

**DEVELOPMENT OF ENABLING POLICIES FOR
TRADE AND INVESTMENT IN THE IT SECTOR OF THE
GREATER MEKONG SUBREGION***

CHAPTER 6: THAILAND

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Chapter 6 Thailand

6. 1. Introduction

Perhaps, the development strategy with focus on private investment in Thailand could be traced back to the first National Economic and Social Development Plan (1961 to 1966), which underscored the role of private sector in industry and commerce. It was laid down that the Government would operate only in those areas where the private sector was not equipped, such as the development of infrastructure. This approach towards private investment continued in the subsequent plans and later the liberal approach was extended to foreign capital. Thus among the GMS countries, Thailand has a longer history of liberal trade and investment policies. This development strategy may have enabled the Thai economy to record a much higher growth rate¹ as compared to other GMS countries. During 1960-73, for example, the Thai economy recorded an annual average growth rate of over 8 per cent (see table 6.1). In the following decade (1974-85) the recorded growth rate was slightly lower (6.3 per cent). The third phase of growth (1986-96) recorded an annual growth rate of over 9 per cent. The final phase was marked by financial crisis and, as a result, the economy recorded a negative growth rate during 1997-00. With an annual growth rate of over 5 per cent during 2002 and 2003 the economy has set the stage for revival. Along with high annual growth there has been significant structural transformation. The share of agriculture in GDP declined from about 28 percent during the first period to 11 percent during 1997-2000. While the share of agriculture declined considerably, that of industrial sector increased from 30 percent to nearly 50 percent. More importantly the share of manufacturing sector almost doubled from about 17 per cent in the initial period to 34 percent during the last period. Thus the high growth of Thai economy was driven by the industrial sector, more specifically the manufacturing sector. Perhaps surprisingly, the share of service sector has not increased but showed a marginal decline during the period under considerations.

¹ For a detailed analysis see (Jitsuchon and Sussangkarn 1993) and Jitsuchon (1994)

Thus, by the time Information Technology revolution was taking root in the 1990s, Thailand has had an economy that was integrated with the world economy and vibrant in output growth. Also going by the available statistics, Thailand stood head and shoulders above other GMS countries in terms of IT production and use. Against this background in this chapter we shall explore the role of further reforms in trade and investment for taking Thailand to the next stage of development. To accomplish this objective we shall begin with an examination of the present policies relating to the development of information technology in the country (section 2), followed by an analysis of the present state of the IT use and production of IT software in the country (section 3). Section 4 deals with the present state of IT manpower in the country. The trade and investment policy in the country are described in section 5. This section also analyses the present state of IT hardware production in the country to highlight certain challenges ahead. The final section sums up the discussions and draws some inference for a policy that could support a process of enabling the IT sector to move from an investment led growth path to one where in growth is driven by innovation.

6. 2.Information Technology Policies in Thailand

Thailand is one of the pioneering countries in the developing world to devise an institutional and policy environment for the development and harnessing of information technology for development. Perhaps the first explicit initiative in this direction could be traced back to March, 1992 when, the National Information Technology Committee (NITC) was formed which was chaired by the Prime Minister, and comprised of ministers, permanent secretaries and high level officers from both public and private sector with National Electronics and Computer Technology Center (NECTEC) as its secretariat. The committee was entrusted with the task of facilitating the development of ICT and promoting the use of the same in different sectors of the economy such that the new technology acts as an instrument socio-economic transformation. By the time the Ministry of Information Technology was formed in October 2002, the NITC had formulated three major policies pertaining to ICT in Thailand viz. IT-2000² - the first

² For a critical review refer Thajchayapong (1997).

national IT policy of Thailand, and subsequently IT 2010 - a vision document providing a long term perspective and the IT master plan for the period 2002-06.

IT 2000: The First National IT Policy of Thailand

IT –2000, the first national IT policy of Thailand, formulated in 1995, focused on the creation of the *fundamentals* for ICT development and use on the one hand and to make use of ICT for good governance. Hence, the three pillars of IT 2000 were;

- Creating a National Information Infrastructure (NII)
- Investment in human resources
- Improvement of public services via public electronic information³

Creation of IT Infrastructure

Given the highly inequitable distribution of IT infrastructure, both across different regions and sections of the society, emphasis was on developing an equitable information infrastructure. The policy was unequivocal when it stated” While the statistics may look impressive, there will be about one telephone for 10 persons by 1996 and one for every 5 persons by 2001, in reality, only about a third of the population residing in the metropolis and large cities will benefit from it. Many *tambons* and almost 6000 plus villages are still be without public phones” (National Information Technology Committee (1996). Accordingly, in the telecommunication expansion program, which envisaged an annual investment of 6,000 million Baht per year during 1996-00, emphasis was given to rural areas with a view to enhance the access of rural people. In more precise terms, the policy set the target of installing telephone lines for at least 12,000 remote *tambons* and at least one public telephone booth for every village. With a view to provide access at reasonable prices, the policy envisaged the need for a more competitive environment in the telecom sector. Hence, it underscored the need for reforming the institutional arrangements by setting up an independent Telecommunication Regulatory Authority for the regulation of

³ For a discussion, see Nongphanga Chitrakorn (1990)

different actors and also for reforms in the Telecommunication Act in tune with changing demand conditions.

Generating Human capital

Human capital plays a dual role in IT - as producer and as user. Hence, the policy laid emphasis on increasing the supply of IT manpower at all levels. The human resource development program for IT got manifested in providing computer access to schools and universities and also in the networking of all the universities, colleges and schools. In this context the policy envisaged the setting up of a National Interactive Multimedia Institute which was expected not only to design courses but also to develop needed software.

IT for governance

Here the policy envisaged making use of IT for ensuring good governance. With this strategic objective, the policy envisaged informatisation of governance at all levels in the country. Also it was envisaged that at least 3 per cent of the budget on personal expenditure to be spend on IT and of which at least 75 per cent percent to be spent on creating IT infrastructure including hardware, software, networking etc. Other policy directions included providing support for the development of a strong local information industry with the active role for the private sector in all aspects of IT development.

An evaluation of IT 2000 undertaken by an independent agency indicated that Thailand made significant progress within a few years with respect to information infrastructure. Telephone penetration in the country increased tremendously. The telephone line service coverage expanded to all tambons around the country and public telephones were made available in all villages. With respect to human resource development, there has also been substantial progress. By the end of 1998, the computer-to-student ratio was 1:84 for primary school level and 1:53 for secondary school level against the target of 1:80 and 1:50 set by IT 2000. Also, by the end of 2000, almost all universities were connected to ThaiSarn, while more than 3,000 schools were connected to SchoolNet (Intarakumnerd and Panthawi, 2003).

In sum, since the initiation of IT-2000, Thailand has many achievements with respect to creating a conducive environment for the development and use of information technology. However, as will be evident from later discussion, the achievements with respect to human capital generation, creation of a more competitive environment in Telecommunication, and the development of IT production, especially software, were perhaps less pronounced. Thailand had a very limited software production base by 2000 and over 80 per cent of the domestic demand has been met through imports. It may also be noted that the Policy was drafted during a period wherein the economy was going through the high growth decade, whereas the economy experienced the financial crisis as the plan got implemented. Yet in many aspects the achievements were above the targets like in case of the provision of computers to schools. The slip between the targets and achievement in some of the areas perhaps needs to be seen in the context of difficult economic conditions that prevailed. It is against this background that the IT vision for 2010 has been formulated and being implemented.

Towards the Future: IT-2010

IT-2010, a national IT policy framework governing a ten-year period- or a vision document, was drafted and approved by the Cabinet in March 2002. While IT-2000 focused on the IT foundations, IT-2010 extended the focus to include not only further strengthening of the IT foundations but also on application domains in which IT should be utilized. More importantly, the focus of IT-2010 has not been on the technology *per se*, but on the effective use of IT to facilitate the transition of Thailand into a knowledge-based economy and society, wherein creation, collection, dissemination and utilization of knowledge are central to economic and social development. To turn this vision into reality, IT-2010 identified three guiding principles:

- ❖ *Invest in knowledge-base - human capital*
- ❖ *Promote innovation*
- ❖ *Invest in information infrastructure and information industry promotion*

Also, following three measurable goals have also been set:

- *Increasing national technological capability in tune with the UNDP Technological Achievement Index, from being in the “Dynamic Adopters” to the “Potential Leader” category.*
- *Increasing the proportion of “knowledge workers” along the International Labour Organization (ILO) classification standard, from 12 percent (as of 2001) to 30 percent – on par with the OECD average in 2001.*
- *Increasing the proportion of knowledge-based/knowledge-intensive industries to 50 percent of the overall economy - the OECD average in the year 2001⁴*

IT-2010 also identified specific application domains in which IT should be utilized. These application domains (flagships) include;

- e-government which *inter alia* aims at full computerization of government internal administration by 2004. Online provision of at least 70 per cent of public service by 2005 and 100 percent by 2010.
- e-commerce for enhancing international competitiveness
- e-industry aiming at development of a vibrant IT industry and promoting the utilization and development of IT within the private sector
- e-education aiming at developing human capital base at all levels to enable the country to be a knowledge-based society.
- and e-society that aims at doing away with intra-national digital divide and harnessing the power of IT for overall improvement in the quality of life of the people belonging to different strata of society.

ICT Master Plan (2002-2006)

In addition to IT 2010, NITC also drafted a five-year plan called National ICT Master Plan 2001-2006 with the top priority to ICT industry development (software industry in particular), human capital development, ICT utilization within the public sector and strengthening the National system of innovation.

With respect to the IT industry, the Master plan has the following targets:

- Software production target of 90 billion Baht by 2006 with 75 per cent exports.
- Establish a Software Industry Promotion Agency by 2003.
- Allocation of 5 billion Bahts in Government budget by 2006 for software development projects for the creation of domestic market
- Provide open-source software with the value of at least 50 percent of the total software market.
- By 2006, the proportion of employment within ICT-based industries should constitute at least 600,000 persons (or 1 percent of total national workforce)
- Market value contributed by e-commerce should be increasing at a minimum rate of 20 per cent annually

⁴ For a detailed discussion on the policy, please refer to Intarakumnerd and Panthawi (2003).

- By 2006, the economic contribution of ICT-based industries should be at least 10 percent of the total national economy.

In terms of developing IT manpower, the targets include;

- By 2006, at least 70 percent of the workforce should have an access to ICT and 40 percent should have an access to the Internet.
- Software manpower outturn of 60,000, with 30 per cent certified software developers.
- By 2006, at least 90 percent of all students should be ICT literate.
- By 2006, the number of knowledge-workers should be increased by at least 150,000 persons.

In the field of e-governance it aims at the following:

- By 2006, all government agencies within a ministry should be able to exchange information and communicate electronically regardless of their location in the country.
- By 2006, through electronic means, every ministry should be able to integrate all relevant data from various locations throughout the country.
- By 2006, at least 60 percent of government agencies should have complete ICT management.
- By 2006, at least 90 percent of public service transactions should be offered online.
- By 2006, at least 50 percent of government agencies should be able to provide electronic services for State fee payment to all provinces.
- By 2006, ministries should exchange information to provide at least 100 public services online (e-citizen).
- By 2006, at least 100,000 million baht of government procurements should be done online (e-procurement).
- ICT security policies and regulations must be put in place.
- By 2006, basic software applications should be available for government agencies.

