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Telematics policy in the ASEAN countries: A base-line data taxonomy of telecommunications and information systems infrastructure and investment for development planning

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TELEMATICS POLICY IN THE ASEAN COUNTRIES: A BASE-LINE DATA TAXONOMY OF TELECOMMUNICATIONS AND INFORMATION SYSTEMS INFRASTRUCTURE AND INVESTMENT FOR DEVELOPMENT PLANNING

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ABSTRACT

Telematics is the growing convergence of computer and information systems technologies with telecommunications and broadcast systems.

In the ASEAN (Association of South East Asian Nations), telematics development is part and parcel to the rapid economic expansion of the region. Trends in policies for the development of telematics in the ASEAN include increasing liberalization of markets, moves toward the deregulation and privatization of the telecommunications authorities and increasing private participation in telematics development.

In order to effect institutionally recognized telematics policy and planning in the region, a base-line data taxonomy of infrastructure and investment for development planning is proposed. Due to the complex, problem-oriented nature of telematics studies, an interdisciplinary approach to understanding theory and methods of research is taken.

A description of telematics policies, infrastructure, investments and markets with regards to social, political, economic, cultural and technical development in five of six ASEAN countries is presented. From this, key developments in telematics in the ASEAN result in the formulation of a

draft base-line data taxonomy as an indicator of telematics development and for use in regional planning. A methodology to develop and refine the data taxonomy is proposed and executed which includes open interviews in a survey of key policy makers in three of the six ASEAN countries, namely, Indonesia, Malaysia, and Singapore. Initial feedback on use of the taxonomy from Malaysia and the Philippines confirms the viability of the base-line data taxonomy for policy and planning purposes in the region.

Data gathered as a result of the operationalization of the base-line data taxonomy could be used with numerous communication planning methods. A formal adoption of the taxonomy and its subsequent implementation in the ASEAN region on an official level is recommended. The process of modifying and updating the description and taxonomy should continue in an effort to provide a meaningful set of tools for policy and planning. The base-line data taxonomy is but a beginning to the operationalization and use of data gathered under its rubrics for policy and planning purposes in the ASEAN region.

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PREFACE

This dissertation is the result, in part, of work completed in conjunction with the project "Impact of Telecommunications Technologies on ASEAN Economies," at the East-West Center in Honolulu, Hawaii. Dr. Meheroo Jussawalla was the Principal Investigator of this project for which I was a Research Intern from December 1988 to May 1990. Material presented in various chapters of this dissertation are from articles authored principally by myself and co-authored by Dr. Jussawalla including published articles in the Columbia Journal of World Business (Spring 1989), The APT Telecoms Journal (July 1990) and a monograph published by the East-West Center (in press). Permission for use of selected data gathered from the East-West Center project, largely as a result of my efforts while a Research Intern, has been graciously granted by Dr. Jussawalla. In addition, material in several chapters emanates in part from the published papers for which I am the sole author or principal co-author that were produced in conjunction with the East-West Center project and as a result of my own previous and concurrent endeavors.

CHAPTER I

INTRODUCTION

Portions of this chapter are from Hukill (1990) and Hukill and Jussawalla (1989, 1990, and in press).

1.1 An Asia-Pacific Era

When the great trade routes to China were opened, as is often historically attributed to Marco Polo more than six centuries ago, the Western and Eastern worlds met face-to-face in lucrative and expansive economic and cultural exchanges. However, the communication and transportation linkages were especially difficult and remained so even after Magellan's opening of routes around Cape Horn and across the vast Pacific Ocean. Economic development remained limited as communication and transportation improved little for another five centuries.

Only very recently, however, has technology enabled us to traverse the open tranquility of the aptly named Pacific in a matter of hours. Voices, images and data information can be exchanged in fractions of seconds as today the peaceful Pacific giant is getting wired.

