

**Technology Transfer to Southeast Asian Countries:
The Case of Telecommunication Multinationals in Thailand**

by

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Chapter 1

Introduction

1.1 Thesis Overview

This thesis is divided into five parts. Chapter I provides an introduction to the thesis and a review of the factors contributing to multinationals setting up operations in Southeast Asia. Chapter 2 looks at the Thai economy and the factors that contribute to the rapidly growing economy. Chapter 3 defines the various modes of technology transfer including foreign direct investment, strategic alliances, joint ventures, and licensing. This chapter also discusses the transfer of technology to wholly owned subsidiaries and discusses how companies select different channels of technology transfer. Chapter 4 presents case studies of four multinational corporations that are located in Thailand. Chapter V discusses products and services these companies offer, and the mode of entry into the Thai market.

Based on these select examples I conclude, multinationals in the telecommunication industry have entered Thailand for new market opportunities both in Thailand and the larger Southeast Asian region.

1.2 Factors Contributing to Multinationals Setting Up Operations in Southeast Asia

The impact of technology transfer on economic competitiveness is evident in the Southeast Asian region, where multinational firms are in fierce competition for new market opportunities. Since telecommunications is part of infrastructure development, major opportunities exist for multinationals in the industry. The primary consideration for multinationals setting up facilities in Southeast Asia is to serve the local market and use this location as a stepping-stone to other Southeast Asian countries. Throughout Southeast Asia, the economy is rapidly expanding. In some cases double digit growth has occurred within a five-year time span.

The Thailand electronic industry began in the early 1960's with the formation of Tanin International, a Thai owned firm.¹ Starting in 1986 the number of firms applying for Board of Investment's promotion has significantly increased. In 1987 there were more than 100 operations.

The electronics producing firms included: consumer electronics, industrial electronics, electronic components. In those manufacturing operations that are labor intensive and require low skilled or semi-skilled employees many multinational firms have shifted some of their low technology manufacturing to Thailand and other Southeast Asian developing countries.

¹Transfer of Japanese Technology and Management to the Asean Countries, Yamashita, S. University of Tokyo Press p. 169

As an example, high labor costs in Germany have caused manufacturing based industries to seek countries with low labor costs. Strong union influence drove labor costs in Germany to become the highest in the world². For example, in the automotive industry unit, labor costs were about 40 % higher than those in France, Japan, and the United States. With such cost disadvantages, German products could not compete with goods produced by multinational competitors in Southeast Asia. Manufacturing in an Asian country represents an attractive alternative^{3,4}.

Rigid union rules in Germany make flexible manufacturing often close to impossible⁵. Manufacturing contracts with tight deadlines must be turned down frequently because rigid labor regulations prevent the flexible use of overtime and additional shifts. Labor productivity is low due to a 35-hour working week, six weeks of paid holidays and 21 sick days⁶. German factories are used on average 53 hours a week, which is the lowest in Europe⁷. In contrast many Asian operations produce six days a week.

²Hans-Olaf Henkel, President of the Federation of German Industries, Japan Economic Newswire, October 3, 1995

³Pittsburgh Post-Gazette, March 12, 1995

⁴Financial Times, September 6, 1994

⁵Littmann, Hugo Boss, International Management, September, 1994

⁶Hans-Olaf Henkel, President of the Federation of German Industries, Japan Economic Newswire, October 3, 1995

⁷Financial Times, September 6, 1994

Compared with their competitors in US. and Japan, European firms operate in a relatively unfavorable economic environment. An analysis of labor costs and government spending show that the European community's share of global exports fell by a fifth between 1980 and 1992 (22% to 18%). Since 1985 EC exports to countries outside the European community has fallen by 7% while trade among EC members increased by 50%.

Japan is a country dependent on imports of natural resources and food products. During the 1960's and 1970's In order to prevent this constraint from limiting the growth of its economy , Japan secured the supply of cheap raw materials from overseas by investing directly in countries with an abundant supply of natural resources⁸.

A higher valued yen has made Japanese products less competitive internationally. Therefore, there has been a shift in Japanese production and distribution to Southeast Asia. For instance, in the electrical machinery industry, most of the electrical appliance parts that had been imported from Japan so far are now being produced in Southeast Asia, and these parts will be exchanged among ASEAN countries⁹.

Tariffs can prevent needed products from being competitive.

⁸Ozawa , T. 1979 Multiculturalism Japanese Style:The Political Economy of Outward Dependency. Princenton, Princeton University Press

⁹Yamashita, S. Transfer of Japanese Technology and Management to the ASEAN countries.

At each country's border, import tariffs and taxes are often levied, which decreases the potential profits of the corporation. For instance, disagreements with other countries regarding trade practices forced Japanese companies to look for manufacturing sites abroad. Japanese companies also seek to establish export bases when they can take advantage of low cost labor and local government incentives abroad.

Depending on the product, there can be considerable transportation costs when they are shipped from Europe or the United States to Asia. For goods with a low value to volume ratio, such as refrigerators, the transportation cost can make the difference between a product competitive or not. The transport of goods from the factory to the harbor, then across the ocean to the customer can take up to twenty days, which may not be an acceptable order lead time. Some customers with high order volumes, place frequent but unpredictable orders with relatively short lead times. This type of business requires either manufacturing presence in the country of origin or the maintenance of costly warehouses in the region.

Chapter 2

Economic Development in Thailand

In this chapter I discuss the economic conditions that contribute to Thailand's growth. Particular emphasis is placed on the shift from an agricultural to a manufacturing economy, and the economic benefit gained from the Thai Sixth Development Plan.

2.1 Introduction

Thailand is located in Southeast Asia, bordered by Burma to the West, Laos and Cambodia to the east and Malaysia to the south. The land area is 514,000 sq. km and the population was estimated to be 58.7 million in 1994. In 1994, Thailand's capital Bangkok, and adjacent vicinities¹⁰ had a population of 9.2 million. Beyond Bangkok, Thailand has only a limited degree of urbanization. Most of the population is living in rural areas. The monetary unit is the Baht, with an exchange rate of 25.5 Baht per dollar in summer of 1995.

2.2 Natural Resources

Thailand's most important natural resource is its natural gas reserve in the Gulf of Thailand. Currently these reserves are estimated at 172,000 million cubic meters; the recent discoveries of new fields

¹⁰Vicinities include Nontaburi, Samut Prakan, Nakhon Pathom

on the northeast plateau of the Khonkaen province significant increases in the total projection of natural gas.

Agriculture has remained the key industry in the central plain region. The primary crop produced has been rice, and since the late 1950's areas of upland have been used for the cultivation of maize, tapioca, jute, beans, cotton and pineapple. Rice and canned pineapples are the most important agricultural export products. Two factors contributed to the increase in agricultural production: government incentives to extend the availability of cultivated region, and greater capital investment from both private and government sources. The agricultural sector is still important: as of 1987, of the 87,000 factories registered, more than half were rice mills¹¹, and today, agriculture provides employment for 50% of the labor force.

2.3 Thai Economy

During the 1950's and 1960's Thailand established a pattern of industrial growth that depended on import substituting industrialization. By the early 1970's most of the growth in manufacturing was based on production for the domestic market; limited government policy adjustments changed the domestic economy and the composition of exports. The share of agricultural products in export earnings fell from 85% to 70% with a simultaneous expansion of exports of manufactured goods, particularly textiles.

¹¹Warr, P. The Thai Economy in Transition

An oil price rise and the subsequent collapse of non-oil commodity prices precipitated a major economic crisis for Thailand in 1979-1980. The terms of the trade declined by 22% the current account deficit widened to 6% of the GDP¹².

2.4 Economic Policy: The Impact of the Sixth Plan

During the 1980's the World Bank produced an economic report recommending the following policy changes for the Thai economy:

- raise domestic energy prices to the international level;
- develop a deflationary monetary and fiscal policy;
- end the import substitution policy;
- place emphasis on exports;
- reduce import tariffs and remove export restrictions;
- create more effective personal taxation;
- eliminate waste in government organizations.

The implementation of the above reforms was the condition for the approval of a World Bank loan; they were partially adopted in the Fifth Thai Plan (1982-86). The progress that was made by 1986 stabilized the economy. In 1986, the export of manufactured goods began to expand significantly due to the devaluation and realignment of the baht, which improved the international competitiveness of the Thai economy.