In addition the Master plan also has specific goals with respect to the ICT use for improving the quality of life of the people, the specified goals are:

- By 2005, at least seven telephone lines with the minimum speed of 32 kbps should be provided to every community throughout Thailand.
- By 2006, broadband services should be provided to every province at a reasonable price.
- By 2006, at least 70 percent of the disadvantaged and underprivileged population should have access to ICT services.
- By 2006, an ICT service centre should be established at every sub-district.
- By 2006, Thailand should have at least 300,000 IT-literate teachers, 70 percent of which should be in the provincial areas.
- By 2004, each sub-district should be able to publicize the content made locally.
- An organization responsible for ICT security should be set up.

With respect to developing a national system of innovation in ICT the Master plan has the following targets:

- The Government should ensure that the public and private sectors together invest in ICT research with the aggregate amount equal or greater than 3 percent of the total ICT industry value.
- The Government should provide a large software development project⁵ that requires at least 100 man-years of work, and this project must include research and development activities with the amount of not less than 5,000 million baht by 2006.
- By 2004, at least 80 percent of PC value and at least 50 percent of software value consumed within the country should be locally developed.
- By 2004, at least 70 percent of the Thai software developers should be working in network computing⁶ and/or Web services.

The Master plan considers ICT as means of improving the competitiveness of SMEs as evident from the following targets:

- By 2006, at least 100,000 SMEs should make use of ICT for back office activities.
- By 2006, 40 percent of the SMEs should make use of ICT for their core business activities.
- The number of entrepreneurs within supply chain domain should be increasing at the rate of 10 percent annually.

On the whole, the past as well as the present IT policies of the Royal Government of Thailand seems to reflect a realistic understanding of the issues being faced by the economy in general and the IT sector in particular. Achieving the targets could take Thailand a long way towards furthering its ICT capability and in harnessing the new technology for the overall development and socio-economic transformation. While the plan is clear about what to achieve, some questions relating to how to achieve the target could be raised. For example, what specific strategies are to be adopted to achieve the target set with respect to Software production and exports? What role could trade and investment policies play in achieving these targets? Can ICT production be developed as has happened in the case of electronics? Is there any need for specific policies and incentive structures for promoting IT production? Since we are dealing with an industry wherein technology is at the center, what role is visualized for the generation of technology at home and what role for imports? Are there possibilities of

⁵ It does not include services.

⁶ This refers to new software technology, such as Java and NET, used for building software systems that operate on network.

collaboration/cooperation with neighboring countries? What is the role of stakeholders other than the private sector, say NGOs, who could play a very constructive role especially in addressing the issue of intra national digital divide and harnessing ICT for the rural masses. What is the role for the provincial governments in achieving provincial equity with respect to IT? How will the formation of a separate ministry lead to an effective coordination and monitoring of various activities undertaken by different actors?

6. 3. Present State of IT use and Software Production

ICT use

To reflect on the present state IT use we shall examine some of the indicators like the use of telephones, both fixed and mobile, Internet and computers. In addition we shall also reflect on the use of ICT in government, education and also different initiatives towards using ICT for poverty reduction.

Telecommunication

Since the telecommunication sector of Thailand has been subjected to detailed enquiry and, the present study do not intend to get into many of the details, which are available in earlier studies {ITU (2002) Tangkitvanich, S. and Ratananarumitsorn, T., (2002), Vongpanitlerd, S (2001) Cairns, R. D and Nikomborirak, D. 1997}. We shall begin with a profile of telecommunication sector in terms of certain broad indicators, in comparison with other GMS countries. Table 6.2 shows that in terms of most of the indicators of telecom development Thailand holds a position much above other GMS countries. In the case of fixed lines, which are provided by TOT⁷, Telecom Asia⁸, TT&T⁹ and CAT, the

⁷ TOT operates in the metropolitan and provincial areas. Also, it provides international service to neighboring countries. Telecom Asia operates in the Metropolitan areas, TT&T in the provincial area and CAT had the monopoly of international telecom services. See in this context Asia Info-communication Council Member Information Thailand, www.aic.or.jp/relatedcountryper_centstatus20per_centreport.thailand.htm

⁸The TelecomAsia's contract with TOT covered the provision of two million lines (later extended to 2.6 million) in the Bangkok region. TelecomAsia is founded around the Charoen Pokphand (CP) Group, which is Thailand's largest conglomerate through its agricultural and food processing activities. It owned 22 per cent of TelecomAsia at end 2000. TelecomAsia's foreign partner is NYNEX of the United States, which owns 18 per cent. Part of TelecomAsia was later listed in the Thai stock market. See for details ITU (2002)

⁹ The TT&T www.tft.co.th contract covered the provision of one million lines (later extended

density increased more than 6 fold during the last decade. The waiting time has considerably declined from about five years in the mid 80s to about one year in 2001. The number of public telephones in the country recorded an annual compound growth rate of nearly 16 percent during the last decade. By March 2003 there were about 13.1 telephone per 100 people. There are many other dimensions of telecom growth and penetration that Thailand could be proud of.

While the inter-temporal growth has been remarkable, the question remains whether the country has been able to fully exploit its potential? To answer this question, it is helpful to place the performance in a comparative perspective. Here we shall compare Thai performance with the average for lower middle-income countries and also with neighboring Vietnam. Despite the fact that Thai per capita income is almost five times higher than Vietnam, the number of telephone lines per thousand people in Thailand is only 2.5 times higher than Vietnam. The telephone penetration in Thailand is also low compared with the lower middle-income countries.

In other GMS countries, the intra-national digital divide - disparity in the access to IT infrastructure across different sections and regions within the country- is found to be as pronounced as the international digital divide. How does Thailand perform in this respect, which has been highlighted as a major task to be addressed by IT 2000? Table 6.2 reveals that the number of telephone lines per 1000 people in the largest city of Thailand is almost 4.5 times higher than the average. In case of all lower middle-income countries considered the ratio is lower with 3.7. In case of Vietnam, it was noted that during 1995-2000 the telephone lines recorded an annual compound growth rate of over 31 per cent, which was almost equally distributed across different regions in the country¹⁰. In

to 1.5 million) in the provinces. TT&T has a number of owners with shareholders that include Jasmine International (20per cent), Loxley (13per cent), Italian-Thai Development (10per cent), Thai Farmers Bank and NTT West (18per cent) of Japan. By June 2001, TT&T had activated some 1.19 million lines but it is growing at a slow rate (less than two per cent per year). Both Jasmine and Loxley have their own ISPs.

¹⁰ In 2000 it was argued that Thailand has installed some 7.4 million fixed telephone lines, which equates to just over 8.5 telephone lines per hundred people. Of these, 4.5 million are in the Bangkok area, serving 15 per cent of Thailand's population. The remaining 2.9 million are installed in the provinces and serve more than 50 million people. <http://www.andrew.com/access/0801/articles/thailand.asp>

Thailand, the metropolitan areas, particularly the capital city and the surrounding areas, were having a teledensity of 54 per cent, whereas in other 76 provinces the teledensity was as low as 6.1 per cent (Tipton 2002). Table 6.3 shows that the share of households having telephone access in the Thai villages, which accounts for about 60 per cent of the total households in the country. In 2001, the percentage of households in the villages of the central region owning a telephone was 28 per cent, which was almost on par with the national average. In the Northeastern region, however, it was only 6 per cent and in the North and Southern region around 14 per cent. Given the fact that the ownership of television is highly equally distributed (see table 6.3), achieving a more equal regional distribution of telephones may well be feasible.

It appears that some efforts are needed to ensure that telecom services in Thailand will be offered at competitive prices. Fixed line telecommunication tariff in Thailand remained constant (connection charge of 3350 Baht and monthly rent of 100 Baht) for a number of years. There is no differential pricing for business and residential connection. While a local call costs only \$ 0.02 in Vietnam and Lao PDR, and \$ 0.04 in the lower middle income countries, in Thailand it costs (\$0.07) more than three times that of Vietnam and almost twice that that in lower middle income countries. However, one must add that in Thailand the recorded cost is for unlimited time where as in other countries like Vietnam it is for three minutes. Such pricing strategy reflects on the revenue per line. While the cost of call is more than three times higher in Thailand as compared to Vietnam, the revenue per line in Thailand is only 1.4 times higher. While the cost of local calls are not strictly comparable with other countries, it appears that Thai consumers are at present paying more than their counterparts in other countries when it comes to domestic long distance calls and international calls (see tables 6.4 and 6.5).

In the case of mobile telephones significant progress has been made in terms of growth and diffusion. There are seven mobile service providers and of them, Advanced Information systems (AIS), is the market leader (see table 6.6). As of May 2003 it was estimated that mobile penetration was approximately 30 per cent. However, it has also been argued that the industry is not highly competitive and prices are shown to be higher

as compared to neighboring countries (see table 6.7), even though price comparisons are based on certain assumptions.

The performance of the Telecom sector (both mobile and fixed) has to be seen in the context of telecom market structure that evolved over years and that has been strongly influenced by policy reforms initiated from time to time. Till recently, the telecom market in Thailand has been the monopoly of the state. The telephone organization Thailand (TOT) has been the only operator for domestic (local and long distance) market including neighboring countries with common borders. The Communication Authority of Thailand (CAT) had the complete monopoly in terms of international services including Internet. Both of them, however, were entitled to provide other related telecom services like paging, cellular and VSAT (Very Small Aperture Terminals).

In the context of limits set by the technical, financial and other organizational matters for providing technical services on the one hand and growing demand¹¹ for telecom services on the other, certain policy reforms were introduced in the mid 80s. This took the form of government relaxing its monopoly control in the telecom market and permitting private sector participation. However, the private sector participation has been visualized in the form of Build-Transfer-Operate Scheme¹². The introduction BTO has to be seen as a means of overcoming the complicated process of amending a number of telecom laws (Vongpanitlerd 2001). The BTO has led to entry of a number of private sector firms into the telecom sector. As of 2001 there were 30 concessionaries who obtained concessions from TOT and CAT at varying terms and conditions. (See Table 6.8 for details of concessionaries and the terms of contract).

Recently the Government has brought about major changes in the telecom sector, which involved the privatization of both TOT and CAT (now called TOT Corporation Plc and

¹¹ The waiting time for a telephone in Thailand is set to have grown to almost eight year by the middle of 1980s.

¹² Build-Transfer-Operate Scheme is some thing unique to South East Asia and has its roots in Thailand. As per the scheme, a few firms called concessionaries are given the permission to invest in the area for a specified period of time on a revenue sharing basis, after which the assets made are to be transferred to the state. Viewed thus, the firms do not own the assets that they generate.