The Transpac and Anzcan undersea fibre-optic cables are the new digital highways which can carry, at present, 40,000 simultaneous phone calls. The people inhabiting the Pacific Rim are also linked by satellites both geo-stationary and maritime. Along with innovative modes of travel and increased facilities for trade in merchandise and services, this region is challenging the established trade routes across the Atlantic for position as the most important world links. The thirty-four countries which encircle the Pacific and twenty-three island states scattered across 70 million square miles account for more than half of the world's population and half of its total wealth. Their political and economic systems range from unbridled capitalism of the United States to the military dictatorships of South America and Marxists regimes in Indo-China. Its approximately 2.5 billion people speak over a thousand languages and display some of the richest religious and cultural traditions of any region of the world. Already possessing 21 percent of the world's oil resources, 63 percent of its wool, 67 percent of its cotton, 87 percent of its natural rubber and 97 percent of its natural silk, the Pacific Rim region has now established a new monopoly over information technology in semi-conductors, super conductors, audio and video systems and is rapidly moving on to artificial intelligence and satellite launching rockets (Lee and Naya, 1988). Indeed, an Asia-Pacific era is upon us and we must grasp its meaning and seize its opportunities as an important focus of our international exchanges.

1.2 Economic Dynamism in the Asia-Pacific and ASEAN Region

In 1984, United States trade with the Asia-Pacific region outstripped, for the first time, the flow of goods and services across the Atlantic. In 1975, United States trade with East and South-East Asia amounted to $42 billion. In 1986, it surged to $200 billion and is continuing to grow. By the end of 1989, it has been estimated that trade in the region with the United States amounted to $350 billion (Naya, 1989). The entry of China into world trade has added to the excitement of the region already vibrant with the success of the four "Asian Tigers": Taiwan, South Korea, Singapore and Hong Kong. The pioneer of this performance has been Japan which attained annual growth rates of 10 percent between 1950 and 1975.

Added to Japan's growth is the fast economic progress of the four Newly Industrialized Economies (NIE's) or the "Tigers" and the emerging near NIE's of Malaysia, Indonesia, Thailand, Brunei and the Philippines, who along with Singapore make up the ASEAN countries, the political Association of South East Asian Nations (see Appendix 5).

The ASEAN countries represent a market of 300 million people and this region constitutes the United States' seventh largest trading partner. The United States is the ASEAN nation's second largest trading partner after Japan. (Naya, 1989). Consequently, these countries constitute one of the most critical marketplaces in the economic future of the United States. Already, Japan represents the largest foreign buyer of semi-conductor equipment made in the United States. With several ASEAN countries looking to be new producers of this equipment, a glimpse of trade structures and marketplace changes to take place over the next several years can be seen. Add to this the "China factor" where, as it has been suggested by Nicholas Lardy (1988), by 1995 China may be among the top five trading nations of the world. Clearly, the focus of attention for markets and policies must now turn to East and South-East Asia.

1.3 A Brief Overview of Telecommunications in the ASEAN region

While the ASEAN pact is essentially political, the six countries of ASEAN represent diverse economic, socio-cultural and political entities. Although each associates to the ASEAN pact, which on a diplomatic level has had success in promoting regional interests, the countries tend to pursue independent policies as they continue to evolve through a process of development at different rates. Despite the differences in each country, the ASEAN nations do share a number of commonalties including placing a increasing focus on the development of telecommunication and information system infrastructures and services.

Cooperation in telecommunications within ASEAN has been largely between the various government telecommunication authorities in building the ASEAN submarine cable communication system and the use of the Indonesian satellite, Palapa, for regional and domestic communication. Currently, four other ASEAN countries, namely Malaysia, Singapore, the Philippines and Thailand, have signed leases for the use of Palapa's transponder capacity for domestic telecommunications. In addition, Papau New Guinea, a non-ASEAN country has also made arrangements for the use of Palapa capacity for its own domestic telecommunications needs.

While Palapa is a government owned and controlled satellite, the introduction of low access-cost private satellites such as is promised by Asiasat opens new pressure on government monopoly telecommunications systems to liberalize policies for use. How far governments will be willing to allow the establishment of private telecommunications networks remains unclear. Asiasat will provide a test for Thailand in particular which is under great strain to vastly improve its telecommunications systems.