¹²Warr, P. The Thai Economy in Transition

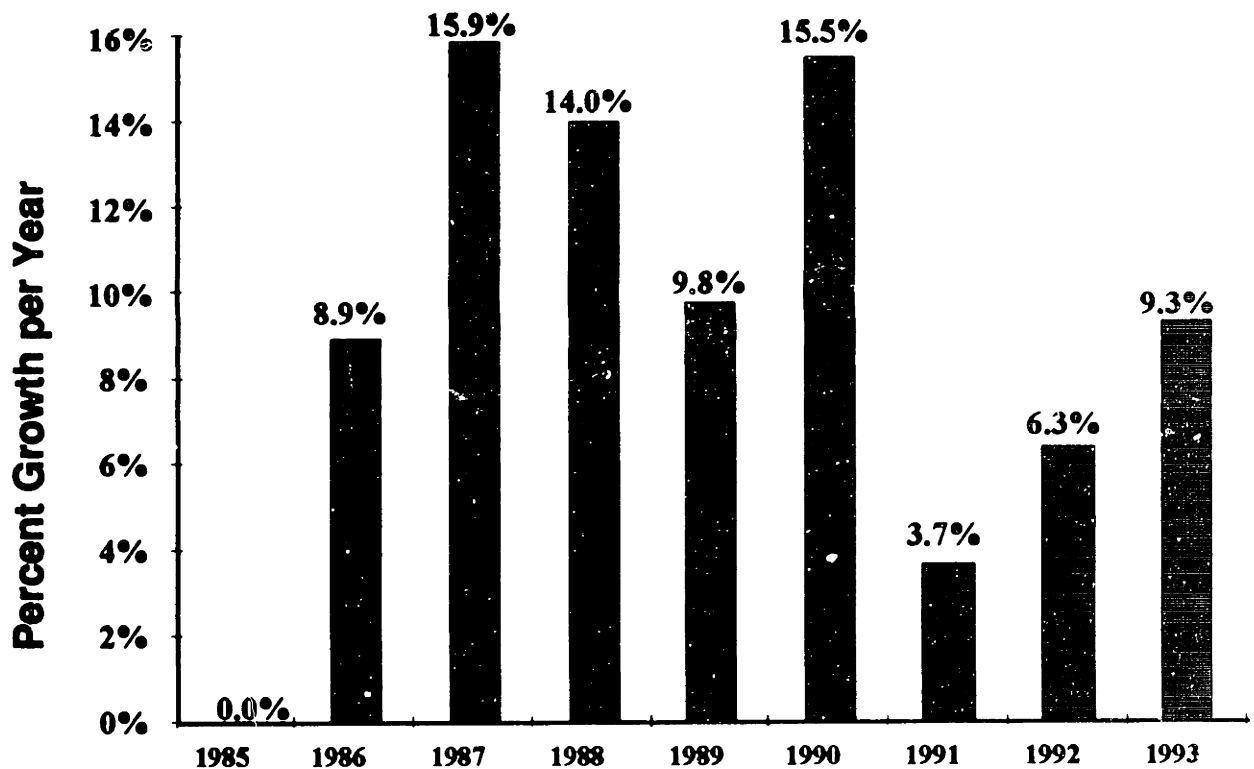
Since then, the Thai economy has experienced rapid growth and structural change and became one of the fastest growing economies in the world. In 1986, the value of manufactured exports exceeded that of agricultural products, and textiles products including garments, have emerged as the most important foreign exchange earner in the export market. Prior to this year, rice had been the most significant export since Thailand entered the foreign trade market.

Several measures are used to examine overall economic development in Thailand. Following the impact of world-wide recession in 1985 and 1986, the annual growth of real GDP in Thailand continued to expand reaching double digit growth in the late 1980's, and inflation continued to decelerate after peaking at 6% in 1990, moving to 3.2% by the end of 1993¹³.

¹³The Investment Environment in Thailand, Office of the Board of Investment, February 1995

Figure 1 shows the real growth of the GDP in Thailand From 1987 on there was a surge of domestic and foreign investment in export oriented labor intensive manufacturing industries As Korea, Hong Kong and Taiwan lost their comparative advantage in labor intensive assembly many of these manufacturing operations were relocated to Thailand.

Figure 1: Growth of Real GDP



2.5 The Shift from Agriculture to Manufacturing Production

The rapid industrialization in the manufacturing industry led to the importation of raw materials and equipment to support the growing manufacturing sector. As import substitution declined and focus was placed on supplying exports to foreign multinationals, the ratio of imports to exports shifted.

Figure 2 shows the impact of imports on the GDP. The annual growth of supply consists of the GDP and the growth of imports. Growth is measured as the percentage change of the value from the previous year. This figure shows that the growth of imports outpaced the growth in GDP, indicating that the previous import substitution policy had been decreasing.

Figure 2: Annual Growth of Supply

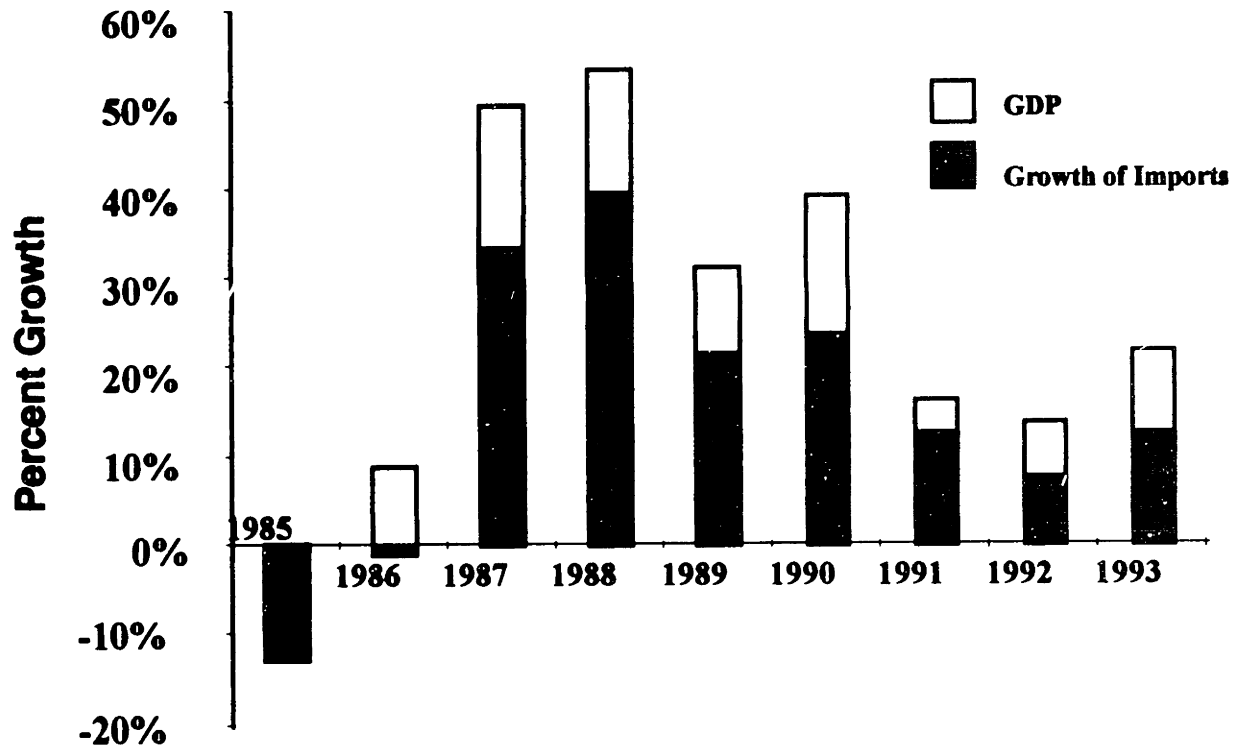


Figure 3 shows the development of the growth of supply over time.

This graph shows a comparison between imports and exports in billions of Bahts. Starting in 1988 the growth of imports surpassed the growth of exports for all subsequent years to date.

