 15% market share, NEC 5% and others 10% with compatibles accounting for the remaining 70%.

Computer Software

In the early years of computing in Thailand, most mainframe and mini-computer users attached the greatest value to hardware reliability. Most developed their own application softwares or had them developed by software houses to meet their requirements. This was due to the fact that generally "off-the-shelf" packages were not suitable to the Thai business environment and were more expensive than having in-house staff to develop them.

As the Thai economy has developed, in-house software development has become more expensive and uncompetitive while there are now more application software packages available in the market either imported or locally developed. The local software industry is mainly provided by the major hardware vendors active in the country and as such software is normally supplied in the same package with hardware. Software has become an important tool in selling hardware.

Many hardware vendors have developed software to fit specific market segments. For instance, Loxley (Bangkok) Co Ltd distributor of Concurrent computer developed a software system named Hospital Information System (HIS), currently used in 4 major local hospitals and one abroad. Datamat Co Ltd distributor of NEC developed a software package for finance and banking sector, while Yip In Tsoi & Co Ltd promoted software for securities trading.

There are also about 30 independent software houses active in Thailand.

In the recent software exhibition arranged by IBM Thailand, there were 12 participants exhibiting their software developments. They included

- Metro Systems Co Ltd; software package for hotel industry, the POS system for supermarkets and department stores and inventory control

- F E Zuellig (Bangkok) Ltd; financial software packages for industrial and pharmaceutical applications

- BM Computer Co Ltd; software packages for production control and the textile industry

- Datapro System Co Ltd; software packages for insurance and finance companies

- Pro Line Co Ltd; software packages for production control and accounting

- Neo-System Co Ltd; software package for hospitals

- Technology Supply Co Ltd; software package for hospitals

- Computer Union Co Ltd; applications in the construction industry

- SCT Co Ltd; software packages for printing, production control, construction and office automation

- SGVN Arthur Andersen Consultants Ltd; software packages for production control

- Sukhothai Thammathirat Open University; computer systems used in education

- Assumption Business Administration College; on-line computerised student registration

In addition there are imported software packages. At present there are several international software houses marketing their products in Thailand. Some of them are

* SAS Institute Inc, USA
* Software Systems Associates (SSA), USA
* Evergreen Technology, Canada
* ATS Computercentre Pte Ltd, Singapore
* Computer Assisted Learning Centre, Singapore
* Omicron Management Software Ltd, UK
* Ashton Tate (dBASE), USA

Users normally require software that has Thai-language capacity; imported software requires modification. The best potential market for imported software will lie in database management, programers' tools, scientific and other specialised packages with less Thai language requirements.

Unlike mainframes and mini-computers, most micro-computer users emphasise software availability as they usually lack the resources to develop their application programs. Hence, they depend on easy-to-use software such as spreadsheets, word processing and data management tools which may be operated by non-technical persons.

Thai-language capacity is essential in marketing micro-computers and there are many software houses developing Thai general software for the micro-computer market. The major ones are R Lab & Consultant Co Ltd, Philos Creative Products, Micro Wiz Co Ltd and International Research Corporation Ltd.

Most of the general software packages for micro-computers are available in Thailand. They are widely copied and supplied by the venders.

The problem of "pirating" software for mainframes and mini-computers is less critical due to the visibility of the users and the size of corporations or institutions that use particular software.

For mainframes and mini-computers, the value of system and utility software can be estimated at some 30% on top of the cost of the hardware. Off-the-shelf application packages cost approximately 30% and tailored software 50-100% of the hardware cost. The cost of having software exclusively developed to one company's requirement is still low compared to that in developed countries.

Section 4 : Demand Forecast

The expectation for forthcoming years is that the expansion of the Thai economy will be better than in the recent past with average annual Gross Domestic Product (GDP) growth during 1988-1991 estimated at 6% minimum.

The computer market in Thailand is likely to expand at 30-40% over the medium term in unit volume terms. This growth however cannot be expected to be the same in terms of computer market value as the price of computers will be cheaper while hardware will be more efficient and powerful.

Future demand in the local computer market depends largely on the overall development of Thai industry. Currently, the Royal Thai Government is heavily and successfully promoting foreign investment and joint venture projects in Thailand. There is great potential that multinational companies will invest in high-technology.