It has been suggested that the overall economic success of the East and South East Asia region will be due to adopting export-oriented policies which generate greater competitiveness and more market responsiveness (Okita, 1988). The development of transportation and communication technologies along with trade and capital networks have accelerated these exchanges. However, a major drop in oil prices and the recession in commodity prices in the 1980's have meant that the ASEAN countries have had to implement major structural adjustments. Thus, the switch to export-promotion strategies from import-substitution strategies and the development of private rather than government led economic growth is characterizing the ASEAN countries in the early 1990's. This shift in economic focus has its effects in the telecommunications sector as well. Combined with social, cultural and political factors and their change both within each country and the region as a whole, a new dynamics in telecommunications is now evident in the ASEAN region.

While telecommunications markets are expanding in the ASEAN region, both a regional and country-by-country perspective must be taken in order to be able to understand its potential and to participate within changing policy developments. Policies governing telecommunications are indeed quite different in each of the ASEAN countries. Laws, various levels of regulation, market control, and levels of private participation are just a few of the factors which differ from country to country.

There is a definite trend to more liberalized markets and deregulation to various degrees in each of the ASEAN markets for telecommunications. Market forces due to increased economic activity in the ASEAN countries are forcing governments to relax monopolistic state-owned and controlled telecommunications organizations as the need to expand telecommunications becomes a greater burden on country resources. From moves to privatization in Malaysia and soon in Singapore to increased private participation with the telecommunication authorities in Indonesia and Thailand, new policies are being developed which are rapidly changing telecommunications, broadcasting and information networks in the region. These changes are part and parcel to the increased economic activity of the region.

Differences in the telecommunications environment in each ASEAN country are in part a product of the social and political environment and so each country must be looked at in turn. The region as a whole, however, has numerous commonalties and cooperation in telecommunication is increasingly becoming an essential part of regional development.

Despite population increases, telephone densities per 100 population have increased for the ASEAN countries over the last ten years, except for the Philippines. The most dramatic change has been the increase in international telephone traffic. Much of this traffic is business related pointing to the concomitant increase in the overall economies with the growing telecommunications systems in the

ASEAN region. Volume for international calls has increased 35-40% for Singapore and Malaysia, 50% for Thailand and 20-30% for Indonesia and the Philippines over the past decade (ITU, 1989).

Both an increase in multinational activities and telecommunication traffic is expected in the ASEAN countries for several years to come. Growth of basic land-based public switched networks, satellite communications and a growth in services such as fax and mobile telephony are expected throughout the ASEAN as economies expand. This expansion is due in part to the increased ability to better communicate as telecommunications infrastructures and services are developed.

On an official level, inter-governmental regional cooperation for telecommunications development in the ASEAN is achieved through the Committee on Transportation and Telecommunication, COTAT (Appendix 5 presents information on ASEAN as an organization and COTAT). Cooperation in telecommunications continues to expand with projects to interconnect the ASEAN countries through undersea fibre which are being put into place. Problems of equipment technology gaps are beginning to be addressed through cooperative efforts. For example, Singapore is nearly entirely digital while the rest of ASEAN remains with analog equipment and still tries to satisfy basic telephony demand. The need for information on each ASEAN telecommunications system is felt throughout ASEAN as regional planning efforts expand.

In addition, regional telecommunication organizations such as the Asia-Pacific Telecommunity (APT), based in Bangkok, as well as the Asia-Pacific Broadcasting Union (ABU) and Asia-Pacific Institute for Broadcasting Development (AIBD) based in Kuala Lumpur, have expanded their regional cooperation and research efforts. All of the ASEAN countries are members of these organizations which have become important focal points for regional telecommunications planning. The APT, for example, will soon provide a common technical database center for countries in the Asia-Pacific region including ASEAN to provide telephony traffic data and to find solutions for potential future traffic and routing problems.

1.4 Technological Dynamism and the Impact of Telecommunications

Dynamic technological innovation and changing economic environments have been bringing new concepts to regulation, institutional configuration, pricing policies and financial structures of a global information economy. Telecommunications carriers, information service providers, and equipment producers are all gearing to fit their organizations into this fast changing and challenging environment.

Both a cause and consequence of the globalization of economies is the dynamic change in the telecommunications and computer industries. The boundaries between these two industries are rapidly blurring and this "telematics" merger is in turn propelling a restructuring of the institutional and market paradigms. It has become difficult for the market participants and policy makers to completely grasp the dynamics of these changes. This difficulty is compounded by the crossing of geographic and regulatory boundaries on both the domestic and international levels.