Figure 3: Exports versus Imports

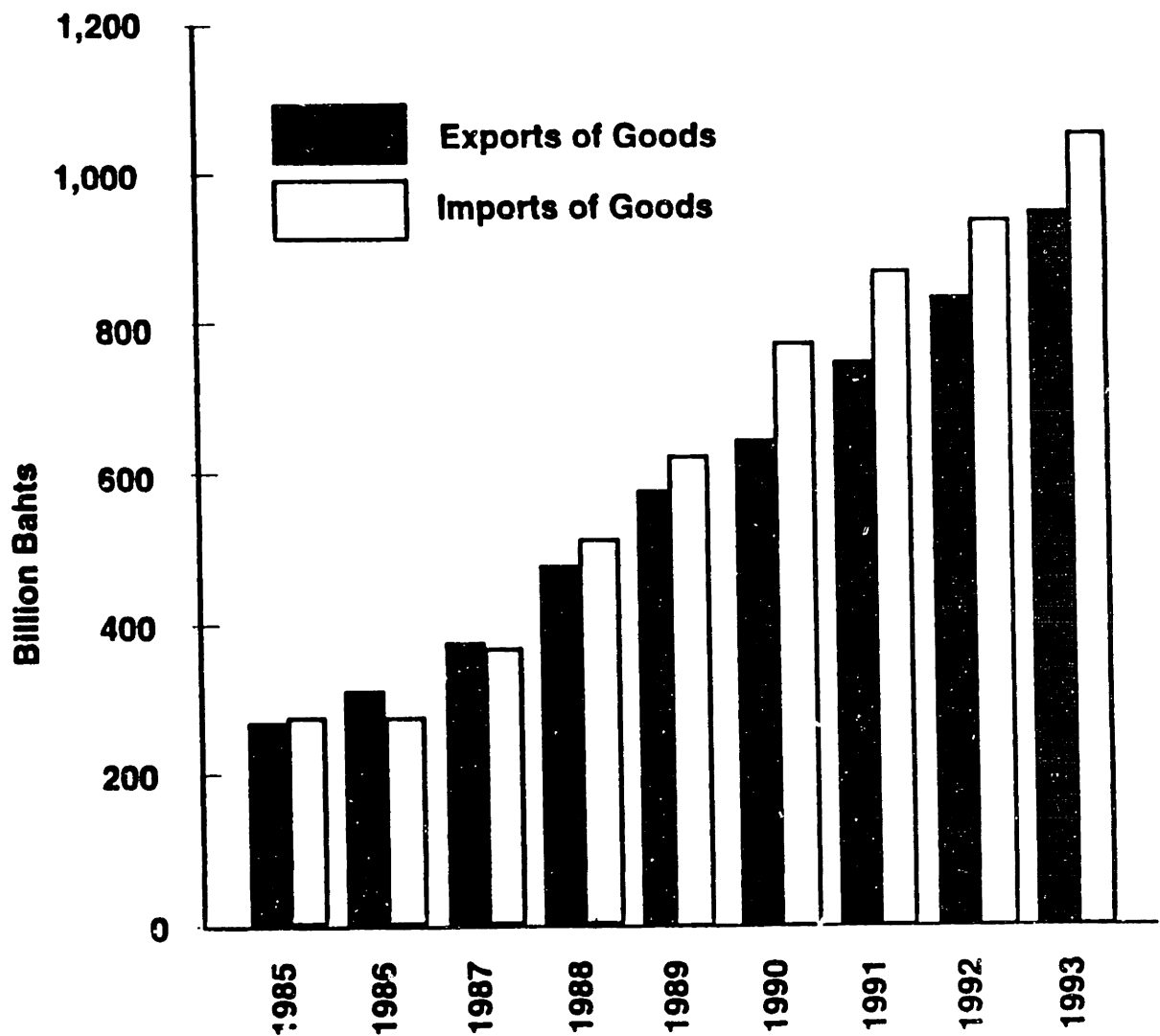
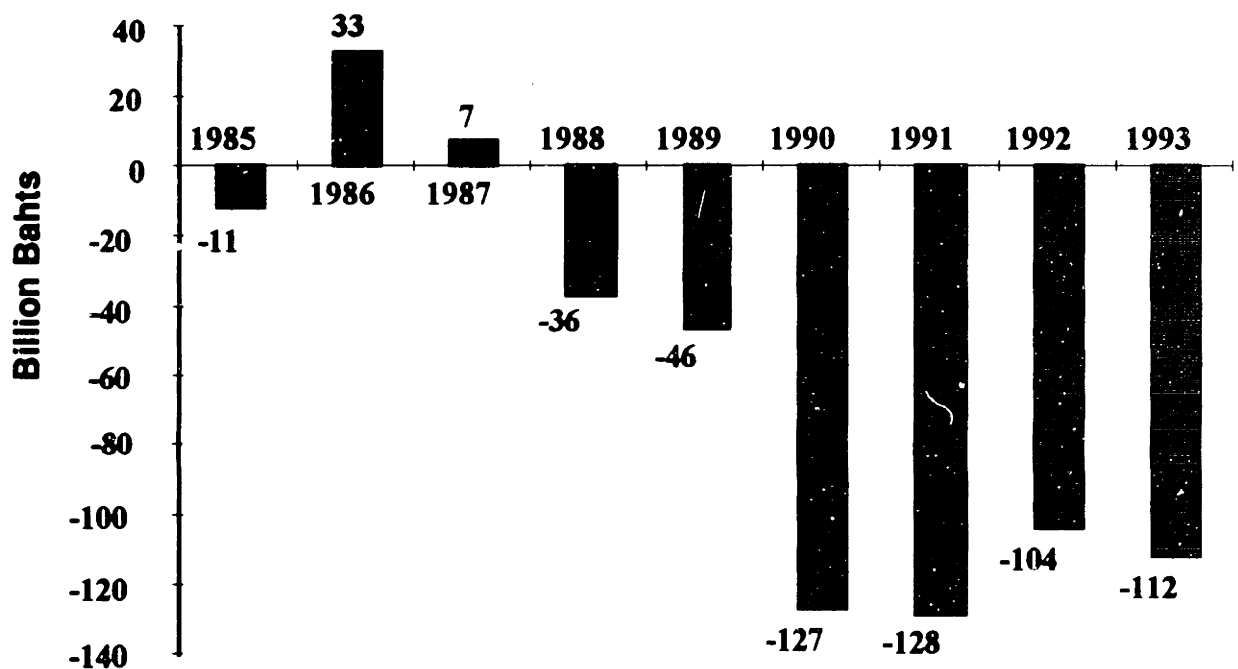


Figure 4 shows the Thai trade deficit in billion Bahts. Starting in 1988 a dramatic increase in the deficit is observed and it leveled off in 1991 at 128 million Bahts or approximately \$5 bn. In 1992 and 1993 the deficit was reduced slightly but remained above 100 billion Bahts.

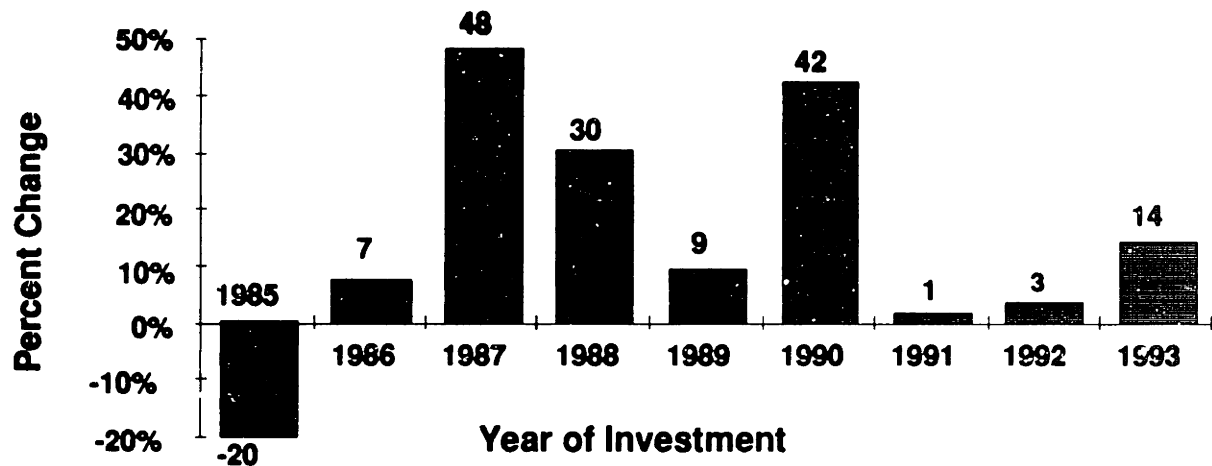
Figure 4: Trade Deficit (Export-Import)



Economic investment includes domestic investment and direct foreign investment. A large number of foreign firms invested in Thailand to escape rising currencies, and escalating labor costs associated with labor intensive manufacturing.

Figure 5 shows Gross Investment growth rates. In 1987 and 1988 a massive growth coincided with the economic boom lasting until 1990. In 1991 a global recession and tight capital markets reduced Thailand's foreign investment activities.

Figure 5: Gross Investment Growth Rates



2.6 The Demand for Consumer Products

In a discussion with Dr. Niramol, Toshiba-Thailand, Dr. Roland Franke and I observed that Toshiba had shifted from refrigerator and air conditioner production to more sophisticated manufacturing such as TVs and VCRs. The rise in disposable income increased as per capita income reached \$2,000 per year in 1993. This development has stimulated an annual increase of private consumption by 6% per year between 1990 and 1993. The strong domestic demand for consumer

products by a population of 60 million drives the current economic transition¹⁴.