Ever increasing computer awareness will lead to more computer utilization. More computer courses are available in both university and secondary education centres through-out the Kingdom which will expand the entire market (hardware, software and peopleware-wise).

It is also anticipated that the price of micro-computers in Thailand will stabilise and competition will in the future not be price based but service based. Computer traders are expected to become more specialized.

Consultancy and program design will be in higher demand. Medium and large size mini-computers will also be in higher demand in line with increases in micro-computer usage as users of micro-computers often require a larger computer to work as a data collection center and to coordinate work with other micro-computers in, for instance, distributed center systems.

Small mini-computers will face competition from large micro-computers, the so-called "super-micro" computers, while the large mini-computers will replace demand for the small mainframes, due to lower price and indistinct performance perceptions between them. Nowadays, it is becoming harder to differentiate between the "super-micro" and mini on the one hand and "super-mini" and small mainframe on the other.

Section 5 : Import Duty and Tax Structure

Computer and related equipments are subject to a total effective tax rate 34.09% while the corresponding figure for parts and accessories is 57.11% and computer media 33.45%.

The import tariff components and effective rates are shown as follows.

	Import Duty	Standard Profit	Business Tax	Effective Rate
* Automatic data processing machines and units thereof; magnetic or optical readers, machines for transcribing data onto data media in coded form and machines for processing such data	20%	21.0%	9%	34.09%
** Parts and accessories (other than covers, carrying cases and the like) suitable for use solely or principally with automatic data processing machines	40%	26.0%	9%	57.11%
Unrecorded or recorded media for data or programs in code form for automatic data processing machines	20%	15.5%	9%	33.45%

* Data recording machines (magnetic disc type) imported for the production or assembly of automatic data processing machines under the rules and conditions specified by the Director-General of Customs with approval of the Ministry of Finance, the import duty is 10%. The effective rate is then 22.91%.

** For keyboards imported for the production or assembly of automatic data processing machines under rules and conditions specified by the Director-General of Customs with approval of the Ministry of Finance, the import duty is 10%. The effective rate is then 23.45%.

Section 6 : Trading Practices

At present, the distribution of mini and mainframe computers in Thailand mainly takes the form of a "turnkey project" directly to the customer.

The project usually includes a preliminary study of the most appropriate hardware configuration and the perceived software requirement of the potential customer. Upon the customer's agreement, the system will be installed together with software. In many cases, the system is developed with programs specifically tailored to fit the customer while many ready-made packages are usually modified to meet customer requirements. Training is provided as part of the sales contract - the amount of training hours being dependant on the situation and relative bargaining skills.

At least 1 year warranty is usually provided to the customer. Maintenance contracts are also available at the normal rate of 10% of the computer's price per annum. This maintenance rate will increase 10% every year or in other words the maintenance rate would be 12% in the second year, 14.4% in the third year and so on.

Technical support for both hardware and software is
necessary from the supplier especially in the case of
mainframe computers. Some suppliers have several software
houses supporting them with standard or customized packages
in order to free them from high investment in the
establishment of software engineer teams.

The foregoing is also true for those active vendors of
micro-computers which also provide both software and
customer support. While there is much application software
generally available, customized software is also available
if needed. Training courses and maintenance services are
normally provided for their customers.

The small vendors of compatible computers, of which there
are a great number in the market, usually sell the machine
together with copies (legal or otherwise) of all the
standard application programs. They are lacking in technical
and after-sale service to their customers.

As previously stated in this report, the public sector is a
large computer customer.

All government procurement are made on a bidding basis.

The Cabinet is currently discussing new rules for procure-
ment. Under the new rules, Government agencies will be
required to buy directly from the manufacturers and major
distributors but they can use small suppliers when the
orders are not more than Baht 200,000 each.

Virtually all computers sold in Thailand require the
availability of Thai features. This can be made possible by
modifying or adding-on to the hardware so that the screen
can cope with Thai characters. Many sole distributors had to
develop their own Thai software before attempting to market
their computers. More often, they modify existing applica-
tion packages into Thai.

Apart from micro-computers in the "clone market", local
vendors usually operate on a 30% mark up on top of machine
cost inclusive of import tariffs.