Whether telecommunication development causes an increase in GNP is not established categorically. Rather than a direct causal relationship between telecommunication development and overall economic development, there appears to be a complimentary and self-reinforcing process. That is, while the growth in telecommunications will not necessarily have a direct effect on the growth of the economy, there is evidence that there is a link between GNP of a country and an efficient phone network for example. The data (Table 1) shows a correlation between the number of telephone access lines per 100 population and the GNP of a country (Wellenius, 1972, 1984). Four countries account for approximately half of the world's telephone access lines. There are also approximately 700 million telephone sets in the world again with the highest concentration in the four countries in Table 1. The United States alone accounts for nearly one-third of all the world's telephones.

Table 1

Four Leading Countries by GNP and Number of Telephone Access Lines (in millions)

U.S.A.	120
Japan	47
W. Germany	26
Soviet Union	26
World Total	430

(source: Communication Technology July-Sept., 1988)

In contrast, the ASEAN countries, as do most other countries, have much fewer access lines, which are still measured primarily in the thousands rather than the millions. Table 3.2, Appendix 3, shows the growth in main telephone lines (access lines) over a ten year period from 1978-1987 in each of the ASEAN countries. This, of course, is due in part to the relative size of these countries, however, the region is also experiencing rapid growth as is indicated in Table 3.21, Appendix 3, showing the rapid rise in GNP of each ASEAN country over a twenty year period.

It appears that the economic efficiency of a country does depend to some extent on strong and efficient telecommunications networks. Therefore, the electronic connectivity level of a people may indeed have a direct relationship with the enhancement of economic activity. For countries such as those in the ASEAN region, the message is clear. The establishment of an efficient telecommunications infrastructure is vital to its success in attaining economic and social development goals.

1.5 Scope of Study, Objectives and Rationale

The regulatory policies and market structures for telecommunications (or more broadly <u>telematics</u> as will be explained in Chapter 2) in five of the six ASEAN countries namely, Malaysia, Indonesia, Thailand, Singapore and the Philippines are presented. Regrettably, Brunei, the sixth ASEAN country, is not included due to the lack of sufficient information and available research contacts. As this research project was dependent on the resources of the Institute of Culture and Communication at the East-West Center and the project, "Impacts of Telecommunications Technologies on ASEAN Economies," directed by Dr. Meheroo Jussawalla, it was not possible to include Brunei. While it is hoped that in future research efforts, Brunei can also be included within the scope of study, its absence here should not detract from the generalizability of the study to the entire ASEAN region. Indeed, Brunei exhibits many similar characteristics of Malaysia and Singapore together (as it was part of the original Malaysian Confederation), if certainly from its own unique political and social base.

The telecommunication, broadcast and information system policies of the ASEAN countries can be characterized by various levels of increasing liberalization of markets, decreasing investment regulation and, also by an increase in privatization and competition. Each country, however, is evolving its own set of policies and practices which necessarily respond to its own political, social and cultural environments.

In addition, regional cooperation is examined. An analysis of the data needs to undertake further study for regional cooperation in policy development and planning is presented in a proposed base-line data taxonomy scheme.

Dynamic technological innovation, regulatory and market changes as well as variable socio-cultural and political impacts of technology development and implementation create an uncertain environment for the development of appropriate policy, and for determining impacts of telematics policies. As a result, telematics development is often driven in a de-facto manner by technology and market forces. The intent here is to assess a means to help shift telematics development toward more meaningful institutionally driven policy-making. It is proposed that the development of a base-line data taxonomy for the collection of comprehensive data, which indicates the present and projected levels of investments and infrastructure developments, will provide a significant new common foundation for assessing and developing policies and for planning in the ASEAN countries.

The problem to be studied, therefore, is the nature of telematics in the ASEAN and the need for a broader approach, across disciplines, for the study and analysis of information which can subsequently provide a common foundation for developing data gathering efforts important for telematics policy and planning in the ASEAN region.

The objectives of this research are therefore twofold:

(1) to identify, through a macro-level, interdisciplinary description, key developments of telematics policy in each of the ASEAN countries under study and the social, political, cultural and technological factors which influence and are influenced by telematics policy development.