Thai Post Co Ltd). This is expected to create a more competitive environment and hence motivate the existing operators to prepare for further competition once the telecom liberalization as per WTO comes into full effect in 2006. The Government is also in the process of establishing two regulatory authorities, National Telecommunication Commission and National Broadcasting Commission in accordance with the Frequency Allocation Act. Another issue being currently tackled relates to BTO concession conversion. A number of issues of issues, however, still need to be addressed. Since an exploration into these issues is beyond the scope of the present study, we only reiterate the need for creating a more competitive environment such that the country is able to fully utilize its potential.

Internet

The Internet was introduced to Thailand in 1991 through academic and research applications. The first Internet in Thailand was the Thai Social/Scientific, Academic and Research Network (ThaiSarn). Starting from only 9600 bps international link in 1992, ThaiSarn was matured within about three years of its introduction with the first 2Mbps international link in September 1995. ThaiSarn became the main academic and research network of Thailand with a number of information servers providing document archives, freeware/shareware mirrored archives and major local information such as the Golden Jubilee Network which hosts a wealth of information about Thailand in Thai language. The collection of servers is called "PubNet" In November 1997, ThaiSarn launched the Public Internet Exchange (PIE) to supplement the PubNet project. PIE allows local commercial Internet Service Providers (through their own investment and connection license) to exchange domestic traffic without leaving Thailand. The project was so successful that after one year of experiment, the participants of PIE decided to provide funding to sustain the project¹³.

There are 18 Internet service providers, (see table 6.9) of which top five of them account for over 70 per cent of the total traffic. These five also accounts for majority of the

¹³ See in this Context Koanantakool T. (2001) Getting Ready for the New Millennium, What are the Thai Government's actions toward the year 2000? NECTEC.

subscribers- both dial up leased line. CAT issues ISP licenses because it is having the monopoly over international communication. ISPs are expected to provide 32 per cent of their shares to CAT. Limits on foreign ownership in ISPs were raised to 49 per cent from 20 per cent in 1998. Given the fact that the local call charges are fixed regardless of the time, demand is tilted in favour of dial up and that for broadband of is limited. The dialup Internet access price has two components; the ISP charge and the telephone charge. The present pricing of telecommunication acts as a factor favoring Internet use. Since the price of local call is fixed regardless of the time used, Thailand has one of the lowest dialup Internet prices in South East Asia (ITU 2003). There have been attempts to do away with the ISP charge completely for dial up Internet access. Though this has not been realized, one of the ISPs, Telecom Asia, offered promotions for its fixed line customers by providing free Internet access through its ClickTA ISP.

As a result of the series of initiatives by the state, there has been significant progress in the use of Internet in the country. By 2001 there were about 3.5 million Internet users in the country, which accounts for about 5.6 percent of the population. Yet English remains a major hurdle for large sections of society in accessing Internet. It has also been observed that there is gender equality regarding Internet use - almost 50 per cent of the users are females. As envisaged in the policy, dial up Internet is available in all the provinces at the cost of a local call. At the same, time it needs to be noted that as in many other developing countries, the capital city accounts for about 71 per cent of the users and about 90 per cent of the users are in the urban centers though the urban centers accounts for only about 30 per cent of the total population.

When it comes to leased lines, the situation is different. The fact that the ISPs are not allowed to directly provide their own infrastructure may have the effect of driving up the costs. This could result from a lack of competition (as CAT is a common share holder in all the ISPs) as well as reselling. As a result, leased line customers have to make two payments, one to the physical leased line and one to the ISP for Internet access, thereby leading to higher prices.

IT in Government

Various projects were undertaken to promote the use of ICT in government at different levels. The projects include, the GINET, CIO programme and the CEO program.

GINET

There are two major components to the core IT infrastructure to Government; the Government Information Network (GINet) and the common information services to all ministries. The Government Information Technology Service Program at NECTEC manages both functions. GiNet is the government networking backbone which links every province in Thailand with high-speed communication lines at the speed of 155 Mbps. High speed access networks are to be made available in all 1,000 districts through leased circuits, ISDN or ADSL technologies. GINet consists of a nationwide ATM (asynchronous transfer mode) network running on TOT's existing and new optical fiber network. By April 2000, about 20 provinces were having access to GINET backbone. Various initiatives have also been made to make use of IT in the provincial administration.

The IT Master plan for local governments (provincial level) has also been implemented. NECTEC-ITS supported one pilot project in Phuket which integrates all aspects of IT utilization within the province. It covers the local economic planning, information infrastructure, education planning, industry planning and maintenance of good environment. Some pilot implementation is now under way. Other provinces may follow the pattern once the model province plan has been reviewed and actions have taken off.

The CIO Program

Started in 1998, the program aimed at appointing a Chief Information Officer in every ministry and department and every state enterprise to over see the unified IT development plans at both the departmental level and the ministerial level. The responsibility of a CIO included drafting of the organization's IT master plan and transforming relevant national

IT policies into organizational actions. The CIOs were provided with required training jointly by NECTEC and the Office of the Civil Servant Commission. The government CIOs are instrumental in ensuring smoother information flow across ministries, more efficient information sharing and improved decision-support system for the country through the use of Government Information Network and a common set of specifications to allow the private sector to carry out IT projects for the government more efficiently.

A related project aims at increasing IT awareness in at the highest government level. The Chief Executive Officers Program (ECP) approved by the cabinet in 2000 calls for two high ranking officers (permanent secretary and director general) within each government organization to attend half day training session on the benefits of ICT. By the end of 2001 all the CEOs have attended the course.

E-Commerce

The importance of electronic commerce has been recognized by NECTEC and NITC since 1992, when NITC set up a subcommittee on EDI for International Trade. Since then, NECTEC has been developing EDI service organization with the Customs Department, Thai Airways International, CAT, TOT, the Federation of Thai Industry, the Chamber of Commerce, Association of Freight Forwarders, etc. In 1998, a joint venture company called TradeSiam was set up with the private sector as a majority shareholders and the government as the minority. The EDI subcommittee was subsequently renamed "Thailand EDI Council". The NITC assigned NECTEC to develop an electronic commerce framework to develop recommendations on the roles and responsibilities of government agencies. One of the objectives of the plan is to facilitate private sector involvement in evolving domestic and international electronic commerce arenas. In January 1999, the cabinet approved a proposal by the Ministry of Science, Technology and Environment to set up the Electronic Commerce Resource Center (ECRC) to ensure the smooth development of E-commerce in Thailand through awareness, training program and information center. In 2000 government approved the National Policy Framework for Electronic Commerce drafted by ECRC. Electronic Commerce revenue in the country was estimated at US\$ 90 million in 2000 and was expected to reach \$ 2.3

billion by 2004. Yet it has been argued that Thailand lags behind in the neighboring countries in terms of its commerce (ITU 2003).

Trade Siam - Thailand's National EDI Provider

The Thailand EDI Council (TEDIC), one of the subcommittees under the NITC, proposed the creation of TradeSiam as a joint venture company between Thai government agencies and the private sector mainly to facilitate international trade. It started a limited pilot service in December 1998 and became fully operational in 1999. TradeSiam serves as a center to provide EDI services between government agencies and the private sector. In order to operate efficiently, TradeSiam is managed as a private company where it positions itself as a national EDI service provider with the following objectives:

- Act as the designated EDI gateway between government agencies and the private sector.
- Become the major training center for businesses using EDI.
- Coordinate with the Thailand EDI Council in EDI development.
- As a one-stop service, trading partners will be able to successfully proceed with trading procedures such as customs declaration, import certification, export license, or electronic funds transfer using the EDI-standard format UN/EDIFACT. TradeSiam will also provide a facility to convert other EDI standards such CARGO*IMP to UN/EDIFACT and vice versa.

Development of IT laws

In late 1998, the NITC empowered six subcommittees to study and draft six IT-related laws. The IT-Law Development project was carried out by NECTEC. The IT laws serves as an infrastructure for doing electronic commerce and enhance confidence among the members of the electronic transaction playground while providing rules and etiquette for fair play. Hence laws have been enacted dealing with data protection, Computer Crime, Electronic Data Interchange, Digital Signature, Electronic Funds Transfer and Universal Access.

IT in Education: SchoolNet

The SchoolNet Project initiated by NECTEC, in cooperation with CAT, TOT and the Ministry of Education was started in 1996. The project has the following specific objectives

- Provision of Internet connection and technical support to schools,
- Promotion of content development and training the teachers
- Promoting the use of Internet in classroom activities.

During the first year of implementation, 20 schools were connected and in 1999 the Cabinet approved the expansion of the project to cover 5000 schools across the country. There are currently 4,751 schools in the School Net network (SchoolNet@1509) with 20 POP nodes around the country. There are 1,650 access numbers with a gateway up speed of 512 Kbps (10 circuits) and 1 Mbps (10 circuits) with international connections speed being increased from 1.5 Mbps to 4 Mbps. The SchoolNet Web site¹⁴ serves as the information centre for teachers and students and is the portal for school Web sites in all regions. Some 1,289 schools participate in the activities of the Web site. Of the 505,120 teachers and administrative personnel under the Ministry of Education, 108,671, or 21.5 per cent have undergone training in ICT.

The Ministry of University Affairs is the lead organization in the development of Inter-University Network (Uninet) in accordance with a Cabinet Resolution in October 1997. Its mission is to develop a high-speed information highway and establish a distant learning network for the university system. Thirty institutions are currently joined together through the Uni Net fiber-optic network. The project has four elements:

- Join all universities and colleges in the network;
- Develop self-access learning centres within universities, including the establishment of electronic library facilities in Campus Networks;
- Develop courseware for joint use by university members as well as information databases and instruction via video conferencing; and
- Capacity building and personnel development to enable research, management and application of new learning technologies.

¹⁴ <http://www.school.net.th>

UniNet is composed of two major networks: the Bangkok Backbone and the Regional Backbone. These two networks will be joined to integrate the inter- and intra-university systems throughout the country;

In 2001, the Cabinet approved the creation of a National Education Network Project, or EdNet, which merged the UniNet and SchoolNet networks into a National Education Network, with the Ministry of University Affairs charged with the development and management of the infrastructure for the network at all levels and the Ministry of Education responsible for installation of equipment and computers in the schools and learning centres in each province. A committee has been appointed to review the design of the ICT system and plan the expansion of the network to include educational institutions from the basic through the tertiary levels.

IT use in Thailand is not confined to government and education alone. Significant use of IT is being made in the field of health care, agriculture¹⁵ and other activities related to poverty reduction. However a detailed enquiry into the extent of use and its impact on all the sectors is beyond the scope of the present study¹⁶.

Private Sector

Private sector in Thailand has been in the forefront with respect to the use of information technology. At present 6460 e-commerce website are established by Thai private sector companies. E-commerce sites are growing in different sector like tourism, computer and internet apparel and cosmetic and handicrafts, jewellery, restaurant etc (UNESCAP 2002) It is understood that small and medium enterprises also are increasingly having their own website and engage in e-commerce.