Profitability of vendors is extremely difficulty to assess
because of the tendency to minimise taxes.

Section 7 : Main Current Issues

One of the current most controversial issues in Thai
politics and one which is said to have contributed greatly
to the 1988 dissolution of Parliament is the copyright bill.
It is also an issue on which the USA is taking the lead in
raising with the Thai Government within the overall
framework of bilateral trading relations between the two
countries.

On the general question of copyright protection, Thailand has agreed to protect US works and expand protection to cover works created before the US became a member of the Berne Copyright Convention.

On computer software, Thailand has agreed to allow its courts to decide whether computer software is protected under the present copyright law. Software will be protected in accordance with the Thai obligations to the Berne Convention, if the court decides they are entitled to this. Otherwise the Thai side is willing to hold talks to provide appropriate measures to protect the works in accordance with Thai law.

It is foreseeable that there will be some US firms taking legal action against Thai computer vendors in the coming years. The Thai courts' decision will be sought on the issue of software copyright protection.

While the US presently has to playing a waiting game, it has been firm in its search for a commitment from the Thai Government. The US insists Thailand must apply adminis-trative measures to provide copyright protection if the Thai court rules that the copyright law fails to cover computer software. In this case the protection will be provided on the basis of the Thai-US Treaty of Amity and Economic Relations.

While the current position is unfortunately very unclear, it is believed that agreed protection measures for computer software will be provided in the medium term future.

Success obtained by USA on software copyright protection will of-course in due course be enjoyed by other countries.

Exhibit 1

List of Major Suppliers of Computer and Related Businesses

Company/Address/Contact Person	Activities	Products/Brands
A S L (Thailand) Co Ltd 522/30 Phaholyothin Rd Bangkok 10400 Tel: 271-0587, 271-0641 Tlx: 20317 KEI Fax: N/A Contact Person: - Mr Natthaporg Ingsuthrarak Managing Director	Supplying computer & peripheral Consultancy & software	Distributor of "SUN" mini-computer, "Automate" micro-computer Dealer of "DEC" mini-computer
Action Computer (Thailand) Co Ltd 5/26 Soi Saladeng, Silom Rd Bangkok 10500 Tel: 233-5274/5 Tlx: 82792 ADAMINT Fax: N/A Contact Person: - Mr Karl M Kunz Managing Director	Supplying computer Consultancy & software	Distributor of "AT&T" mini and micro- computer Distributor of "Discovery" micro- computer
BM Computer Co Ltd 756 Sukhumvit 30/1 Bangkok 10110 Tel: 391-3618, 391-9820 Tlx: 82367 BONFIDE Fax: N/A Contact Person: - Mr Wanchai Ekbundit Managing Director	Supplying computer & peripheral Consultancy & software	System Remarketer of "IBM" mini- computer

Company/Address/Contact Person	Activities	Products/Brands

Bangkok Data Center Co Ltd
183 Pisanuloke Rd
Bangkok 10300
Tel: 282-8615/7
Tlx: 87632 BANDATA
Fax: N/A
 	
Contact Person:
- Mr Anuvat Venanuvethapong
  Executive Director
	Supplying computer & peripheral
	Consultancy & software
	Service bureau & data preparation
	  service
		Distributor of "DEC" computer and
		  peripherals
		Plotter "BENSON"
		Digitizer "CALCOMP"
		Data communication equipment "DECnet/
		  SNA GATEWAY, DES DZS11 STATMUX"

Betagro Computer Co Ltd
1-7 Yukol 2 Rd
Bangkok 10100
Tel: 224-3859, 223-9686/7
Tlx: 87637 BETAGRO
Fax: 2247049
 	
Contact Person:
- Mr Bamrek Saroggananda
  Managing Director
	Supplying computer	Distributor of "Alpha Micro" mini-
		  computer and "Trigem" micro-computer

Business Information System Co Ltd 10th Fl, Mahathun Plaza Bldg 888 Ploenchit Rd Bangkok 10500 Tel: 253-6818/9 Tlx: N/A Fax: N/A Contact Person: - Mr Virat Charoenpanich Managing Director	Consultancy and software	