2.7 Key Telecommunications Organizations in Thailand

Thailand has two telecommunications carriers that are government operated: the Telephone Organization of Thailand (TOT) and the Communication Authority of Thailand (CAT). These carriers report to the Ministry of Transport and Communications in Bangkok, Thailand¹⁵. TOT operates over 2 million subscribers' lines and is responsible for the country's national local and trunk line networks as well as mobile radio networks.

CAT is responsible for two areas: data and telex networks, and domestic and international connections. CAT is responsible for the Thai connections to the international telephone network, the national and international data and telex networks, and some aspects of the mobile radio network. Previously, TOT and CAT were two completely distinct organizations. Currently, in certain services such as mobile radio paging and networks, they are competitors.

The Thai Ministry of Transport and Communications has promoted competition and liberalized the telecommunications sector by agreeing to award telecommunications projects in selected economic

¹⁴World Bank Report, 1995, Southeast Asia - Population Statistics

¹⁵Siemens Review, 5/93.

zones to private operators on a concession basis. These operators are responsible for planning the delivery and installation, and commissioning of lines. In exchange, they receive a share of the income from the telephone charges during the franchise period.

As part of this Build-Transfer-Operate Program (BOT), the Telephone Organization of Thailand also receives a percentage of the profit. They are designed to meet the rapidly accelerating demand for telecommunication services in a shorter time period and at a lower cost. Concession holders must provide a network infrastructure. This program has led to an increase in the number of local carriers who are gaining skills to operate at a regional level.

2.8 Telephone Services Demand

The TOT services 2.4 million lines nationwide; this will increase to 5.2 million lines by 1997. Serious shortages of conventional telephone lines have led the TOT to seek private sector cooperation in expanding capability. A 25 year concession to install and operate 2 million phone lines in Bangkok was granted to TelecomAsia, a subsidiary of the giant CP Group, in 1991. A further concession to install one million lines in the provincial areas was granted in 1992 to Thai Telephone and Telecommunication (TT&T), a four-company consortium. The investment costs of these two projects are estimated at US\$ 6 bn. Both plan to build on TOT's fiber optics network to launch a full range of telecommunication services.

Conventional line shortages and traffic congestion have led to the extensive popularity of alternative phone services. Various types of cellular mobile phones, cordless phones, and paging services are now provided by both public sector organizations and private companies under concessions from the TOT and the CAT. Mobile phones, of which there are currently over 800,000 subscribers, will remain a strong competitor to conventional phone services at the same time that more sophisticated value-added paging services are being offered.

Several long distance transmission projects are being developed in order to integrate the local telecommunication networks scattered throughout the country. These include microwave and fiber optics, satellite links, and an underwater fiber optics system to link phone networks in the Eastern Seaboard and the South.

Thaicom is the country's first satellite project. The Thai government, which initiated the project, has granted a 30-year concession to the Thai company, Shinawatra Satellite Co., Ltd. The Thaicom 1 satellite started operations in February 1994 with coverage includes Thailand and several other Asian countries.

A second satellite, Thaicom 2, was launched in August 1994, giving a total of 24 transponders available for Thailand's use. Two more satellites, Thaicom 3 and 4, are also planned. The demand for telecommunications via satellite had risen sharply to an estimated 10.5 transponders at the end of 1993, a new era of long distance telecommunications, providing services for nationwide television

distribution and live broadcasting; radio distribution and relaying; video conferencing systems; and satellite television through digital video compression.

Chapter 3

Technology Transfer

3.1 A Definition of Technology Transfer

Technology transfer is transplanting know-how from one location to another. The motivation is to leverage scientific or engineering knowledge and business proficiency. In this thesis, the transfer of technology focuses on the transfer of technology from multinational corporations in Europe, the US. and Japan to Thailand to Southeast Asia. Managing technology transfer includes providing documented procedures, establishing quality performance metrics, and developing human resource training.

3.2 The modes of technology transfer

The modes of technology transfer for multinational corporation include: foreign direct investment, strategic alliances or joint ventures, and licensing. Over the years, corporations have developed different preferences for technology transfer. These preferences are related in part to risk affinity, competency in certain geographic areas, and capital available for investment. The technology may be transferred from a multinational corporation between parent and subsidiary and vice versa, or the technology may be transferred from a corporation to a completely different enterprise.

3.2.1 Foreign Direct Investments

The United States Commerce Department defines "foreign direct investment as ownership by a corporation of at least 10 % of a foreign business enterprise." Less than 10 percent is not considered a direct investment as it is not considered sufficient to influence management.

The four major countries which account for most of the direct investments in developing countries are Japan, the Federal Republic of Germany, the United States and the United Kingdom¹⁶. Major investments in the developing countries are in the areas of chemicals, electronics and transportation. In Thailand, U S multinationals have invested heavily in the food, chemical, electrical, and transportation industries, whereas Japan has relatively large shares in all industries, including textiles. Additionally Japan has a relatively larger investment in the chemical sector. The rapid development in the semi-conductor industry caused multinationals worldwide to have a need for increased production capability. To keep up with the Asian market demand, multinationals opened manufacturing facilities in Southeast Asian developing countries.

¹⁶Warr, P. The Thai Economy in Transition, p. 68, Cambridge University Press

3.2.2 Strategic Alliance

A strategic alliance is a formal coalition between two or more firms, formed for the purpose of a potential business opportunity, which may lead into a permanent relationship¹⁷. These alliances include joint ventures, licensing agreements, supply agreements, joint partnerships, and many other forms of corporation. In split control alliance, each parent company has a separate and distinct role (for instance, marketing in the developing country and technology development in the industrialized country).

3.2.3 Joint Venture

International joint ventures have become an important development vehicle for the transfer of technology. The joint venture is a specific form of equity investment where two or more partners join together to create a new corporation. Each has an equity position and representation on the board of directors.

3.2.4 Licensing

Licensing will be advantageous to the owners of technology under certain conditions that are specific to the technology, to the industry, the host country, or the country of origin.

¹⁷Hax, A. The Strategy Concept and Process.

The advantages of licensing would depend on:

- the characteristics of the technology involved licenses are rarely used if the transfer involves a core technology of the licensor, rather than a peripheral one.
- the size of the firm: small firms will tend to use licensing more than large ones, since they lack the necessary resources for foreign direct investment.
- the maturity of the product: licenses will be more willingly granted for relatively old products, except if reciprocity seems possible for newer products.
- the firm's degree of experience in international operations (risk considerations; comparative pace of response for licensing and foreign direct investment; transaction costs relative to licensing).

Franchises are licenses which generally cover the transfer of know-how about a product or process. The franchise provides the utilization of a brand name and the provision of basic inputs such as management expertise and support.

3.3 Technology Transfer to a Wholly owned Subsidiary

For those companies that are transferring technology to a subsidiary, fees and royalties are paid when the technology is transferred to

their affiliate firms. During the 1980s more than 30% of the trade of leading companies of the developed world fell into this category. Technology transferred through internalization will be to some extent different from technology transferred by contractual agreements. A subsidiary is more extensively used to transfer a new technology (i.e., for the first five years following its introduction of a new product)¹⁸.

3.4 Selecting Different Channels of Technology Transfer

Technology that is transferred which would have a low profitability in the source country would likely be transferred through either a joint venture or licensing. Technology that is older than six years on average is more likely to be transferred to subsidiaries in developing countries. The transfer effected through licensing or joint ventures involves a technology that is older still, averaging 13 years.

Crookell¹⁹ (1984) maintains that licenses would be rare for a core technology, except in the case of an old technology widely available among competitors and also in the presence of a cross-licensing agreement with another research and development intensive firm. A peripheral technology will be transferred more often through licensing if it has an uncertain commercial value.

¹⁸Mansfield, Edwin et al., *Technology Transfer, Productivity and Economic Policy*, New York: Norton, 1982.

¹⁹Crookell, H. et al., *Getting Along Without Multinational Firms*, unpublished paper, The University of Western Ontario, London, Ontario, 1984.

In general, the majority of technology transfer activity has taken place between multinationals and private organizations in Thailand. This is not the case in telecommunications, where many of the joint ventures or collaborations have been amongst Thai government, Thai private companies, and multinationals²⁰.

²⁰ref UN Economic and Social Change No. 18/19 Industrial Development News For Asia and the Pacific

Chapter 4

Case Studies

4.1 Introduction

In 1995, worldwide revenues of \$1.43 trillion (5.9% of world gross domestic product) were attributed to telecommunications, computing, and audio-visual industries²¹. Approximately \$770 billion, or half of the worldwide revenues, were generated by 25 of the world's leading info-communications firms.