Production of IT software

One of the declared objectives of IT 2010 is the establishment of software production base in the country. The master Plan (2002-06) has the target of producing software

¹⁵ See for a discussion Pongsrihadulchai (1998)

¹⁶ See for details NECTC, 2002, ICT for Poverty Reduction: Examples of Programmes/Projects in Thailand, NECTEC, Bangkok.

worth about \$ 2 billion, of which 75 per cent for the export market. Today Computer software demand in Thailand is being stimulated by the economy's continuing adjustment to the economic crisis of 1997-98, including restructuring of business operations, expansion of multinational companies' operations, increasing competition in manufacturing and distribution industries, and growing use of the Internet and e-commerce. But local software development is still a young industry. It has been claimed by the industry that as of now there are about 500 firms operating in the software sector. But more than 70 per cent of the domestic demand is being met by imports.

Going by the Board of Investment statistics, the number of promoted software companies increased from just 2 in 1996 to 49 in 2001 and declined to 13 in 2003. The cumulative number of promoted companies since 1996 stands at 170. Out of these, 75 were fully owned by Thai companies, 34 were foreign companies and the others were joint ventures. It may be noted that of these, 33 licenses were issued during 2002 and 2003 and hence not started operations. The total investment commitment by 137 companies promoted prior to 2002 amounted to 1632 million Baht with a mean investment of 11.9 million bahts. But the actual investment made amounted to only 52 percent (846.5 million bahts) with an average investment of 9.7 million bahts. As we shall see the next section, the observed rate of investment fructification is much lower as compared to other sectors and for the economy as a whole.

In the case of fully Thai owned companies the investment commitments amounted to 532 million Baht and actual investment was of the order of 389 million bahts (73per cent). When it comes to fully-owned foreign companies, total investment commitments were of the order of 113 million Baht and the actual investment was about 90.8 million bahts (80per cent). In the case of 55 joint ventures (1996-02) total investment commitment was of the order of 986 million Baht with an actual investment of 365.9 million bahts (35.7per cent). Thus it appears that investment realization has been the highest in the case of fully owned foreign companies followed by Thai companies and joint ventures. It is beyond the scope of the present study to analyze how to account for the observed differences in

the rate of investment realization across different ownership categories. However, further enquiries in this direction may lead to important insights.

Total employment commitment by the 170 promoted companies was of the order of 4207, whereas the actual employment generated was only of the order of 1969. Out of the realized employment, 1184 (60per cent) was accounted by Thai firms, 165 (8per cent) by foreign firms and 620 (32per cent) by joint ventures. Of the foreign firms 25 per cent are from Japan, 13 per cent from the US and 9 per cent from the UK. Other countries and economies with foreign investment in the software sector include Canada (7per cent) France (7per cent) Singapore (7per cent) Taiwan Province of China (5per cent). From discussion with industry sources it was discerned that the export base of Thailand is rather limited¹⁷. But as a result of the series of policy initiatives to promote the use of ICT in different sectors of the economy, there is a growing domestic demand (see table 6.10). In 2001 the IT market is estimated at 1.6 billion, of which hardware accounts for about 63 per cent. Thailand also has set up a software park with a view to promote software production and exports (see Box 6.1).

On the whole, there are a number of achievements that Thailand could claim in terms of harnessing ICT for development. Significant progress has been made in terms of making available the new technology for educational institutions at different level though improvements in many directions are called for¹⁸. Initial conditions for launching e-commerce has already been set. Information Technology is being used extensively in the provision of government services. Many programs in the rural sector in general and agricultural sector in particular have been initiated. In tune with the general trend the private sector has been harnessing the new technology as a tool for increasing competitiveness. These achievements appear even more impressive when we consider the fact that, these were made during a period of general economic recession. As the

¹⁷ One estimate claimed exports in 2000 at \$ 11 million.

¹⁸ It has been argued that in the majority of schools, programme packages are used and technology is not integrated into the teaching of subjects in the curriculum. Computers are used to teach computer skills rather than as tools for learning other subjects. See for details Suksiriserekul (2003).

Box 6. 1 Software Park of Thailand

Drawing lessons from Silicon Valley and recent experience in India Thailand established a software park. The objective of the software park of Thailand, as approved by the cabinet are to:

- Become the national cluster for activities related to software production and marketing of software products and services,
- Become a center of excellence for software engineering/software technical support/technical consulting/professional training.
- Raise Thailand's potential as a competitive software producer in the world market.

The software park provides common facility and an incubation center and operates as a center of excellence in bringing together the corporate and academic institutions by organizing collaborative activities. It also enables the local software developers to enjoy professional support for international marketing one-stop meeting point for potential customers, both local and foreign and provide high-speed networking. Software park of Thailand maintains its close association with private sector and in association with Thai software industry organizes an annual software fare.

Located about 20 kilometers from Bangkok on Chaengwattana Road the park is surrounded by government agencies and states enterprises such as ministry of foreign affairs, telephone organization of Thailand and communication authority of Thailand. As of now 52 firms are operating from the software park. Of these 14 are foreign companies including world famous companies like Intel, IBM, Informix etc. It is understood that two more parks are likely to come up in the near future.

Source: Based on <http://www.swpark.or.th/>

economy is showing signs of robust revival, much progress could be expected in the years to come.

6. 4. Human capital for Information Technology¹⁹

From the very beginning policy makers have underscored the importance of developing human capital base for developing information technology on the one hand and its effective use on the other. Consequently, one of the three pillars of IT- 2000 dealt with developing human capital base and various initiatives have been made in this direction.

Emphasis on human capital formation was nothing specific IT. During the past period of economic crisis, for example, more importance was given to tax incentive schemes for supporting and stimulating training and skill development in the private enterprises. Although Thailand entered 1990s with a relatively poorly educated workforce (84 per cent of the workforce having elementary or lower level of education), it may have been slow at developing policies in this field when compared to neighbouring countries like Malaysia and Singapore. Until 1994 there was no demand side policies to promote training and skills upgrading. In that year the Vocational Training Promoting act was introduced, offering tax incentive for company-based training centers. The registered private enterprises could obtain a 50 percent tax deduction of training expenses in their income tax. In 1995 a new fiscal decree made it possible to deduct 150 percent of the cost of in-house or out house training, when employers trained employees with more than six month of seniority.²⁰

Tax incentive to support training through private training institute had by January 2001 supported 51 companies, which trained 5000-6000 workers on a yearly basis. The other tax incentive scheme with 150 per cent tax deduction had been utilized by about 500 companies and during 1990-2000 and there were around 190,000 participants per year (Lauridsen 2002) The low utilization of tax exemption scheme has been noted by the Thai Industrial and Innovation survey and by other studies (Arnold et al 2000).

¹⁹ For a detailed analysis of various policies on Human Development and for the present status see, S. Suksiriserekul (2003) and Lauridsen (2002)

²⁰ DSD, 2000 Direction in skill Development, Technical Studies and Planning Division, Department of Skill Development, Bangkok: Ministry of Labour and Social Welfare.

A second major initiative was the skill development fund set up in 1997 wherein soft loans were provided to workers wishing to upgrade their skills, knowledge and capabilities. By 2001 almost total amount of fund had been utilized. It is found that three quarters of the fund were used by new entry workers (mostly women) aiming employment in the service sector; a further 5 to 10 percent were used by laid-of workers (normally following computer courses) while only 10 to 20 percent were used by workers in job. Another initiative to skilled development was the amendment of Skills Development Act, in particular the change in the financing and working of the skills development fund.

Data presented in table 6.11 tend to suggest that Thailand is likely to achieve the target set out in the Master Plan at least with respect to manpower with higher level of qualifications. Yet, the available estimate on the demand for and the supply of IT manpower as well as the projection for the near future as presented in table 6.11 shows that Thailand will have to live with excess demand situation at least in the near future. During 2002-06, notwithstanding the near doubling of the supply of IT manpower, the deficit in the year 2006 is likely to be of the order of 26000. This calls for intensified efforts on the part of government and private sector to address the growing demand for the IT manpower.

So far we have been dealing with IT manpower from the “quantity perspective “. But if Thailand were to achieve the objectives enunciated in IT 2010, especially those with respect to IT software production and export and use of ICT in different sector of the economy society, there is the need for “quality manpower”. ICT software and services for example is emerging as most of the competitive industry in other countries like India and Philippines and these countries are having earlier mover advantage coupled with substantial institutional capabilities to generate high quality IT manpower. In this context Thailand it may be necessary to device appropriate policies to improve the quality of IT manpower.

Given the fact that there is growing demand for computer/software training, a number of private training institutions are operating in this field. The high demands for IT training arise not only from the young generation but also from the fact that the private sector in Thailand is in the process of upgrading their operations and expect their employees to acquire IT skills. The Thai Ministry of Education reports that there were more than 800 computer training schools with approximately 320,000 students in 1999, 11 percent higher than in 1998. However from the industrial sector it is discerned that the quality of IT manpower coming out of these institutions is much to be desired. While very high targets have been set by the IT master plan, specific strategies towards achieving high quality manpower seem to be necessary.

Here the policy makers may consider the following policy options. First, efforts need to be made to foster a strong relationship between academia and industry, involving an active participation by the industry in deciding the curriculum of the university so that the students and faculty get accustomed to a current state of art in the industry. The software park of Thailand indeed makes an earnest attempt in this direction. However, such linkage should perhaps not be confined to units in the park alone. Secondly, it may be advisable to explore the possibilities of fostering relationship with those universities/institutional in neighboring countries known for their IT capabilities. This could be supplemented by creating a more conducive environment for investment especially in the IT training field. Further, following the strategy that has been adapted by developed countries, relaxing the restriction on the mobility of knowledge workers may give rich dividends. Given the high variations in the quality of training offered by different training institutions, much could be learned from the DoE accreditation system followed in India.

6. 5. Trade and Investment in IT: Policies, Performance and Challenges

Among the developing world Thailand is known for its most liberal policies towards Foreign Direct Investment (FDI). As early as in the 70s, while there was a general disenchantment towards FDI among the developing countries, Thailand adopted policies that welcomed foreign investment with minimum of restrictions. Such initiatives have to

be see against the fact that the policy makers were convinced of the benefits that FDI could bring along with in an economy having limited savings and investment capabilities on the one hand and small domestic market on the other. The underline objective of the liberal policies was to get benefit from the inflow of capital resource and other intangible assets like technology on the one hand and get better access to world market with the help of multinational corporations. While the policies have changed over the years, in essence it remains as one of the mostly facilitating policy regime in the region.

In this section we shall address two basic questions; first what are the broad contours of FDI policy being followed by Thailand at present and what policy lessons other GMS countries could imbibe. Secondly we shall briefly explore the outcomes of the policies followed by Thailand with special focus on ICT sector. This part highlights potential limits of the policies followed and tries to discern a direction of future policy options that could help to bring this sector towards a different development trajectory.