Company/Address/Contact Person	Activities	Products/Brands
C P System PTG ltd 6th Fl, Vanich Bldg Petchaburi Rd Bangkok Tel: 253-9903/4 Tlx: N/A Fax: N/A Contact Person: - Mr Kovit Kanthapatsara Managing Director	Consultancy and software	
Compunotion Co Ltd 5th Fl, Panavong Bldg 104 Surawongse Rd Bangkok 10500 Tel: 235-3550 Tlx: 84097 PANAVON Fax: N/A Contact Person: - Mr Manas Vongsuvan Managing Director	Supplying computer & peripheral Consultancy & software	Distributor of "CompuNET" & "Talent" micro-computer
Computer Line Co Ltd Ruamchunpetana Bldg 2387 Petchburi Rd Bangkok 10310 Tel: 318-1704, 318-1720 Tlx: N/A Fax: N/A Contact Person: - Ms Angeena Tanchatchawan Managing Director	Supplying computer & peripheral Consultancy & software Training service	System Remarketer of "IBM" mini- computer

Company/Address/Contact Person	Activities	Products/Brands
Computer Management Co Ltd 28/18-21 Sukhumvit 19 Bangkok 10110 Tel: 253-0614/8 Tlx: 87239 KRANPAT Fax: 2530619 Contact Person: - Mr Yingyong Wongsuksiri Managing Director	Supplying computer & peripheral Consultancy & software Training service	Distributor of "Convergent" mini-computer Dealer of "Mitec" micro-computer Plotter "Roland" Mouse "Genius Mouse" Modem "Smart Link" Network "Novell"
Computer System Development Co Ltd 7th Fl, Thosaphol Bldg 200 Ratchadapisek Rd Bangkok 10310 Tel: 277-6408, 273-8481 Tlx: N/A Fax: N/A Contact Person: - Mr Nakorn Hoonpanich Managing Director	Supplying peripheral Consultancy & software Service bureau & data preparation service	Dealer of "GDC" modem
Computer Technology Co Ltd 1 Soi Yasoob 1 Viphavadee Rangsit Rd Bangkok 10900 Tel: 279-4892, 279-4894 Tlx: 81032 ASSENCO Fax: N/A Contact Person: - Mr Suchart Areekul Managing Director	Supplying computer Consultancy & software	Distributor of "Texas Instrument" computer

Company/Address/Contact Person	Activities	Products/Brands
Computer Union Co Ltd 1828 Sukhumvit 62 Bangkok 10110 Tel: 311-5111/9 Tlx: 84939 SAHAUNI Fax: N/A	Supplying computer & peripheral Consultancy & software	Dealer of "IBM" micro-computer
Contact Person: - Mr Chamin Se-rguandeekul Managing Director		
Control Data (Thailand) Co Ltd 7th Fl, U-Chuliang Bldg 968 Rama IV Rd Bangkok 10500 Tel: 233-4991/3 Tlx: 87365 CONDATA Fax: N/A	Supplying computer & peripheral	Distributor of "CDC" computer & peripherals OMR system "National computer system"
Contact Person: - Mr Yodjin Uahawatanasakul Managing Director		
Datamat Co Ltd 1931-7 New Petchburi Rd Bangkapi Bangkok 10310 Tel: 314-5451/4 Tlx: 84330 DATAMAT Fax: N/A	Supplying computer & peripheral Consultancy & software Service bureau & data preparation service Training	Distributor of "NEC" computer & peripherals
Contact Person: - Mr Manoo Ordeedolchet Managing Director		

TARA SIAM LIMITED

Company/Address/Contact Person	Activities	Products/Brands
Datapro Co Ltd 485/15-16 Silom Rd Bangkok 10500 Tel: 233-2804/5 Tlx: 84878 PETCH Fax: N/A	Supplying peripheral Consultancy & software	"SAHO" access control, data collector, data entry terminal, magnetic card reader
Contact Person: - Mr Chaivutti Petchdee Managing Director		
Digital Data Co Ltd 3th Fl, 1025 Ploenchit Rd Bangkok 10500 Tel: 252-6221, 252-8540 Tlx: N/A Fax: N/A	Supplying computer & peripheral	Distributor of "ALR" and "Fortune System" computers Distributor of "Athena" and "Magnetic Data" media
Contact Person: - Mr Sanit Sakdiseree Managing Director		
Digital Information Associates Co Ltd 7th Fl, U-Chuliang Bldg 968 Rama IV Rd Bangkok 10500 Tel: 235-9586/8 Tlx: 87365 CONDATA Fax: N/A	Supplying computer Consultancy & software	Distributor of "Prime" mini-computer
Contact Person: - Ms Supavadee Pandhuvanich Managing Director		