(2) to develop a base-line taxonomy data scheme for the measurement of telematics infrastructure and investments relevant for policy development in each country as well as for cooperative planning in the ASEAN region.

Telecommunications in this study will refer to all systems and technologies which utilize electro-magnetic and electronic means to transmit and receive communications as well as store and retrieve voice, video and data information. This includes telephony and other voice communications, computer information networks, broadcast and cable television and radio, and satellite systems and networks. In line with the approach of the International Telecommunications Union, ITU, because of the ubiquitous nature of telecommunications and the evident "telematics" merger of technologies and systems, telecommunications is referred to here in its broadest definition and the term telematics is used throughout to characterize this merger.

From a macro-level perspective, whether national development is largely technology driven or can be institutionally driven in a goal-oriented manner has been the topic of previous and current debate, especially in terms of technical development itself. Such is the case for telematics development in the ASEAN. Whether an institutionally driven development can succeed may largely depend on the ability of policy makers to work with appropriate tools for the formulation of policy and for planning purposes. In the absence of such tools for intentional policy making and planning, technology and market-driven forces may better account for the often erratic nature of national development and crisis response of policy making. If institutionally driven development, as desirable, is to succeed, then relevant foundations for policy making must be created to provide for intentional policy making which can in turn direct the forces of technology and markets rather than be directed by them. This research, therefore, has as a focus, the development of such a policy and planning foundation for telematics in the ASEAN countries.

From a extensive review of the current literature and an analysis of current available data on telematics in the ASEAN countries, key developments in telematics policy as they relate to overall social, cultural, political and economic development are identified for each of the ASEAN countries. A base-line data taxonomy for comprehensive collection of telematics infrastructures and investments data, over time, in the ASEAN countries is developed. The initial proposed base-line taxonomy, presented in Chapter 5, is an inventory outline of telecommunications, broadcast, satellite and information system infrastructure and investment items identified from the key developments analysis. The data taxonomy is then structured and refined through the results of a open-interview survey of selected key policy makers and participants of telematics in three of the six ASEAN countries namely Indonesia, Malaysia, and Singapore. These countries were selected to be representative of all the ASEAN countries, with Singapore as the more developed country, Malaysia as a near NIC (Newly Industrializing Country) similar to Thailand and Brunei, and Indonesia, represenstive of a lesser developed country similar to the Philippines.

The goal of the survey is to identify areas of common concern which should be reflected in the base-line data taxonomy as well as identify necessary data items and the availability of data for the identified key telematics sector categories. The results of the open-interview survey are reduced to the common responses of the respondents which are reflected in the refinement of the draft base-line data taxonomy.

The resulting data taxonomy provides a common base-line for telematics infrastructure and investment data gathering in each ASEAN country. Such a data taxonomy is necessary in order to provide a common database for future regional policy and planning in the ASEAN countries by better understanding the present situation. This data taxonomy is an important new foundation for telematics policy formulation and planning in the ASEAN region.

The need for such a data taxonomy has been demonstrated by the enthusiasm of authorities in both Malaysia and the Philippines in particular. Available data has been collected according to the developed taxonomy for Malaysia and the Philippines by the telecommunications authority in those countries. While not the main focus of study, the data collected provides evidence of the utility of the data taxonomy and provides verification of its importance and preliminary acceptance as a guide for data gathering efforts in the region. Since the nature of the actual data which may be collected is not entirely known prior to the development of the data taxonomy, as no operational definitions are provided, and certainly not all of the data can be collected in the scope of this project, it remains for subsequent efforts to develop operationalizations of the taxonomy and proceed to analyses of the collected data.

The developed data taxonomy, which will be common to all of the ASEAN countries under study, will provide a significant new foundation from which policy makers in the region can, for example, formulate policy "white papers" for future regional telecommunications development. This will respond to the need for better planning and policy formulation if institutionally driven technological development is to be enhanced. In addition, the data gathered as a result of the operationalization of the taxonomy can be used as input for various methods of policy and planning analysis, including trend extrapolation and as input to futures forecasting methods as is described in Chapter 3.