Investment Promotion in Thailand

The Board of Investment, set up in 1959 to promote investment, both foreign and local, is the official agency responsible for providing incentives to promote investment in the country. Although investment promotion dates back to more than three decades, the BOI is officially governed by the 1977 Investment Promotion Act, which was amended in 1991 and 2001 to take care of the changing economic conditions. In 1993, the BOI initiated a major shift in emphasis from export orientation to industrial decentralization as a major policy goal. Intended to spur development in rural areas where the population is employed primarily in the labor-intensive agricultural sector, this decentralization focus continues under the new policy. A chief objective is to reduce congestion in the already-overcrowded capital and to strengthen and diversify the economic base in the provinces

Guiding Principles in Investment Promotion²¹

As of now the investment policy is governed *inter alia* by two broad objectives; to promote investment in certain priority areas in tune with the national economic development goals and secondly to promote investment in such a way as to promote balanced regional development. In keeping view of the first objective, the BOI is empowered to provide wide range of fiscal and non-fiscal incentives to investment projects that strengthen the country's industrial and technological base. Hence the BOI investment promotes investment which

- Strengthen Thailand's industrial and technological capability,
- Make use of domestic resources
- Create employment opportunities
- Develop basic and support industries
- Earn foreign exchange
- Contribute to economic growth of regions outside Bangkok
- Develop infrastructure and conserve natural resources and
- Reduce environmental problems.

Privileges are granted to projects that actually benefit the economy and good governance shall be used for managing and supervising the application of tax and duty privileges. In view of increasing international competitiveness, every promoted project that has investment capital of 10 million bath and upwards (excluding cost of land and working capital) must obtain ISO 9000 certification or similar international certification within 2 years from its start-up date. Special promotion shall be given to region or areas with low income and inadequate investment facilities. Maximum tax and duty privileges shall be given to these region or areas. Importance is given to small and medium industries by applying a minimum level of investment capital of 1 million Baht (excluding cost of land and working capital) for projects eligible for promotion.

Priority is given to activities in agriculture and agricultural products, projects related to technological and human resource development, public utilities and infrastructure, environmental protection and conservation and targeted industries. At the same time, and

²¹ Draws from, Board of Investment (2003), A Guide to the Board of Investment, Bangkok.

in order to ensure that Thai investment policy is in line with all international obligations, the BOI has lifted all local content and export requirements.

Investment Zones

In 1993, the BOI initiated a major shift in emphasis from export orientation to industrial decentralization as a major policy goal. Intended to spur development in rural areas where the population is employed primarily in the labor-intensive agricultural sector, this decentralization focus continues under the new policy. Accordingly the country has been divided into three investment zones²² based on economic factors, i.e., the level of income and the availability of infrastructure in each province. All areas in the Zone 3 provinces are designated as Investment Promotion Zones and there are differential incentives as given below.

Projects in Zone 1 are eligible for 50 percent reduction of import duty on machinery that is subject to import duty of not less than 10 percent; Corporate income tax exemption for 3 years for projects located within industrial estates or promoted industrial zones, provided that such a project with capital investment of 10 million Baht. In addition exemption of import duty on raw or essential materials used in the manufacturing of export products for 1 year is also provided.

Incentives provided in Zone 2 include: 50 percent reduction of import duty on machinery that is subject to import duty of not less than 10 percent; corporate income tax exemption for 3 years, increased to 5 years for projects located within industrial estates or promoted industrial zones, provided that such a project with capital investment of 10 million Baht or more.

²² Zone 1 consists of 6 Central province with high income and good infrastructure: Bangkok, Nakhon Pathom, Nonthaburi, Pathum Thani, Samut Prakan, and Samut Sakhon. In Zone 2, there are 12 provinces: Ang Thong, Ayutthaya, Chachoengsao, Chon Buri, Kanchanaburi, Nakhon Nayok, Ratchaburi, Samut Songkhram, Saraburi, Suphanburi, Phuket, and Rayong. In Zone 3 the remaining 58 provinces with low income and less developed infrastructure are included.

Zone 3 provides more incentives in the form of: Exemption of import duty on machinery; corporate income tax exemption for 8 years provided that a project with capital investment of 10 million Baht or more; exemption of import duty on raw or essential materials used in the manufacturing or export products for 5 years;

A project located on one of the select 18 less developed provinces are granted tax and duty privileges, plus: 50 per cent reduction of corporate income tax for 5 years after the exemption period; Double deduction from taxable income of transportation, electricity and water costs for 10 years from the date of first revenue from promoted activities; Deduction from net profit can be made for 25 per cent of the project's infrastructure installation or construction cost for 10 years from the date of first sales, and net profit for one or more years of any year can be chosen for such deduction. The deduction is additional to depreciation.

Keeping view of the guiding principles, outlined earlier, certain priority areas have been specified:

- Agriculture and agricultural products;
- Direct involvement in technological and human resource development;
- Public utilities and infrastructure;
- Environmental protection and conservation;
- Targeted industries;

To attract investment into these priority areas additional privileges like; exemption of import duty on machinery regardless of location; corporate income tax exemption for eight years, regardless of location; and other privileges entitled for each zone are offered.

In general the policy towards investment is highly liberal and transparent also efficient (see Box 6.2), with hardly any performance requirement like export obligation or local content requirement. The policy aims at attracting investment especially to those sectors of national priority and also in less developed regions with importance assigned to SMEs.

Trade policy Regime in Thailand

Thailand has a highly liberalized trade regime which has been particularly facilitating the inflow of raw materials and capital goods for export production. Being a member of WTO Thai government is complying with WTO Tariff production commitments. To facilitate trade in 2000 government announced the new custom valuation system by which there are six methods of custom valuation to estimate the import duty. Government has also made use of information technology in the custom departments for the speedy clearance of exports and imports. Licensing requirements has been reduced over the year and today it is required only for 26 categories.

Box 6. 2 Time Frame for Project Consideration and Related Procedures

Initial Project Analysis

By the OBOI (investment of up to 40 million baht)	60
By the OBOI or Sub-Committee (investment of 40-500 Million baht)	60
By the BOI (investment of more than 500 million baht)	90

Project Modifications

Changes in location, raw material import schedule, registered capital, Foreign equity share, or reduction in production capacity	5
Additional privileges, product withdrawal, sale or by-products	15
Increase in production capacity, change in type of products, change In method of production, change in exporting condition, or transferring Of promoted activities	30

Promotion Certificate Issuance

Extension of promotion acceptance period	7
Issuing promotion certificate	10

Clearance of Machinery Imports

Approval of machinery clearance*	3 hrs
Approval of use of bank guarantee	3
Approval of bank guarantee withdrawal	7
Approval of master list of machinery	60

Clearance of Raw or Essential Materials Imports

Approval of raw or essential materials clearance*	3 hrs
Approval of use of bank guarantee	3
Approval of bank guarantee withdrawal	3

Approval of input formula and maximum stocks	30
Granting Permission for Foreigners	
To conduct feasibility studies	15
To work in promoted activities	10
To own hand	15
To mortgage land	15
To own a condominium unit	5
* These processes must be done at the Investor Club Association	
Source: Board of Investment, 2003, A Guide to the Board of Investment, Office of the Board of Investment, Royal Thai Government.	

Investment Performance

Table 6.12 presents data on the inflow of foreign direct investment to Thailand. It is evident that Thailand accounted for about 2.65 per cent of the FDI inflows to developing countries and by 1998, even while the economy was under the grip of financial crisis, FDI peaked at about \$7.4 billion and accounting for about 4 per cent of the total FDI inflows to the developing countries. The higher inflow was made possible not only through the liberal trade and investment policies but also because of the abundant supply of cheap labor, political stability, good infrastructure and geographical proximity to investing countries like Japan. Since 1998, there has been a downward trend in inflows and the total inflows in the year 2002 was only about one-sixth of that the country received in 1998.

The effectiveness of the policy regime in attracting investment as well facilitating investment could be gauged from the fructification rate. During the five years ending 2001, total approved investment was of the order of 29.34 billion and the actual inflow was about 24.6 billion. This makes the fructification rate of nearly 84 per cent, which was one of the highest in the region. Given the fact that FDI fructification is found to be much lower in other GMS countries, much could be learned by other countries from Thai experience.

While there is no perfect substitute for sector level and industry level detailed studies to understand the contribution of FDI to overall growth and development, some broad idea could be obtained from simply looking at data. As we have shown in chapter 2, in an economy constrained by the availability of investible resources on account of lower savings rate, FDI could contribute to growth by supplementing domestic savings and also by providing technology and other intangible assets that are scarce in developing countries. To reflect this issue in the Thai context we present the data on the contribution of FDI to the capital formation in the country. It may be noted except for a few years, the contribution of FDI to Gross Fixed Capital formation in Thailand was much higher than that of developing countries in general and that of other South-East Asian countries (see table 6.13).

We have seen that one of the declared objectives of FDI policy was to facilitate a regionally balanced development. Keeping this in view, incentive structure has been modulated with view to attract more investment to the less developed regions. Table 6.14 presents data on the distribution of FDI across different zones during 1997-2001. In 1997 Zone 1 accounted for about 19 per cent of total investment and the share of Zone 3 was over 56 per cent. Since then the share of Zone 3 has shown a decline and that of Zone 1 increased. In general it points towards the difficulties of incentives to attract investment into an economy. As has been shown by many studies, in deciding the investment location, the amount of incentives does not have any overriding importance.

In terms of the sector wise distribution of FDI, it is found that electrical and electronics industries account for largest share of investment followed by metal product and machinery. During 1997-01 for example, electrical and electronic industries accounted for nearly 26 percent of the total FDI inflows into the country followed by metal products and machinery with a share of nearly 20 percent (see table 6.15).

In electrical and electronic industries group, the bulk of the investment has been accounted for by electronic industries as is evident from table 6.16, which gives a detailed breakup of investment in electrical and electronic industries. It is evident that

within electrical and electronics industries, electronics accounts for about 90 percent of the total number of project approved and more than 95 percent of total investment. More interestingly in tune with the policy objectives, as well as the vision presented in IT 2010, about 23 percent of the total number of project approved in electrical and electronics sector has been in the field of software development. Table 6.16 also presents data on employment potential with breakup of foreign and local. It is evident that the number of foreign employment per million Baht of investment in the electrical and electronic sector is found to be 0.016. But when it comes to software the corresponding ratio is 0.12, more than seven times the industry average. This point reiterate our earlier observation that today there is an excess demand for IT manpower and underscores the need for building up needed manpower if the country has to achieve the objectives set out in IT 2010.

Present state of IT Hardware (Electronics) Production and Challenges Ahead

Though electronics production in the country dates back to 1960s, Thailand actively promoted Electronics industry during the late seventies. This is evident from the fact that while the number of firms that entered electronics production were only 6 during 1960-73 and 29 during 1974-79, their number increased to 211 during 1987-92 and further to 375 since 1993, reflecting the success of the government policy wards attracting investment into this sector. In Thailand, the electronics industry played a significant role in the economy during the past two decades, both in terms of developing the sector itself as is evident from the recorded growth rate, which has been much higher than the economy as whole and the industrial sector, and in terms generating employment and export earnings and thus aiding overall development.