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Company/Address/Contact Person	Activities	Products/Brands
F E Zuellig (Bangkok) Ltd 1 Silom Rd Bangkok 10500 Tel: 233 5870, 2330110 Tlx: 82639 ZUELLIG Fax: 2367142 Contact Person: - Mr Alfred Epprecht Managing Director	Supplying computer & peripheral Consultancy & software	System Remarketer of "IBM" mini- computer
General Data Co Ltd 181/15-18 Surawongse Rd Bangkok 10500 Tel: 233-0047, 233-7962/4 Tlx: 84028 NARAINS Fax: 2365882 Contact Person: - Mr Vichai Chivangkul General Manager	Supplying computer & periphral	Distributor of "Data General" computer & peripherals
IBM Thailand Co Ltd 388 Phaholyothin Rd Samsen Nai, Phyathai Bangkok 10400 Tel: 271-0051/2 Tlx: 82874 IBMTHAI Fax: 2714185 Contact Person: - Mr Sompop Amatayakul Managing Director	Supplying computer & peripheral Consultancy & software	Distributor of "IBM" computer & peripheral

Company/Address/Contact Person	Activities	Products/Brands
Infortech Co Ltd A S C Bldg 325-9 Silom Rd Bangkok 10500 Tel: 253-5956/9 Tlx: 82195 PASANGA Fax: N/A Contact Person: - Mr Yongyut Archakraisorn Managing Director	Supplying computer & peripheral Consultancy & software	Distributor of "Televideo" mini and micro-computer Network "Inforshare", "PM/Network"
Innovation Corp Ltd 2nd Fl, Sinthorn Bldg Wireless Rd Bangkok 10500 Tel: 2500587/8 Tlx: N/A Fax: N/A Contact Person: - Mr Noppadon Yingchatchawan Managing Director	Supplying computer & peripheral	Distributor of "WANG" computer & peripheral
International Research Corporation Ltd 2nd Fl, Lido Theater 258/18 Siam Square Soi 3 Rama I Rd Bangkok 10500 Tel: 254-1138/9, 251-3060/1 Tlx: 82474 EXINTEN Fax: 2541137 Contact Person: - Mr Kengwarn Kusolthamarat Managing Director	Supplying computer & peripheral	Distributor of "ARC" micro-computer Thai interface card, data switching box "TRC"

Company/Address/Contact Person	Activities	Products/Brands
Loxley (Bangkok) Co Ltd 304 Suapa Rd Bangkok 10100 Tel: 221-6121/30 Tlx: 81188 LOXLEY Fax: 2244630 Contact Person: - Mr Thongchai Lamsam Managing Director	Supplying computer & peripheral Consultancy & software	Distributor of "Concurrent Computer" mini-computer, "Olivetti" micro-computer, OCR "Recognition"
Metro Systems Corp Ltd 180-184 Rajawongse Rd Sampanthawong Bangkok 10100 Tel: 225-4395/7 Tlx: 82271 METROOD Fax: 2247669 Contact Person: - Mr thawat Charuvajana Managing Director	Supplying computer & peripheral Consultancy & software Training Service	System Remarketer for IBM S/36, S/38 and AS/400 computers Dealer for IBM micro-computer Tape drive "Tallgrass" Expansion card "AST"
Mojdara Co Ltd 967-969 New Rd Bangkok 10500 Tel: 236-0169, 236-5698/9 Tlx: 81087 Fax: N/A Contact Person: - Mr Metha Mojdara Managing Director	Supplying computer and peripheral	Mini and micro-computer "Kienzle"