The base-line data taxonomy, therefore, represents a new common foundation for consideration of the broad range of telematics technologies and services, from which policy and planning efforts based on infrastructure and investment information may proceed.

CHAPTER II

THEORETIC FOUNDATIONS FOR TELEMATICS DEVELOPMENT

2.1 Overview

The growing convergence of computer and information technology with telecommunications and broadcast systems has begun, in part, to transform the socio-economic fabric of both the industrialized and developing worlds. This is leading to global, inter-related if not yet completely integrated, electronic communication and information systems. The convergence of technologies of communication and information and the world-wide development of integrated networks is often described as a "telematics revolution." (European Telecoms, 1990)

The term telematic (telematique) is a derivation by the French of the English and french words "telecommunication" and "informatique". The latter means information systems or datamation. Quite simply, telematics is an all encompassing term which refers to the convergence of telecommunications and information systems technologies and services (Martin, 1981). In other words, telematics are all the systems and services which combine or are a part of electronic communications and networks as well as information processing, transfer, storage and retrieval. Technologies of telematics include everything from the ubiquitous computer to facsimile (fax) machines and cover delivery systems from twisted-pair copper wire to fibre optic cabling and satellites. Telematics services include everything from remote paging and tele-mass-marketing to international broadcasting and person-to-person voice telephony.

What is important in the meaning of the term telematics is the convergence of computer systems with the electronic pathways of telecommunication networks. As communication signals and data transfer become fully digital, the distinction between various forms of information in the networks become less obvious as it all transfers as digital bits. Standardization, compatibility and bandwidth allocation become primary issues in such an integrated information environment. These are issues that cut across all systems and services as an integrated telematics environment evolves on all levels from the single end-user to global information networks. Telematics, is therefore a holistic view of the telecommunication and information environments, providing a systems view to the world's rapidly developing electronic environments. An example of telematics development as the convergence of information and telecommunication systems can be seen in the development of Integrated Services Digital Networks (ISDN) which is an attempt in the telephony industry to formulate standards as well as implement infrastructure which will allow for end-to-end digital connections in the public switched networks. The establishment of such networks means that other information which is also in a digital form can be transferred across the ISDN network with little distinction as to the sourcing and reception of the signal in video, voice or computer systems. ISDN therefore represents an example of one of several first steps in the pragmatic development of a telematics environment.

The purpose here is not to bias the description of technology with such buzzword phrases as "telematics revolution." The term telematics will be used throughout to encompass the broad range of electronic communication technologies and services as well as the computing and information processing technologies involved which are utilized for human communication.

In terms of telematics policy and planning on a macro-level, which is the particular focus here, two major problem-oriented approaches are apparent. One involves the premise that the technology itself has the ability to transform economic, social and political structures. The other asserts that an institutionally driven policy and planning approach can achieve desired results in the utilization of technology for general as well as specific purposes. These two approaches are not unrelated and their particular ontological and epistomological viewpoints overlap. The major difference is in whether or not the primary impact of social, cultural, political and economic change is technology driven or is more intentionally carried out through the specific application of technology to help, in part, engender change. Empiricists have tended to approach the problem from the former "effects" premise although more recent communication planning methods have focused, in part, on assessments based on the later approach of goal-oriented policy development (Middleton and Wedemeyer, 1985) as will be discussed in Chapter 3.

The point here is that the former or technology driven change is seen as the market paradigm, which is certainly important to understand in terms of functioning of an economic and social system. It asserts that cause for change can be attributed to the technology itself and policy development is essentially a reactionary process. Indeed, in the absence of an intentional, proactive change process, this may indeed be true and hence its inherent validity has at least a nominal substantiation (Ghosh, 1984).

Nonetheless, it is perhaps the nature of human existence which presumes that change can be a proactive process and that the use of technologies to achieve goal-oriented change is effective. Thus policy development which is based on an intentional planning process attempts to create optimal social and political structures and processes in part through the intentional development and application of technologies to meet a goal or set of goals.