As of today more than 600 firms are active in the field of electronics production giving employment more than 0.3 million. In term of the distribution of employment, consumer electronics accounts for about 19 per cent, Computers and other electronics capital goods 28 per cent an electronics parts and ICs accounts for 53 per cent. The major product of Thai electronics industry includes computers and components, integrated circuits and parts, Hard Disk Drives and parts. In each of these product lines the world leaders have their presence in Thailand and most of them are expanding their production base. To list

a few, foreign firms like IBM, Fujitsu²³ Cannon, Cal Comp, and Oki, Seagate²⁴, Lucent²⁵, AMD²⁶, NS Electronics²⁷ have established production facilities in Thailand.

As we have argued in chapter 2, given the specificities of electronics production, no country can afford to produce all the components and raw materials needed for electronics production. Hence, to promote investment, the trade regime needs to be one that facilitates the free flow of inputs into and output out of the economy. Data presented in table 6.17 tend to suggest that Thailand presents a typical case wherein the trade policy facilitated free imports of components and materials through the liberalized trade policy regime which in turn led to substantial investment on the one hand and export earning and employment generation on the other. Table 6.17 shows that total exports from the country increased from \$10 billion in 1997 to over \$15 billion in 2000 and there after showed a declining trend. At the same time the imports also increased yet, the trade balance ranged from 3 to 4 billion US dollars. This data, however, does not take into account the imports of capital goods needed for electronics production, which has been estimated at about \$0.8 billion.

Challenges before Thai Electronics Industry

Needless to say, the electronics industry has made significant contribution to the overall economic development of the country. But based on a detailed analysis of the electronics industries in South East Asia, Earnst (2001) expresses the view that export-oriented

²³Fujitsu, a subsidiary of Fujitsu of Japan, completed a \$ 425 million expansion project in 2001 to increase annual production of hard disk drives to 29.1 million units. Fujitsu employs 5,000 workers at its two manufacturing plants in Thailand.

²⁴ Seagate recently invested \$115 million to improve its production process and upgrade labor skills at three manufacturing plants this year. Seagate has its largest production base in Thailand with 33,000 employees and five manufacturing plants.

²⁵ Lucent Technologies Microelectronics, owned by Lucent of Murray Hill, New Jersey, has recently completed a \$30 million expansion project to double its production of integrated circuits. The plant has 1,200 employees and is one of its largest integrated circuit assembly and test operations worldwide.

²⁶ AMD (Advance Micro Devices), headquartered in Sunnyvale, California, also has expansion plans in Thailand and it has 1,300 employees.

²⁷ NS Electronics made an additional investment of \$40 million in on machinery and equipment to produce new product packages. The firm also plans to increase its production capacity of integrated circuits from 2.5 million to 5 million units per day in the near future. NS Electronics is a Thai company, recently separated from Alphatec Group and currently maintains strong position as an export manufacturer. The firm has 2,800 employees.

production can no longer guarantee sustained growth and welfare improvement alone. Export led production also faces serious external challenges from volatile global finance, currency and export markets. The conclusion, if correct, appears to be highly relevant in the case of Thailand as well. Three potential weaknesses identified by Earnst – a sticky specialization on exportable “commodities”, a narrow domestic knowledge base leading to limited industrial upgrading and limited backward and forward linkages in the context of South East Asian countries could be applicable in the case of Thailand.

Electronics industry comprises of a large number of products and Thailand has specialized in the mass production of a few products to serve the export market. This has led to a kind of sticky specialization with limited backward and forward linkages especially for materials and production equipment that give rise to very high level of import dependence and limited value addition. A recent survey notes that that Thailand’s ICT-related firms play a small subcontracting role by supplying minor components for foreign firms in the ICT industry. According to the survey, there are four main reasons why firms in this industry have to import these components from foreign suppliers: First, the production technology belongs to foreign parent companies. Second, there are no domestic components because the production technology is not available in Thailand. The first and second reasons are related to each other. If the technology, which is specific to parent companies, is not transferred to firms in Thailand, components cannot be produced domestically. The third reason is that the quality of domestic components cannot meet the foreign parent company’s requirements. The last reason is that it is easier to deal with foreign suppliers who have already created long-term relationship with their parent companies. Thus Thai firms have small room to play in the Thai ICT industry (Mephokee 2003)

A striking feature, which could partly be attributed to the strategy being adopted, is the mismatch between local production and consumption both at the component and equipment level. To illustrate, in the case of telecommunication equipment, Thailand exports almost 70 per cent of its production and at the same time imports more than 70 per cent of its domestic demand (see table 6.18). Similar is the case with semiconductor

devices. This very high degree of integration into the world market, which is a common feature of most countries that are leading in ICT exports, allowed Thailand to increase production and employment, but also had the effect making the industry highly susceptible to international market fluctuations.

An issue that is of great concern for a country in the process of leaving the status as developing country is limited industrial upgrading within the electronics industry. Following Hobday (1994), three stages could be identified in the evolution of electronics industry in South East Asia (see Table 6.19). Most of the East Asian countries have began as Original Equipment manufactures. The OEM system enabled firms to export to international markets and to acquire foreign technology. In the 1980s, own design and manufacture (ODM) emerged out of OEM, as noted by Johnstone (1989) in the case of Taiwan Province of China. In the 1990s, some of the leading firms in East Asia began their own-brand manufacture (OBM), competing directly with international suppliers from Japan, the US, and Europe. Under OBM, the latecomer firm carries out all of the stages of production and innovation, including manufacturing, new product designs, and R&D. One question is how Thai electronics industry fared in this respect. If the available evidence is any indication, the transition has been rather slow. It is further evident from Table 6.20 presenting the stages of development of electronics industry in different countries in South East Asia. It appears that the Thai electronics industry has been locked up in low value adding assembly of electronics commodities and there has been very limited industrial upgrading.

The limited industrial upgrading could be seen in the context of the National System of Innovation evolved in the country over the years²⁸. Lauridsen (2003) argues that Technology policy came on the agenda quite late in Thailand. During the long period of stable growth (1960-86), industrial upgrading and technological development was not a burning policy technology was to a large extent embodied in the important machinery and equipment which-in the case of complex technologies-could be acquired either for

²⁸ See in this context Intarakumnerd P et.al (2002) National Innovation System in Less Successful Developing Countries: The Case of Thailand, *Research Policy*, Vo. 31 pp 1445-1457.

the parent company (in case of joint ventures) or imported as turn key packages. During the high-growth decade (1987-97) Thailand experienced an economic growth that to a great extent was linked to exceptionally high growth rates in manufacturing exports. During the same period there was an even stronger increase in imports, which was largely due to a rapid increase in import dependency. This in turn reflected a weak engineering base and lack of supporting industries. Here it need to be noted that foreign direct investment which acted as vehicles of growth were not under any pressure to develop supporting industries or local content. It has also been argued that the subsidiaries and joint ventures created by FDI engage in very limited training at levels above the most basic operating skills. They also undertake little or no technology development, consequently investing little in building the capabilities for such activities (Dahlman and Brimble, 1990). However, the recent evidence as presented in Arnold at al (2000) presents a number evidence to show that there has been a change in the approach of foreign firms in the recent years.

With respect to technology generating efforts an extensive study by Arnold et al (2000) which analyzed different aspects of innovation system in Thailand, *inter alia*, has shown that during the 1980s and early 1990s, overall expenditure on R&D increased (at current prices), but it grew more slowly than the economy in general, and consequently steadily declined as a proportion of GDP – falling from 0.21 per cent in 1987 to 0.12 per cent in 1996. The situation seems to have changed little (see table 6.21). In this respect Thailand followed a path that was significantly different from that in several other countries in the region where R&D expenditure was a rising proportion of GDP. The proportion of total R&D performed in business enterprises was very low – estimated at around 10 per cent in 1996. Several constraints of R&D activities, mainly related to institutional and governmental support and the availability of human capital and support services, have been identified (Broker group, 2001). Hence, it appears that the effect of the new policy initiatives in the last years has not fully materialized yet.

6. 6. Concluding Observations

Among the GMS countries, Thailand has a longer history of liberal trade and investment policies which in turn were instrumental in bringing about higher output growth along with structural transformation wherein the industrial sector, and more specifically the manufacturing sector, emerged as the most vibrant sector of the economy. Thus at the time when the information technology revolution was taking root in the 1990s, Thailand has had an economy which was integrated with the world economy and vibrant in output growth. Realizing the importance of information technology, the Thai government initiated certain pioneering efforts in form of new policies and institutional structures which culminated in the formation of a separate ministry for Information Technology, not only towards developing an ICT base in the country but also in the wide spread use of technology in different sectors of the economy including government.

While the first Information Technology policy, IT-2000, aimed at laying foundations for development and use of new technology, the IT2010 provided a long term vision with focus to further strengthening of the IT foundations and also to facilitate the transition of Thailand into a knowledge-based economy and society, wherein creation, collection, dissemination and utilization of knowledge emerges as major instrument of economic and social development. The vision got translated in the IT master plan (2002-06) that has highly ambitious targets in terms of ICT production and use as manifested in e-governance, e-commerce, e-society, etc. These policies indicate a realistic understanding of the issues being confronted in terms of developing and harnessing the new technology for development. Yet the overall approach of the policy appears to be one of highly centralized decision making with limited role for the provincial authorities. Also, the role that Civil Society Organizations could play in achieving the targets set by the country could perhaps be further explored.

Thailand has made significant progress in terms of laying an IT infrastructure foundation as manifested in the growth of fixed telephones, mobile telephones and Internet. The

government has been successful in implementing a number of projects with respect to e-governance, e-commerce, and progress made making use of new technology in education, agriculture, health deserves to be complemented. These achievements were made despite the fact that the economy has been passing through a difficult period on account of the financial crisis. What is striking about Thailand is that there is general awareness of the limits and the limitations and a number of measures have been undertaken to overcome them. For instance, the privatization of CAT and TOT is likely to bring about the much-needed competitive environment in the telecom sector and thereby providing access to telecom services at affordable prices. The setting up of the Ministry of Information and Communication Technology is expected to coordinate different actors and provide new directions.

The single most hurdle that Thailand faces today in making headway in the sphere of information technology is the scarcity of human capital, both in terms of quantity and quality. Despite various initiatives especially during the post crisis period, the IT sector of Thailand is faced with an excess demand situation. While human capital cannot be built overnight, the policy makers may consider a two-pronged action towards increasing the quantity and quality of IT manpower. More targeted policies for attracting investment into the IT manpower training may be beneficial. In the short run, following the strategy adapted by developed countries and China, relaxing the restriction on the mobility of IT manpower may give rich dividends. Towards improving the quality of manpower, fostering a strong relationship between academia and industry could be helpful. This could involve an active participation by the industry in deciding the curriculum of the university so that the students and faculty get accustomed to a current state of art in the industry. While the software park of Thailand makes an earnest attempt in this direction, it could be considered to scale these activities up. It may also be advisable to explore the possibilities of fostering relationship with those universities/institutions in the neighboring countries known for their IT capabilities. Given the high variations in the quality of training offered by different training institutions, much could be learned from the Department of Electronics (DoE) accreditation system followed in India.