Company/Address/Contact Person	Activities	Products/Brands
N C L Charoenchai Co Ltd 166 Nanglinchee Rd Yanava Bangkok 10120 Tel: 249-8806/8 Tlx: 20152 SENSE Fax: 2498804	Supplying micro-computer & plug-in module and peripheral for industrial & control	Distributor of "Action Instrument" computer & peripheral for industrial control
Contact Person: - Mr Rangsan Saengchindawongse Managing Director		
NCR Thailand Kian Gwan Commercial Co Ltd 140 Wireless Rd Bangkok 10500 Tel: 251-6141/6 Tlx: 82778 KGCOM Fax: N/A	Supplying computer & peripheral Consultancy & software Training Service	Distributor of "NCR" computer & peripheral
Contact Person: - Mr Ronald E Tanner Managing Director		
Norsk Data Thai Ltd 8th Fl, Mahathun Plaza Bldg 888/82-83 Pleonchit Rd Bangkok 10500 Tel: 253-5012/3 Tlx: 20581 NDSCAN Fax: 2536864	Supplying computer Consultancy & software	Distributor of "Norsk Data" mini- computer Software for hospital "HOOS"
Contact Person: - Mr Stein Murer Managing Director		

Company/Address/Contact Person	Activities	Products/Brands
Olympia Thai Ltd 956 Rama IV Rd Bangkok 10500 Tel: 2340770/8 Tlx: 20191 Fax: 2365939 Contact Person: - Mr Udom Udompol Managing Director	Supplying computer & peripheral Consultancy & software	Distributor of "COMPAQ" computer & peripheral Plotter & Digitizer "DATAMATE" Printer "OKI" & "Olympia"
Philips (Thailand) Co Ltd 283 Silom Rd Bangkok 10500 Tel: 233-6330/9 Tlx: 87327 PHILTHA Fax: 2367468 Contact Person: - Mr P Dekker Managing Director	Supplying computer & peripheral Consultancy & software System Integration	Distributor of "Tandem" & "Philips" computers
Philoa Creative Products (1984) Co Ltd 15th Fl, Amarin Plaza Bldg Ploenchit Rd Bangkok Tel: 256-9922/3 Tlx: N/A Fax: N/A Contact Person: - Mr Sirichai Footrakul Managing Director	Consultancy & software Training service	

Company/Address/Contact Person	Activities	Products/Brands
R Lab & Consultant Co Ltd 2nd Fl, Marine Bldg 1091/2099 Petchburi Rd Bangkok 10400 Tel: 252-4254/5 Tlx: N/A Fax: N/A	Consultancy & software Supplying peripheral	"R-Lab" Thai interface card
Contact Person: - Mr Prayong Kusolapakorn Managing Director		
SCT Computer Co Ltd 614 Sukhumvit Rd Bangkok 10110 Tel: 258-0070/85 Tlx: 81164 INTENCO Fax: 258-3808	Supplying computer & peripheral Consultancy & software Training service	Dealer of "IBM" & "IPS" micro-computer
Contact Person: - Mr Oranop Chanthprapa Managing Director		
Sahaviriya Infortech Computer Co Ltd Prapawit Bldg 28/1 Surasak Rd Bangkok 10500 Tel: 236-0295 Tlx: 87112 SIC Fax: 2366954	Supplying computer & peripheral Consultancy & software Training service	Distributor of "Multitech" micro- computer Printer "Seikosha" Hard disc drive "Microscience"
Contact Person: - Mr Jack M C Hu Managing Director		

Company/Address/Contact Person	Activities	Products/Brands
Sahaviriya International Computer Co Ltd Prapawit Bldg 28/1 Surasak Rd Bangkok 10500 Tel: 236-0295 Tlx: 87112 SIC Fax: 2366954	Supplying computer & peripheral Consultancy & software	Distributor of "EPSON" computer & peripheral
Contact Person: - Mr Jack M C Hu Managing Director		
Sahaviriya System Co Ltd Prapawit Bldg 28/1 Surasak Rd Bangkok 10500 Tel: 236-9509 Tlx: 87112 SIC Fax: 2366954	Supplying computer & peripheral Consultancy & software	Distributor of "APPLE" computer peripheral
Contact Person: - Mr Jack M C Hu Managing Director		
Shinawatra Computer Co Ltd 526 Rama V Rd Bangkok 10300 Tel: 241-2879, 241-2416 Tlx: 72195 SHINCOM Fax: 2413160	Supplying computer & peripheral Consultancy & software Training service	System Integrater of "IBM" mainframes, mini and micro computers and peripheral
Contact Person: - Ms Potjaman Shinawatra Managing Director		