Currently, there are many multinational corporations conducting business in all of the industrial sectors throughout Thailand. I chose to study the telecommunications industry in Thailand because of its rapid growth and as a leading example of a market development that is expected to aggressively expand into the remaining parts of Southeast Asia. The companies for my case study were selected to represent the leading telecommunications companies from the United States (AT&T), Japan (NTT), and Europe, (Sweden-Ericsson, Germany-Siemens).

²¹ Business Communications Company, *Industries In Transition*, October 1, 1995

4.2 Case study of multinational corporations in Thailand

4.2.1 LM Ericsson

Ericsson is an international leader in telecommunications with corporate headquarters located in Stockholm. The company is widely recognized for their development of advanced wired and mobile telecommunications systems and products that can be used in public and private networks. In 1994, their cellular systems world market share was 41%²². The company currently has more than 75,000 employees²³ and specializes in niche markets²⁴. For instance, Ericsson is the only company that has developed digital systems based on the following three standards²⁵:

- GSM (European)
- D-AMPS (American)
- PDC (Japan)

Ericsson's analog systems continue to be installed throughout Southeast Asia. The company's geographic presence is as follows:

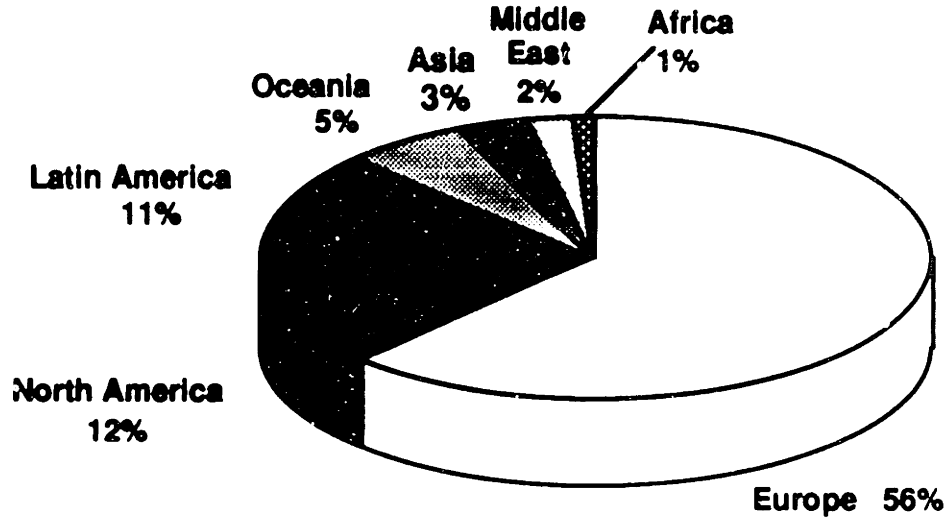
²²Ericsson Annual Report 94)

²³Ericsson Annual Report 94)

²⁴Communications Daily, August 10, 1995

²⁵Communications Daily, August 10, 1995

Ericsson's World Wide Business Distribution



The above figure represents 90% of the Ericsson worldwide distribution; the remaining 10% of the business is distributed in countries that have less than 1% of the market share.

In November of 95, Ericsson's revenue was \$10 billion and profits were \$720 million²⁶.

One of the most important factors for Ericsson's economic growth is the generally improved economic conditions in most of their key markets. Many of their customers are in newly industrialized countries, and more recently, developing countries. Widespread deregulation measures or anticipation of those measures are encouraging new investments in the telecommunication market. Those companies that have been conducting business in developing countries prior to the market deregulation are best positioned to take advantage of the changing business environment.

²⁶Ericsson homepage, <http://www.ericsson.nl/>, 11/95,

4.2.2 Corporate Strategy

Initially Ericsson's core competency was in electromechanical switching technology, which positioned the company to advance into electronic technology²⁷. During the 1970s switching systems combined hardware and software. In the electromechanical stage 70% of the costs were hardware related and 70% of the hardware costs were direct labor. The production costs were highly manufacturing scale sensitive²⁸.

Ericsson had a competitive advantage, since they had historically concentrated on placing their manufacturing facilities in developing countries. In the 1970s, Ericsson responded to increasing competition with modular technology that integrated electronics into small telephone systems. The company gained a cost advantage by spreading the software development cost over a rapidly increasing unit output. This cost advantage created a barrier to entry against competitors and the price sensitive systems market²⁹. As the demand for this technology increased, Ericsson leveraged its technology expertise by targeting the global market.

²⁷The Investment Environment in Thailand, Office of the Prime Minister, Royal Thai Government. Feb. 1995

²⁸Porter, M. Haut, T. Rudden, E. Global Strategies: How Global Strategies Win *

²⁹Communications Daily, August 10, 1995

4.2.3 Ericsson Joint Venture in Thailand

In 1994 the Ericsson Thai Networks, a subsidiary of Ericsson, formed a joint venture with Thai companies Jasmine International Public Co, LTD and the Loxley Public Company Limited, a Thai Telephone and Telecommunications (TT&T's) supplier³⁰. The Loxley Group is one of the top twenty business groups in Thailand. The joint venture gives Ericsson access to TT&T, which has a twenty-five year concession to install one million lines in rural Thailand. Loxley and Jasmine both own 25% stakes in the Thai concessionaire.

The new company, Ericsson Thai Network Products, began manufacturing in Rayong which is southwest of Bangkok. The company will be equally owned by the three parties mentioned in the above paragraph. The network material production plant will be Ericsson's second telephone equipment manufacturing plant in Thailand. In 1993, Ericsson started production of telephone switching equipment in Ayutthaya, close to Bangkok.³¹

³⁰East Asian Affairs, March 23, 1994 No 33

³¹East Asian Affairs, March 23, 1994 No 33

4.3.1 Siemens AG Corporation

Siemens was founded in Germany in 1847. Today, Siemens is one of the world's largest technology companies, with operations in 120 countries and approximately \$55 billion in sales for fiscal year 1993/1994. Siemens' products and services include systems for voice data image text and sound communications. Transmission is by cable, radio, public, or private networks. These products are designed to integrate all types of communication, including digital voice and data in private communications. Management resource services provide a family of information, administration, and management tools.

4.3.2 Corporate Strategy

In order to compete effectively in an increasingly tight telecommunications market, Siemens has increased their investment in innovations within their basic technologies and products. One example is the consolidation and focus of know-how for new markets such as multimedia. A second example is the company's investment of DM7.3 billion (over 8% of their worldwide sales) to further develop their position as a leading global player in the electrical and electronics industry. This investment led to the research and development of the Synapse neural computer, which works roughly 8,000 times faster than conventional workstations. In the field of

microelectronics, this product won the Innovation Prize of German industry.

4.3.3 Siemens' Presence in Asia

Siemens has traditionally used several types of technology transfer methods in Asia, notably strategic alliances, cooperation's, joint ventures, and licensing. Previously, strategic alliances between Siemens and developing countries had a larger percentage of Siemens personnel. Increasingly, there has been a shift towards local country participants³². Because of their success in these partnerships, sales in the Asia -Pacific region rose to DM8.6 (1994: DM7.4) billion. The region now contributes approximately 10% of the total business volume, and Siemens projects a 15-20% annual sales growth in the region.

Joint ventures in China, Malaysia, and Singapore (of assembly and distribution) provide access to a rapidly growing market. The Rolm-US acquisition gave Siemens a competitive advantage in Southeast Asia because many Association of South East Asian Nations (ASEAN) states use public switching and private branch exchanges that are based on US standards. A second advantage for Siemens is that the ASEAN region is rapidly becoming a homogenous economic region. Many of these countries match the European standards for an integrated service digital network (ISDN) technology.

³²1995 Siemens Aktiengesellschaft;webmaster@siemens.de

Siemens has been able to profit considerably from the liberalization of the Thai telecommunications sector. Since 1991, Siemens has provided the telecommunications technology for a half a million subscriber lines and 120,000 trunk lines ³³ The capacity for the installed network is still above demand, as the system was designed to meet projected demand through 2001. In the next decade, the potential exists for Siemens to connect 950K phones ³⁴. As part of the 6th program, Siemens received an order for installation of an ISDN.

As part of its role in developing communications in Thailand, Siemens also led the organization of a consortium. Comprised of an international team of companies (Siemens of Germany, and Hitachi, Comsys, Fujitsu and Fujikura of Japan), the consortium was formed to address the telecommunications services in the specially selected growth zones of Thailand. The focus on technology know-how was influential in supporting two Thai programs: The Urgent Telephone Expansion Project and the National Economic Social Development Plan. Of the consortium members, the Japanese companies are the most experienced partners.