Given the human capital constraints, Thailand has so far not been successful in developing IT software production in the country. The investment attracted to IT sector has been small when compared to investment in the IT hardware sector. Moreover investment fructification in IT software is found to be much lower as compared to other sector of the economy. The initiative towards developing a software industry base in the country by setting up the software technology park of Thailand, the move towards setting up two more parks, and the setting up of an Software Industry Promotion Agency (SIPA) may bring rich dividend. However, success will probably depend on the supply of IT manpower in the near future.

While the country is lagging behind in attracting investment into software, the highly facilitating trade and investment regime coupled with other facilitating environment like good infrastructure abundant supply of cheap labour led to substantial investment in the field of IT hardware production. Thus, over the years electronics has emerged as one of the major sources of employment and export earning. Today almost all the world leaders are active in the Thai electronic industry. However, there appears to be a potential danger in that the electronics industry in Thailand may be characterized by sticky specialization in a few low technology products leading to low value addition, poor forward and backward linkages and high import industry - thus locked up in the low end of the electronics value chain.

There is some merit in the argument that the emergence of a lop-sided production structure has been affected by the policy followed hitherto towards investment. While encouraging investment, the incentives structure were not tuned to induce the companies, both foreign and local, to invest in skill upgradation and knowledge generation. At the same time the policies were not effective in fostering a vibrant national system of innovation linking different actors involved in knowledge generation and diffusion. This had led to limited skill and knowledge base, which in turn failed to create a facilitating environment for the establishment of high value adding skill incentive activities. Thus Thailand could be locked up in a kind of circle of weak national system of innovation leading to a production structure characterized by low value addition, which in turn

provide limited opportunities for further learning and improvements. There may be scope for targeted investment policy in general, and incentive structures in particular, to help the IT sector moving up the value chain.

In general, remarkable attempts are being made towards generating a skill base, promoting R&D investment and fostering an interface between academia and industry. Also, there is evidence to suggest a greater orientation in the private and public sector towards innovative activities. Moreover, the government has also undertaken initiatives to foster relationship with regional countries outside ASEAN like India that may lead to beneficial cooperation in the field of skill intensive areas like IT and software. On the whole, with the marked revival in the economy during the recent years, and series of initiatives in the pipeline, the future appears to be more promising than the past.

Table 6.1: Growth and structural change of Thailand economy

	1959- 1973	1974- 1985 (II)	1986- 1996 (III)	1997- 2000
Sectoral Growth rates				
Agriculture	6.0	3.8	3.5	0.3
Industry	10.2	7.7	11.8	0.2
Manufacturing	10.5	7.2	12.5	2.0
Services	8.2	6.4	8.3	-2.6
Total	8.1	6.3	9.1	-0.9
Sectoral Share				
Agriculture	28.5	21.4	13.7	10.9
Industry	30.6	36.6	45.7	49.4
Manufacturing	17.1	22.7	28.2	33.9
Services	41.0	42.0	40.6	39.7
Total	100.0	100.0	100	100

Source: National Economic and Social Development Board, Thailand as quoted in Jitsuchon (1994)

Table 6.2: Indicators of Telecommunication Development in Thailand in a comparative Perspective

Telecom Indicators	Cambodia	Lao PDR	Myanmar	Vietnam	Thailand	Lower Middle Income Countries
Lines per 1000 people	2	10	6	38	99	139
Lines/1000 people in the largest city	19	65	32		452	524
Waiting list (000)		5.9	79.9		544.2	
Waiting Time		1.1	5.3		1.6	1.9
Lines/employee	51	39	37	41	198	
Revenue per line (\$)	705	488	61	414	579	288
Cost of local Call (\$/3minutes)	0.03	0.02	0.01	0.02	0.07	0.04
Mobile/1000 people	17	5		15	123	107
Outgoing traffic (minutes per subscriber)	32 0	138	34	18	52	62
Cost call to US (\$ per 3 minutes)		6.37	23.71		1.49	--

Table 6.3: Use of Telephone Radio and Television in Thailand Villages
(2001)

per cent of Household Owning	Total	Central	North	Northeast	South
Telephone	14.50	28.33	14.53	6.13	13.60
Radio	62.53	78.84	65.94	52.68	55.79
Television	83.17	88.63	80.54	82.82	79.39

Estimates based on data obtained from Ministry of Information and Communication Technology, Statistical Yearbook Thailand 2002. pp 443.

Table 6.4: Comparison of prices for domestic long-distance calls (as of June 2002)
(Bt/minute)

Distance (km)	Thailand	Malaysia	Philippines
	TOT	Telekom Malaysia	PLDT
Up to 50	3	1.35	2.59
51-100	6	3.39	
101-150	9		
151-200	9	9.67	
201-350	12		
351-500	15		
More than 500	18		

Source: TDRI as quoted in Tangkitvanich, S. and Ratananarumitsorn, T. (2002).

Table 6.5: Comparison of prices for international calls (as of May 2002)

Destination	THAILAND		Malaysia	Philippines	Singapore	Hong Kong
	CAT	Hatari Technology	Telekom Malaysia	PLDT	Singtel	HKIC
UK	30	20	22.6	17.5	14.0	27.4
USA	22	14	22.6		9.3	14.6
Japan	30	19	33.9		21.4	32.3
Australia	22	16	22.6		14.3	25.1

Source: TDRI as quoted in Tangkitvanich, S. and Ratananarumitsorn, T., (2002)

Table 6.6: Mobile service providers in Thailand (as of March 2002)

Company	Main services	No. of lines (million)
TOT	CMTS 470	0.013
AIS	NMT 900	0.24
	GSM 900	7.4
CAT	AMPS-A (800 Mhz)	0.012
	CDMA (800 Mhz)	0.005
TAC	AMPS-B 800 Mhz	0.038
	PCS 1800	2.8
DPC	PCS 1800	0.4
TA Orange	PCS 1800	0.2
ACT Mobile	PCS 1900	Service under test

Table 6.7: Comparison of total cost of mobile phone usage (As of May 2002)

(Bt/month)

Monthly Usage (minutes)	AIS	TAC	TA Orange	SingTel	SMART	HK Orange	Celcom
100	942	914	775	682	864	1157	613
200	1242	1164	965	682	1547	1157	991
300	1362	1314	1075	966	2231	1179	1369
400	1642	1614	1075	1251	2915	1448	1747

Notes: Total usage cost = handset price + monthly fee + airtime charge. The handset price is distributed for three years of usage.

It is assumed that users choose package most suitable to their calling patterns.

It is assumed that the ratio of usage time for local and domestic long-distance call be 80:20, the ratio of usage during peak and of-peak time be 60:40 and the ratio of calling within the same operator and other operator be 40:60.

Source: TDRI as quoted in Tangkitvanich, S. and Ratananarumitsorn, T., (2002)

Table 6.8: Profile of Build Transfer Operate Concessions (as on September 2000)

Service	Project	Concessionaire	Duration (years)	Awarded by	Contract date	Status
Telephone lines	2.6 million fixed lines in Bangkok area	Telecom Asia	25	TOT	1992	3 amendments to provide public phones, VAS, and PCS
	1.5 million fixed lines in provincial areas	TT&T	25	TOT	1993	
Pay phones	Card Phone	Lenso	15	CAT	1994	
Long Distance	Optical Fibre along rail way	Com-Link	20	TOT	1991	

	East Coast Submarine Optical Fibre	Jasmine Submarine Telecom	20	TOT	1991	
	West Coast Submarine Optical Fibre	Thai Long Distance Telecom	15	TOT	1996	
	Domestic satellite transmission	Acumen	15	TOT	1991	
	ISBN	Acumen	15	TOT	1991	
	VSAT	SiamSat	22	CAT	1994	
	VSAT	WorldSat	22	CAT	1995	
	VAST	Usat	22	CAT		Terminated 1998
Data	DataNet	Advanced Data Network	25	TOT	1990	Amended 1997
Videotex		Lines Technology	15	TOT	1993	Cancelled 1987
Cellular	NMT 900, GSM 900	AIS	25	TOT	1990	
	AMPS 800, GSM 1800	TACS	27	CAT	1990	Amended 1996
	Digital GSM 1800	Wireless Comm.	17	CAT	1996	Assumed by CP Orange
	Digital DCS 1800	DPC	16	CAT	1996	Bought by AIS
Paging	Phone Link	Advanced Paging	15	TOT	1990	Revenue sharing cancelled in 1997
	Page Phone	Hutchison	15	TOT	1990	
	World Page	World Page	15	TOT	1994	
	Digital	Packlink	15	CAT	1990	
	Alphanumeric	Lenso	25	CAT	1990	Amended 1995
CT2	Fonepoint	Phone Point	10	TOT	1991	Cancelled 1998
Trunked Mobile Radio	WorldRadio	United	15	CAT	1992	
Mobile Data		Network Consultant	20	CAT	1994	
Others	Directory publishing	Shinawatra Directories	10	TOT	1995/1995	n.a.
		Business Int'l	5	CAT		Termination 1999
	Info Transfer Service	Reuters	5	CAT		End of contract 1996

Source ITU 2003

Note Note: Only revenue-sharing concessions granted by CAT and TOT. AIS= Advance Info Service; CAT = Communication Authority of Thailand; TACS= Total Access Communications
TOT= Telephone Organization

Table 6.9 Internet Service Provides in Thailand

	Name	License Date
1	A-Net Co., Ltd	Mar-96
2	Asia Access Internet Service	Apr-96
3	Asia Infonet Co., Ltd	Nov-96
4	C.S. Communications Co., Ltd	Jan-97
5	Cable & Wireless Network (Thailand)	Feb-00
6	Chomanan Worldnet Co., Ltd	Oct-97
7	Data Line Thai Co. Ltd	Oct-96
8	E-Z NET Co., Ltd	Nov-99
9	Far East Internet Co., Ltd	Oct-97
10	Internet Thailand	Mar-95
11	Jasmine Internet Co., Ltd	Mar-96
12	KSC Commercial Internet Co. Ltd	Jun-95
13	Loxley Information Service Co., Ltd	Mar-96
14	Samart CyberNet Co., Ltd	Mar-96
15	Siam Global Access Co., Ltd	Dec-96
16	RoyNet Co., Ltd	Oct-99
17	The Idea Net	Nov-96
18	WorldNET & Services Co. Ltd	Jul-96

Notes: Licenced by CAT.

Source: ITU (2003)

Table 6.10: ICT Market in Thailand (1997-2003)

Year	1997	1998	1999	2000
Harware	27.6	13.6	20.1	23.2
Software	6.8	5.1	6.2	7.7
IT services	8.2	7.2	8.7	9.3
Total	42.6	25.9	35.0	40.2

Source: Thai Computer Industry Association, as quoted in

www.itu.int/asean2001/documents.pf

Table 6.11: Comparison Between the Demand and Supply of ICT Manpower in 1994-2006

Year	Demand	Supply	Balance + =Surplus, - = deficit
1994	32544*	12501	-20043
1995	37217*	14953	-22264
1996	42293*	18811	-23482
1997	47692*	22126	-25566
1998	53517*	24867	-28650
1999	59928*	N.A	N.A
2000	67072*	N.A	N.A
2001	74640*	N.A	N.A
2002	92091*	70386**	-21705
2003	106992	82986**	-24006
2004	122670	97030**	-25640
2005	139154	112795**	-26359
2006	156546	130502**	-26044

Notes: *An average of the estimated demand from two scenarios.