Company/Address/Contact Person	Activities	Products/Brands
Siam Teltech Co Ltd 75 Sol Rubia Rama IV Rd Prakanong Bangkok 10110 Tel: 390-2445/54 Tlx: 82631 WHITOO Fax: 3811525	Supplying computer & peripheral	Mini-computer "Honeywell" and micro-computer "Apricot" & "Victor"
Contact Person: - Dr Adisai Podharamik Managing Director		
Summit Computer Co Ltd 8th Fl, Silom Bldg 197/1 Silom Rd Bangkok 10500 Tel: 234-3931/4 Tlx: 82709 SUMMIT Fax: 2367392	Supplying computer & peripheral Consultancy & software	Distributor of "UNISYS" computer & peripheral
Contact Person: - Mr Amorn Tarvornmard Managing Director		
Systomat Co Ltd 181/1 Surawongse Rd Bangkok 10500 Tel: 234-8880/8 Tlx: 84028 NARANTS Fax: 2365882	Supplying computer & peripheral Consultancy & software	Distributor of "Datapoint" mini-computer Printer "C ITOH"
Contact Person: - Mr Praphrudhi Hetrakul Managing Director		

Company/Address/Contact Person	Activities	Products/Brands
T N Business System Co Ltd 8th Fl, Yada Bldg 56 Silom Rd Bangkok 10500 Tel: 236-7293, 236-3477 Tlx: 20875 NIXITHAI Fax: N/A Contact Person: - Mr Vigrom Chaisinthop Managing Director	Supplying computer	Mainframe and mini-computer "Nixdorf"
Tavon Computer Co Ltd 316/2-3 Sukhumvit 22 Bangkok 10110 Tel: 258-3282, 258-9863 Tlx: 20309 CHARTAN Fax: 2589991 Contact Person: - Mr Chira Chiriyasin Managing Director	Assembling & supplying micro-computer	Micro-computer "Tavon"
Technology Supply Co Ltd 2096/35-36 Ramkhamhaeng 26 Bangkok 10240 Tel: 314-6759, 314-4482 Tlx: 87468 ABAC Fax: N/A Contact Person: - Mr Chitpan Thummasiri Managing Director	Supplying computer & peripheral Consultancy & software Training service	Distributor of "Xontech" micro-computer Softwares : Xontech Attendance System, Xontech Inventory System, Xontech Clinic System

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Company/Address/Contact Person	Activities	Products/Brands
Unimesa Co Ltd 30 Patpong Rd Surawongse Rd Bangkok 10500 Tel: 235-5727 Tlx: 84439 SIMONOO Fax: N/A Contact Person: - Mr Athivart Jira Managing Director	Supplying computer and peripheral	Distributor of "Hewlett Packard" computer
Yip In Tsoi & Co Ltd 523 Mahaprutaram Rd Bangrak Bangkok 10500 Tel: 236-9294, 236-0162 Tlx: 82929 YIPJACK Fax: 2365693 Contact Person: - Mr Theinchai Lailert Managing Director	Supplying computer & peripheral Consultancy & software Training service	Distributor of "UNISYS" computer & peripheral

TARA SIAM SERVICES

INCLUDE

- Project identification; evaluation; structuring; and, on-going maintenance
- Identification, assessment and recommendation of business opportunities for foreign investors; and, relative thereto, the identification, assessment and recommendation of the optimum method of market entry
- Investment, agent, distributor and joint venture searches, structuring and maintenance
- Facilitation of arrangements for technology transfer and the promotion of trade between Thailand and other countries
- Business and corporate appraisal; rehabilitation and re-organisation
- Acquisitions; mergers; divestments; and, rationalisations
- The definition of medium to long term industrial and commercial strategies
- Financing (equity and debt) appraisal and sourcing including mobilisation of project finance funds from export credit agencies and other international sources
- The provision of economic, political, financial and business information on an on-going basis