Hitachi and Comsys are responsible for constructing and installing the local network and the installation of the optical fiber networks to remote exchanges; and Fujitsu and Fujikura are responsible for the

³³Siemens Review 5/93

³⁴Siemens Annual Report 94

delivery and the installation for the of the central transmission equipment and optical fiber links. ³⁵ Siemens supplies the optical fiber and digital switching and transmission equipment.

4.3.4 Joint Venture Tied to Local Production

In 1993, 40% of Thailand's decentralized subscriber exchanges were installed in containers. These exchanges are equipped with switching and transmission equipment and are assembled locally. Due to the growing demand in the Thai market, the establishment of a joint venture for local production of ESWD exchanges is currently under consideration ³⁶ (see 94 annual report). This joint venture would be a 49% Siemens ownership. Collaboration partners are TA and B. Grimm & Co., and TOT as joint venture partners. The joint venture calls for an annual capacity of 200k ESWD lines in the initial phase. Production is modular, allowing for rapid expansion.

The 7th Thai Development Plan calls for an additional six million lines by the year 2000. Siemens market analysis indicates that the number of mobile radio suppliers will increase by an additional six million lines. As the first contractor, Siemens has a good chance of increasing its share of telecommunications services to Thailand.

³⁵Siemens Review 5/93

³⁶Siemens Annual Report,Lexus Nexus,1994

4.4.1 AT&T

AT&T is a US. headquartered telecommunications company with a market capitalization of \$81.8 billion. Their business focus is on developing innovative products for communication and computing, primarily by using networks to move and manage information ³⁷. The corporation has a presence in nearly 100 countries around the world and does business in approximately 200 countries. As of March 1995 AT&T had approximately 51,000 employees abroad. In numerous countries AT&T partners with local manufacturers to manufacture telecommunications equipment. AT&T has 43 joint ventures in 24 countries around the world ³⁸.

The total worldwide revenue of AT&T for 1994 was \$71.9 billion. 43.4 billion dollars or 60% originated from revenues in telecommunications³⁹. Operations abroad contributed \$17.95 billion or 25% of its total revenues⁴⁰.

³⁷AT&T Annual report 1994

³⁸AT&T Annual report 1994

³⁹ San Francisco Chronicle, 9/21/95

⁴⁰ Canada News Wire Sept 25 1995

4.4.2 International Growth Strategy

AT&T has a multi-pronged approach to international growth and technology transfer:

- **Acquisitions**, such as ISTEEL in the United Kingdom, and Barphone in France.
- **Joint ventures**, which include: a joint venture in Ukraine with the Deutsche Bundespost Telekom.
- **Partnerships** with Dutch PTT to design, build, and operate a long distance international network.
- **Alliances** a business alliance in Canada with the new long distance company Unitel.
- **Expansion of existing business** outside the United States, including sales and installation of switches, PBXs and other business communications systems in Thailand.

4.4.3 Direct Foreign Investment

AT&T has had a presence in Thailand for more than ten years. In 1985 the company invested 46 million dollars in Thailand (JUNE 23*). The following three operations were established:

- semiconductor production;
- local telephone directory publishing business; and
- distribution of computer and phone switching products.

In early 1990, a branch of AT&T Telecommunications Products, Thai Ltd, produced approximately five million telephones a year ⁴¹. When production started in Bangkok, AT&T employed approximately 1,100 people. The manufacturing of corded telephones had been transferred from the company's Singapore facility. The Singapore plant retained the production of cordless phones and used the freed up capacity to produce more sophisticated telephone equipment. The Thai plant supplied the seven million corded telephones AT&T sold in the U.S. This operation raised AT&T's total 1990 investment in Thailand to slightly over 100 million dollars.⁴²

Mitsubishi Electric and the AT&T Microelectronics Unit signed an agreement for the assembly of Mitsubishi products at the AT&T facility in Bangkok. Under the terms of the agreement, Mitsubishi will ship finished wafers to the AT&T plant for final assembly. The agreement also covers the mutual licensing of assembly production technology used in the manufacturing process.⁴³.

⁴¹ Reuter, wire release, Bangkok, June 23, 1990

⁴² Reuters Ltd. June 23, 1988

⁴³ BC cycle, June 17, 1992

AT&T developed a Network Systems Program-Management to provide total systems integration⁴⁴ They are able to support multi-vendor networks to customers world-wide by providing delivery of the network, installation and program management. This led to groundbreaking agreements with Thailand's Telecom Asia. The services organization in Thailand provide capabilities that include consulting, systems integration, installation, engineering, maintenance, out sourcing, vendor management and infrastructure integration.

⁴⁴ McGinn, R. CEO, Network Systems Group, October 25, 1994

4.5.1 Nippon Telegraph & Telephone (NTT)

Located in Japan, NTT is the worlds largest network operator ⁴⁵. In fiscal 1994, NTT had a consolidated operating revenue of \$66.8 billion, and by the close of 1996 the company projected, their total number of subscribers would be 61 million people. NTT was founded as a public organization, the principal buyers of services are government agencies or state-owned companies.

Unlike the world's other telecommunications giants, NTT can not provide international phone service outside of Japan⁴⁶. It conducts its overseas business such as marketing and engineering through a subsidiary, NTT International (NTTI). NTT developed installation of an advanced integrated service digital network (ISDN) capability for high speed, broadband communications. The three services that make up the NTT product line include:

- telephone;
- textmail; and
- visual telephones.

4.5.2 Global Strategy

⁴⁵Kemper, A.;Gossack, L.;US Industrial Outlook 1/94

⁴⁶Kageki, N The Nikkei Weekly, July 4, 1994 .

As of 1985, the company was privatized and become a private joint stock corporation that provides telecommunications services in a competitive market, although the Japanese government still holds 65.7% of the stock⁴⁷. Foreign investors are now allowed to own up to 20% of NTT's shares.

The overall NTT corporate strategy is as follows:

- The organization will continue to order next generation systems, forcing a strong level of competition in a constantly upgraded local industry.
- NTT will join other international carriers, by helping them provide service in Japan. This will be accomplished by linking with NTT's network.
- The company will join with foreign service provide and electronics manufacturers to advance into the potentially lucrative multimedia business.

NTT positioned the company for entry into the global market by listing its stock on both the New York and London exchanges. The purpose of the stock listing was to raise the international profile of NTT by increasing name-recognition abroad which could lead to overseas expansion⁴⁸. A second advantage of this listing was that it

⁴⁷The Nikkei Weekly, July 4, 1994

⁴⁸The Nikkei Weekly, July 4, 1994

helped the company acquire additional capital. Listing the company on the stock markets does not greatly impact the company, since as of 1994 foreigners owned only 1.38% of the issued shares, and investors will have to value NTT by its prospects in Japan alone, which is different from the listing of a multinational corporation ⁴⁹ .

4.5.3 NTT's Presence in Thailand

Prior to 1992, NTT's overseas activities with developing countries were limited to non-business technological cooperation through the Japanese government's overseas aid program. NTT International Corporation (NTTI), which is a NTT affiliate, had been involved only in consulting and engineering for telecommunications facilities. In the past, any serious discussion of NTT's global strategy was stifled by the fact that NTT is prohibited by law from providing international service. However, while NTT is banned from providing international telephone calls, there is no restriction on its participation in domestic business in a foreign country.⁵⁰

In 1992, NTT shifted its global strategy by investing in its first foreign alliance with a telecommunications firm in Thailand. NTT signed a contract with a Thai consortium to set up a one-million-circuit network throughout Thailand. The consortium was established by four major Thai companies, including Loxley (Bangkok)

⁴⁹ Sasaki, Kazuto LTCB Research Institute, Economist .

⁵⁰ Nikkei Weekly, November 15, 1993

Ltd., a trading firm for telecommunications and computer-related equipment.

NTT was responsible for designing, constructing, and operating the \$2 billion project of installing lines in various regions of Thailand, with the exception of metropolitan Bangkok. With this investment, NTT acquired a 20% stake in Thailand Telephone & Telecommunications Corp.⁵¹

This alliance became possible because NTT had convinced the Japanese government that its participation would be limited to services within the country. According to NTT's General Manager Jiro Sasaki, "NTT must at least show its presence to the world by listing its stock on foreign markets, or else it will be left behind by its global counterparts," such as AT&T, British Telecommunications, and Deutsche Bundespost Telecom, which are grouping with other carriers to take the lead in the global phone market.