**The supply of workers with a bachelor's degree and higher.

N.A. = not available

Sources: Durungawarol et.al. (1995) and Puntasen et al. (2001) as quoted in Somchai Suksiriserekul (2003)

Table: 6.12 FDI Inflows into Thailand in Comparison with Developing Countries and South East Asia

Year	Developing Countries	South, East and South East Asia	Thailand	Share of Thailand in Developing Countries
1990-95(Average)	74288	44564	1990	2.68
1996	91502	56147	1964	2.15
1997	193224	100067	3882	2.01
1998	191284	90093	7491	3.92
1999	229295	105313	6091	2.66
2000	246057	138698	3350	1.36
2001	209431	97604	3813	1.82
2002	162145	88613	1068	0.66

Source: UNCTAD, *World Investment Report*, Different years, Geneva.

Table 6.13: Contribution of FDI to Gross Fixed Capital Formation in Thailand in Comparison with Developing Countries and South. East and South East Asia

Year	Developing Countries	South, East and South East Asia	Thailand
1990-95	5.7	6.7	4.4
1996	6.5	7.4	3.7
1997	11.4	10.4	7.6
1998	12	11	29.9
1999	14.3	12.2	23.8
2000	14.6	14.8	12.4
2001	12.7	10.3	14.1
2002	10.5	7.3	3.7

Source: UNCTAD, 2003, *World Investment Report*, Different years, UNCTAD, Geneva.
 Note: 1990-95 refers to the average for the period.

Table 6.14: Region-wise Distribution of FDI Approvals

Year	Zone 1	Zone2	Zone 3	Total
1997				
Number of projects	96	128	290	514
Share in total	18.7	24.9	56.4	100
Investment	178876	66119	216493	300470
Share in total	5.9	22	72.1	100
1998				
Number of projects	172	119	192	483
Share in total	35.6	24.6	39.8	100
Investment	59084	37621	158136	254842
Share in total	23.2	14.8	62.1	100
1999				
Number of projects	188	142	183	513
Share in total	36.6	27.7	35.7	100
Investment	39307	32615	69565	141488
Share in total	27.8	23.1	49.2	100
2000				
Number of projects	229	219	313	714
Share in total	30.1	28.8	41.1	100
Investment	33359	81136	98152	253278
Share in total	15.7	38.2	46.2	100

2001				
Number of projects	153	271	151	615
Share in total	26.6	47.1	26.3	100
Investment	36545	111354	61722	149436
Share in total	17.4	53.1	29.4	100
1997-01				
Number of projects	742.00	751.00	839.00	2325.00
Share in total	31.91	32.30	36.09	100.00
Investment	168295.00	262726.00	387575.00	799044.00
Share in total	21.06	32.88	48.50	100.00

Source: Board of Investment, Thailand.

Table 6.15: Sector-wise Distribution of Foreign Investment Projects Approved by BOI

	Agricultural Products	Mineral & Ceramics	Light Industries Textiles	Metal products and machinery	Electric & Electronic products	Chemicals & Papers	Services	Total
1997								
Projects	48	22	46	147	97	88	66	514
Share (per cent)	9.3	4.3	8.9	28.6	18.9	17.1	12.8	100
Investment	7568	9240	8334	28015	30123	131807	85200	300469
Share	2.5	3.1	2.8	9.3	10	43.9	28.4	100
1998								
Projects	50	9	76	70	133	66	79	483
Share (per cent)	10.4	1.9	15.7	14.5	27.5	13.7	16.4	100
Investment	11777	951	13250	9465	59458	43427	116532	254864
Share	4.6	0.4	5.2	3.7	23.3	17	45.7	100
1999								
Projects	49	9	73	1.9	143	69	61	513
Share	9.6	1.8	14.2	21.2	27.9	13.5	11.9	100
Investment	11265	480	8942	12452	57287	41547	9423	141489
Share	8	3	6.3	8.9	14.5	29.4	6.7	100
2000								
Projects	72	22	112	195	185	108	67	761
Share	9.5	2.9	14.7	25.6	24.3	14.2	8.8	100
Investment	23127	9991	23937	26122	71613	54449	3407	212649
Share	10.9	4.7	11.3	12.3	33.7	25.6	1.6	100
2001								
Projects	46	13	57	135	173	84	67	575
Share	8	2.3	9.9	23.5	13.5	14.6	11.7	100
Investment	15273	5411	12150	25374	51855	69908	29649	209623
Share	7.3	2.6	5.8	12.1	24.7	33.3	14.1	100

1997-01								
Projects	265.00	75.00	364.00	548.90	731.00	415.00	340.00	2846.00
Share	9.31	2.64	12.79	19.29	25.69	14.58	11.95	100.00
Investment	69010.00	26073.00	66613.00	101428.00	270336.00	341138.00	244211.00	1119094.00
Share	6.17	2.33	5.95	9.06	24.16	30.48	21.82	100.00

Source: Board of Investment

Note: Projects are given in number and investment figures are given in million baht.

Table 6.16: Distribution of Investment Across Different Projects in Electrical and Electronic Products (2001)

Industries	No. of Projects	Investment (Million Baht)	Employment	
			Thai	Foreign
Electronic Industry and Electric Appliance	173	51855	31753	876
Manufacture of electrical products	5	888	1677	62
Manufacture of parts or equipment used for electrical	5	395	381	13
Manufacture of electric lamps	1	41	60	1
Manufacture of insulated wires or cables	2	80	27	1
Manufacture of parts or equipment for other appliances	3	1520	474	22
Manufacture of electronic products	5	1034	1845	15
Mfg. of office equipment computing or accounting	1	115	425	5
Manufacture of household appliances	1	2	115	-
Manufacture of radio, television or telecommunications	3	1199	995	17
Manufacture of professional and scientific measuring and	1	39	123	1
Manufacture of parts or supplies used for electronic	65	38991	19262	362
Magnetic components, including telescopic antenna	5	301	634	91
Connectors	2	71	162	5
Printed circuits boards	2	658	255	10
Plugs and sockets	1	55	220	10
Acoustic parts, including microphones, ear-phones	1	105	196	10
Micro-motors	2	163	392	9
Diodes	1	498	95	-
Computer components, including storage equipment	6	701	1383	17
Electronic sub-assemblies, including PCBs	7	839	526	17

Flat, shielded, coaxial or Signal cables	3	436	517	10
Integrated circuits	3	2304	345	6
Capacitors	3	500	86	-
Relays	1	109	28	2
Switches and keyboards	1	5	19	1
Embedded system design	1	3	21	1
Software	40	764	1430	176
E-commerce business	4	32	70	12

Source: Board of Investment.

Note: Investments are given in million baht.

Table 6.17: Structure of exports and Imports in Thai Electronics Industry

Exports (\$ Million)	1997	1998	1999	2000	2001	2002
Computer and Parts	6520.92	7575.09	7672.38	8432.30	7725.83	7282.63
Of Which Parts	2973.32	4714.60	5861.36	6434.79	5941.60	4461.88
Others	1227.43	1205.35	1177.67	1629.38	1646.78	1883.19
Integrated Circuits and parts	2307.93	2518.82	2255.00	4464.32	3486.71	3439.28
Of which Parts	304.93	481.98	492.69	556.52	277.50	364.95
Telecommunication equipment	505.68	528.37	532.91	884.71	796.26	875.74
Television	1028.49	1079.58	905.80	1093.87	915.86	1122.86
Radio	52.84	111.07	300.85	419.07	374.30	439.72
Total Exports	10415.86	11812.94	11666.94	15294.27	13298.96	13160.23
Imports (\$Million)						
Computer	661.72	386.23	337.67	619.80	1098.55	1823.81
Computer components	3098.90	2406.82	1901.60	3053.93	2894.10	1851.65
Integrated circuits	2135.12	2148.89	1820.19	2786.50	2690.05	2648.05
Integrated circuits components	2720.24	2802.96	2279.98	3673.01	3046.62	2824.16
Telcom equipment	1821.00	1350.00	1420.00	1100.00	940.00	1010.00
Total Imports	10436.98	9094.90	7759.44	11233.24	10669.31	10157.67
Trade Balance	-21.12	2718.04	3907.50	4061.03	2629.65	3002.56

Source: Bank of Thailand, *Economic and financial Statistics*, first quarter 2003.

Note: Data on Telecommunication imports are from US Department of Commerce, Country Commercial Guide,

<http://www.usatrade.gov/website/ccg.nsf/ShowCCG?OpenForm&Country=THAILAND>

Table 6.18 Exports Imports and local production of Telecommunication equipment

Year	Domestic production	Exports	Imports	Domestic demand
1997	3110	2176	1821	2755
1998	2400	1700	1350	2050
1999	2520	1800	1420	2140

2000	1150	805	1250	1250
2001	1200	840	1300	1300
2002	1300	910	1010	1400

Table 6.19: Stages of Latecomer Development

Period Stage	Technological Transition	Market Transition
1960s/1970s original Equipment Manufacture	Local firm learns assembly process for standard simple goods	Foreign MNC/buyers designs, brands and distributes. Also gains non manufacturing value added
1980s Own Design and Manufacture	Local firm learns process engineering and detailed product design skills	As with above, MNC buys brands and distributes. MNC gains non manufacturing value added
1990s Own-Brand Manufacture	Local firm conducts manufacturing product design and R&D for new products	Local firm has own brand, organizes distribution and captures all value added

MNC- Multinational Corporation; R&D research and development
Source: Amendment Hobday (1994).

Table 6.20: Technological Stages in Southeast Asia's Electronics industry

Decade	Singapore	Malaysia	Thailand	Indonesia	Viet Nam
1960s	Assembly				
1970s	Process Engineering	Assembly	Assembly		
1980s	Product Development	Process Engineering	Assembly	Assembly	Assembly
1990s	Research & Development	Product Development	Process Engineering	Process Engineering	Assembly

Source: Hobday (2002)

Table 6.21: GERD and GERD/GDP of Thailand and Other Countries

Economic Level	Development	GERD (million US \$)	GERD/GDP(per cent)
Advanced Countries	Japan	121250	3.17
	USA	243548	2.69
First-tier NIEs	Korea	10028	2.47
	Taiwan Province of China	5903	2.05
	Singapore	1641	1.89
Second-tier NIEs	Malaysia	296	0.39
	Thailand	269	0.26

Source: The World Competitiveness Yearbook 2001, IMD; National Survey of R&D in Singapore 2000. Agency for Science Technology and Research (A*STAR), National Survey of R&D 1998, MASTIC; National Statistics Office, Japan, as quoted in Intarakumnerd P and Panthawi P., (2003)

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