NTT presence in Thailand included other communications opportunities, for example, in 1992 the Bank of Thailand asked NTT International for an engineering proposal to develop a system to speed up interbank foreign exchange and loan settlements. The order was valued at \$6.5 mm. The system would be used in Thailand's central bank and could be expanded to other financial institutions.

⁵¹The Nikkei Weekly, November 2, 1992

Chapter 5

5.1 Discussion and Conclusions

Telecommunication expansion is a high priority for the developing country governments of Southeast Asia. My discussions with leading industry executives, university presidents, and government officials in Thailand during 1995⁵² indicated a chronic unmet demand for telecommunication services.

As discussed in chapter two the economic reasons multinationals are setting up operations in Southeast Asia, include their interest in reducing high labor costs, the need to lessen the impact of the appreciating yen, the necessity of increasing production capability in certain industries such as electronics . Specific elements which make Thailand an attractive location for multinational corporations in the telecommunications industry encompass the demographic changes of the country as the economy shifts from agriculture to manufacturing production; government policies to stabilize the economy; and an increase in communication and information technology as a basic tool in supporting the infrastructure of a rapidly growing economy.

Telecommunications and electronic information are integrated into most aspects of the Thai economy. It is a critical factor for

⁵²Elliott W., Franke R. Technology Assessment of Thai Industries
5/14/1995

manufacturing and agricultural production, and is vital to such export industries as product assembly, textiles, and tourism. In addition, it provides vital links between the financial industry, investors and the consumer. The presence of a telecommunications infrastructure critically affects the decision for foreign enterprises to locate in the region.

In this chapter, I examine four leading telecommunications companies Ericsson, and Siemens from Europe, AT&T from the United States, and NTT in Japan. Each multinational has established operations in Thailand. In this thesis, I compare the modes of technology transfer for entry into the Thai market. Within each company, I identify the products or services these companies supply, and examine whether companies are setting up operations in Thailand as a platform for global production, or whether the primary objective of the corporation is access to new market opportunities and geographic presence to increase their market share.

5.2 Telecommunication Products: in Switching Technology

LM Ericsson Corporation

Telecommunication needs in switching technology varies from country to country. Ericsson designed a unique modular architecture and a library of software packages which is used to adopt a common piece of hardware to local country needs. This design modularity innovation lowers the manufacturing costs of the product and larger volume production of a single product.

Mobil phones represent a rapidly expanding area of operations for Ericsson. Sales doubled in 1994, and Ericsson became the third largest supplier of pocket telephones in the world ⁵³. Mobil telephones are a rapidly growing segment of the telecommunications market in Thailand, particularly in Bangkok, where travel can be difficult. Insufficient phone lines have led to a technical leap from the traditional corded phones to mobile phone use. During my visit to Thailand, it was evident that the use of mobile phones within the business community was higher than what occurs here in Cambridge, Massachusetts. As an example, in Thailand mobile phones make good use of the idle time in traffic during daily business travel.

In areas where the fiber optic cable installation is limited because of the obstacles, from pre-existing structures, the primary use of mobile phones may be as a first phone; this directly contrasts with the way mobile phones are being used in industrialized countries. Mobil phone development today has improved functionality by providing higher quality sound and optimal design. Phones are becoming light in weight and smaller in size. These systems make it easier to use in densely populated cities and are safer to use while driving. Recently in the less regulated telecommunications markets of Thailand, supplier demands are increasing. Companies compete by offering lower prices and shorter lead times to make it easier for telecom operators to introduce and handle new services that they want to offer the customer.

⁵³Ericsson Financial Operations, Lexus Nexus, 1994

Lower prices can be transferred to the customer since Ericsson creates products using a standard platform, which can then be modified according to country specifications. Worldwide price declines are tied to both technical advancements and larger scale production.

Market entry for Ericsson was the formation of Ericsson Thai Networks, a subsidiary of Ericsson Corporation. This company was founded as a joint venture with several Thai companies. The joint venture gave Ericsson access to a Thai telephone and telecommunications supplier which has an extended contract, for 25 years, to install one million lines in rural Thailand. The Loxley Company and Jasmine International public company both own 25% stakes in the Thai concessionaire. Ericsson's entry into the Thai market was specifically to increase their market share as a principal supplier of equipment and mobile telephone systems.

Siemens

Siemens is the second largest equipment supplier for the rapidly growing telecommunications market.⁵⁴ They build and market equipment for all forms of communication in the Southeast Asian market. Their products include systems for voice, data, image, text and sound communications. These systems are for either stationary or mobile terminals. Telecommunication access systems make it

⁵⁴Siemens Annual Report, 1994

possible to connect groups of subscribers via fiber optic cable. Siemens provides the optical fiber, digital switching, and transmission equipment for subscriber lines.

Thailand is installing fiber optic lines in high traffic regions to improve the availability of telephone lines. In 1992 alone, Siemens installed 110,000 new subscriber lines in the context of turn key projects.⁵⁵ The demand is expected to increase proportionately to the industrial growth and increasing personal consumer demand.

Siemens has a joint venture with Thai partners TelecomAsia/TOT, and B. Grimm and Co. Siemens' subscriber exchanges are installed in containers and assembled locally. Since Siemens delivers their product in containers as a turnkey operation, and the process requires only local assembly, this limits their technology transfer activities.

As a global recession continued through 1993 Siemens' business stagnated. In 1993 there was no indication of overall sustained improvement in their economic environment and there was great to pressures to reduce costs and streamline operations. Siemens gains considerable market opportunity by operating in Thailand. The business offsets the digital mobile communication recession that they are experiencing in Europe. In order to secure competitiveness in the future, expansion in Southeast Asia and development of new accounts represent an important business strategy.

⁵⁵Siemens Review

Opportunities for New Businesses: Transportation Expertise

Siemens Corporation has a transportation sector which provides comprehensive solutions to different types of transportation problems. The department offers consulting solutions for railroad traffic including track signaling systems, instrumentation and control. Their traffic management systems from the Industrial and Building Systems group is designed to regulate traffic flow on highways.

I believe Siemens Corporation could leverage their position in telecommunications in Thailand to explore the potential for new businesses in other business areas in their company. Since Thailand has severe transportation problems within densely populated areas there are demands for outside expertise to work in conjunction with government and private concerns in Thailand in the area of mass transportation. As an example, in Bangkok alternate passenger and freight transportation systems are required because of the increase of road traffic, and with it the inherent problems of congestion, pollution and safety.

5.3 Telecommunication Carriers AT&T and NTT

The strategic drivers for AT&T and NTT presence in Thailand, are to provide comprehensive packages of mobile communications and information exchange tools to an emerging market. AT&T provides

telephone service communication networks, broadcast distribution and products, such as, cellular phones and computing (hardware-software). NTT differs from AT&T; they exclusively offer network services.

NTT

Global Strategy

NTT's chief regulator and government overseer is the Ministry of Posts and Telecommunication (MPT). This organization created the regulation which restricts NTT from offering services outside of Japan. In 1991 Nippon Telegraph and Telephone Corp. President, Masashi Kojima announced NTT's interest in becoming a telecommunications business operator on a global scale⁵⁶. Kojima saw the opportunity for expansion, because "network operators in many countries were looking for partners to help develop their networks. Several indicated NTT that would be a good partner"⁵⁷. Although there have been policies restricting the provision of network services overseas, he was able to influence the ministry, by defining the benefits this global expansion would have to their domestic business. The benefits to NTT are: "the experience gained and the revenue received from these activities "⁵⁸Kojima felt that

⁵⁶Telephony, August 5, 1991

⁵⁷NTT press conference Dec. 3, 1990,

⁵⁸Ministry of Finance's Journal.

this is the best direction for us to take toward world cooperation," wrote Kojima in the Ministry of Finance Journal⁵⁹

Financial Services Opportunity: Bank of Thailand

In 1992 the Bank of Thailand, asked NTTI for an engineering proposal for a system to speed up interbank foreign exchange and loan settlements. This order had an estimated value of (US)\$ 6.5 million⁶⁰.

NTTI

NTTI's first network service outside of Japan was in Thailand. Within a year NTTI had provided additional network service capability. The data suggests that the operation in Thailand is an expansion of their previous efforts to provide technical and marketing support to developing countries. In Thailand they were able to gain experience and a greater level of profitability. NTT's second foreign network service was in the US market. In 1994, NTT International become a wholly-owned subsidiary of NTT and was absorbed into the main company⁶¹ by June 1994. NTTI was previously 56.6% owned by NTT and 43.4% owned by trading companies, including Mitsubishi, Itochu and Mitsui and JGC Corp.

⁵⁹Ministry of Finance Journal

⁶⁰.Daily News Computers, December 21, 1992

⁶¹Telenews Asia Comline News Service March 3, 1994

AT&T

ATT was asked to provide network switching capability by Thai Telephone and Telecommunication TOT. In an interview⁶² with an AT&T Director Gary Epp he indicated the operation was both an opportunity to supply part of the 2.4 million line demand and to have an increase in market share in the Southeast Asian Market. AT&T has a US team of senior level managers that were involved in the negotiations. These individuals continue to provide technical and management support. The company also has an AT&T country team in Thailand, which is a marketing and sales organization. This group of managers directly interacts with the venture management team. During the interview I asked how AT&T handled the technical and management issues associated with the day to day operation. He responded the Thai partners initially were dependent on feedback regarding maintenance problems; currently many of these issues are handled locally. On average there is a monthly feedback session that is a scheduled between Thai and US staff.

In addition to network services there is an increased demand for basic telephone service, mobile communication messaging, and a developing emerging market in voice data and video communications, including electronic mail, and video services. In public places, pay telephones are virtually unavailable.

⁶²Epps G., AT&T Baskin Ridge

Conclusion

The rapidly developing economies in Southeast Asia have become attractive markets for multinational corporations. Foreign direct investment in the form of financial and organizational assistance from governments, global information access, and mutual collaboration between industrial groups has contributed to making this possible.

Several variables contribute to the reasons which make operating in Thailand an advantage for the Telecommunication multinationals.

Market Opportunity

The primary reason for multinationals to shift their manufacturing operations to South East Asia is the opportunity to gain market access, both from the host country and the surrounding countries.

With the increase in industrial growth and the average wages of Thailand workers the telecommunication industry has an excellent market prospect.

The export oriented economic policies in Thailand coincide with the rising need for low cost manufacturing in industrialized countries.

Telecommunications has traditionally been a national industry and as such there is a high demand for vertically integrated manufacturing, by local companies or by joint venture companies that involve local

parties. The demand for local responsiveness varies across industries.

Technology Transfer

Each of the telecommunication companies in this study used a joint venture with local Thai partners as the mode of entry. Each multinational then structures their relationship to prevent loss of technology.

There are different stages in technology transfer : the operational, the acquisition of the technique and the tacit knowledge; installation and maintenance, insuring the combined technology and management provide performance that parallels the transferee's structural adaptations to optimize manufacturing performance in the host country. Both AT&T and NTT companies are engaged in these two of stages of technology transfer, providing local staff with tacit information on how to install and maintain networks. Companies providing products such as mobile phones are not transferring technology in their core competency, in product development, but provide manufacturing expertise in any product assembly that is located in Thailand. Siemens has the limited its technology transfer because the product is delivered in a container as a turn key operation. Ericsson has the greatest opportunity for technology transfer since their product is designed to be modified for the local market.

In closing, the data suggests that Thailand is a favorable economic environment for the telecommunications industry based on economic growth, public and private investment and the interest of the Thai government to create an opportunity for collaboration with foreign multinationals.

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Appendix: AT&T In Thailand

Strategic Planning in Technology Transfer to Developing Countries

What are your company's products in Thailand?

- **Passive inter connective devices which are put into the network. They are located inside cabinets where the lines come together.**
- **Multiplexed systems where the cables split up**

1-What advantages did AT&T hope to achieve in transferring technology to Thailand?

- reduction in labor costs
- gaining access to a new market
- gaining economics of scale
- other

AT&T's entry into Thailand in 1990-91 was primarily for the purpose of gaining access to new market.

2-Which individuals (level only) were part of the decision making process to transfer technology to Thailand?

At the working level the key people were Vice President and Officers of the company. These individuals were business people and not technologists since the objective was to increase market share.

3-There are several strategies for transferring technology to developing countries. Which technology strategy was used by AT&T?

- foreign direct investment
- multiple licensing

- exclusive licensing
- joint ventures
- a mixture of joint ventures and licensing and co-production
- other

The TOT Telecommunication Authority of Thailand Telecom Asia, a government operated telecommunication carrier and the CP group of Thailand (an agricultural) company of which TelecomAsia is a group member, sought technical expertise to license and install 2 MM lines in Bangkok. Equipment supplies to exercise license. The distribution Siemens received the contract for 1 MM and AT&T 1/2 MM. The subcontract partner one of the sons of the Charoen Pokphand (CP) group received the contract for the installation of 2MM lines.

4-What are the critical Success Factors in Transferring Technology?

4.1 Public Policy

External and internal public policies influence the technology transfer process. Legislation on foreign investments, trade policies and tariffs influence a corporations decision to invest in a foreign country.

Could you indicate whether government policies were important in deciding whether or not to conduct business in Thailand? For instance in 1985 the Thai Five Year plan eased tax regulation and restrictions on foreign exchange. Did this increase the rate of technology transfer?

Tax holiday to help economic business

Trade policies for duty rates for import and export

In many developing countries the intellectual properties law are underdeveloped, this was not a concern in this in this particular joint venture.

AT&T does not have a problem with foreign exchange fluctuations since the product produced is for the local market.

4.2 Resource Availability

Many US countries are establishing facilities in Southeast Asia. What kind of resources was/is your company looking for in Southeast Asian countries?

Some joint ventures require local engineering talent, in AT&T's case their was no new product design required.

- **The company locally sourced metal work**
- **In other countries where AT&T has a joint venture the company has localized product design and adapted to the customer**
- **AT&T has considered the feasibility of producing a product in the future, which is primarily developed in Thailand**

The resources limitations for the current venture;

- **lack of sufficient business management experience particularly in marketing and sales**
- **scarcity of supply of personnel can be seen in the job hopping (low personnel retention)**
- **scarcity of trained people is prevalent in a number of technical industries.**

4.3 Infrastructure Requirements

What type of basic facilities, equipment and services does AT&T require?

- **The process is labor intensive not heavily equipment based**
- **The equipment is sourced outside of Thailand. It is not exclusively purchased from the United States**

- **The plant is operated by batch process in a 1-2 shift operation**

Transportation Related Issues

- **AT&T is not exporting finished products therefore transportation problems are not a critical issue at this time.**
- **Many companies including AT&T provide employee transportation by bus which reduces the problems personnel have with transportation.**

Energy and Environmental Issues

- **This operation does not require the services of either high energy demand or waste treatment facilities.**
- **Maintenance can be handled throughout the year, no shutdown of the entire plant is required.**

The educational requirements are as follows:

- **Managers and Engineers have to be bi-lingual**
- **Human Resource Manager has to be a native speaker**

4.4 Technological Considerations

Many industries benefit from the service and support of related industries. Did AT&T gain from other industrial sectors located in Thailand?

- **The Thai metal fabrication industry and the plastic processing industry are related industries that have supported our business.**
- **In terms of multinationals we have a close collaboration with some of our customers. For example we have collaborated with a multinational, they provide us finished product we handle the final packaging and shipping.**

4.5 What type and level of technology was transferred?

- **Manufacturing**

If manufacturing is conducted in Thailand is it automated or primarily labor intensive?

- **The process is labor intensive and we employ several hundred individuals**

-
- **Research and Development**
 - **Other Manufacturing Related Issues**

A part of the process of AT&T was to rigorously qualify the suppliers.

Problem Solving

- **The first few years US managers were sent in to solve the problems**
- **As Thai managers became more experienced the venture can solve the problems locally. (The technical and product development challenges in this plant are low level)**
- **The joint-venture is self sufficient**

Information Technology

- **Electronic Mail is not frequently used for day to day operations**
- **Managers use fax and phone**

4.6 Supply chain Management

Has AT&T incorporated the local suppliers in the development of new technology transfer?

The Thai partner was well informed regarding the product design needs and requirements, as they have already worked with multinational telecommunication companies.

4.7 Marketing

Does AT&T have a marketing operation in Thailand?

- AT&T has a country team in Thailand, which is a marketing and sales organization. They have a close and direct collaboration with the venture management team. This facility is located in Bangkok.

4.8 Education and Training

What type of educational level was needed for Thai employees to support the technology transfer process?

What educational system and technology programs would best address your companies needs?

Were any of the recipient company employees sent to the US for additional training?

Do your facilities require bilingual employees?

- They sent engineers to the US for technical training on the equipment

4.9 Management Practices

When does AT&T consider the technology successfully transferred?

What metrics are used to evaluate success?

What type of maintenance tool is available i.e. access to the Internet for changes in the process, documentation updates?

What percentage of problems requires technical support from the US and how much of it is managed locally?

- Less \$ equity lower risk and lower return
- Objective to have good relationship with customers
- In the future they would consider putting in high technology which is more capital intensive