The European Commission in June 1987 set forth the ground work for the concept of a change in attitude toward the traditionally state-owned monopolies in telecommunications to coincide with the completion of the European internal market scheduled for 1992. In fact, this trend can be seen worldwide. The deregulation processes which began in the United States in telecommunications have spread to Japan, Australia, New Zealand, and, to various degrees, in Europe as well as the ASEAN countries as will be discussed in Chapter Four. Privatization of telecommunication authorities and the liberalization of telematics markets can be seen taking shape at various levels. In Europe, the so-called "Green Paper" (1987) on telecommunications recognized on a Europe-wide level that developments in the area of micro-electronics, the digitization of telecommunications and the introduction of new technologies such as fibre-optics and satellites has resulted in the fact that telecommunications, computing, and television to name the larger areas of concern, can no longer be considered separately. Endorsement to the general approach to worldwide telecommunications development by the Council of Ministers and the European Parliament has meant that changes in Europe in the telecommunications sectors will be considered as an integrated whole and will be described by the term telematics. Therefore, intentional policy and planning processes are to be adopted in the approach to telematics development. At the same time, the numerous electronic media and the markets created by the development and use of these media are not to be ignored. In addition, the "telematics revolution" in the European view is impacting on the way business, social, cultural and political relations are conducted due to the ever increasing use of electronic means of communication and information storage, processing, retrieval and distribution via electronic means. (European Telecoms, 1990) This point of view clearly indicates that the European community recognizes that technology-driven development is an important reality. However, the Europeans also view that technology which is not intentionally planned in terms of utilization can have adverse consequences. The idea of an institutionally planned approach to the utilization of technology of course cannot guarantee only positive consequences. But, it may be the only alternative to the technology driven, "let the chips fall where they may" approach to development of telematics. It is from this view that telematics is described in the ASEAN region and that the formulation of a base-line data taxonomy as a tool for policy and planning efforts in the region is derived.

2.2 A General Telematics Theory?

Given the situation described in the previous section, it may be somewhat presumptuous if not whimsical to think that there is some sort of explanatory theory for the specific topic of telematics development. Indeed, it is a complex array of numerous theories of human communication and perspectives on technology and development which among others must be taken together as explanation. This involves a number of traditional disciplines including psychology and sociology and its impact on human communication theory as well as disciplines of economics and political science to understand structures, processes and change in human organizations and activities among others. In addition, technology development requires a understanding of natural science disciplines including mathematics and recent hybrids of computer and information sciences as well as processes of information processing, storage and retrieval and the pragmatics of engineering. It is this complexity of the topic of telematics development, policy and planning which requires at least a multi-disciplinary if not a more complete interdisciplinary approach which combines, interprets and integrates concepts, theories and methods.

It is certainly a reasonably valid approach to study telematics from the specific viewpoint of a particular discipline. For instance, one might try to discern differences in predictive outcomes of input-output theory in economics in terms of growth and impact of the telematics sectors on the macro-economy of a particular country or region. While this may tell us in great detail and in the language of the discipline itself, quite a bit about the subject, it nonetheless remains somewhat oblivious to other no less important and reasonably valid disciplinary approaches which may attribute predictive outcomes to an entirely different set of explanations.

Thus, it is no surprise that attempts are made to put together a more integrated approach to a study endeavor which tries to produce explanation on the basis of an understanding of more pieces of the puzzle. The risk of such an endeavor of course means that the detail of specialization of a discipline may be lost in trying to combine ideas across a number of disciplines. This is not a minor loss. However, what is gained is a broader picture which, on a modest level, may help direct more disciplinary approaches and, on a more ambitious level, offer more powerful explanation of phenomena.

It is the latter approach that this study endeavors to achieve. No excuses are provided for what might be criticized as a lack of disciplinarity. Indeed, "justice" may not be given to each particular disciplinary approach which will be discussed. But, human activity is complex and certainly no one discipline alone is apt to discover all the so-called truths. It is therefore in the spirit of prying into the complexity of the particular subject (in this case, of telematics policy and planning in the ASEAN countries) that this study is undertaken. It is an attempt to discover relationships among the economic, social, cultural, political and technological facets which may lead to understanding and finding viable solutions for complex policy and planning issues. While perhaps not carrying a particular theoretical or clean methodological punch, a combination of theories and methodological approaches will be discussed in an attempt to better understand at a macro-level the numerous facets of the topic at hand.

The struggles of multi-disciplinarity or interdisciplinarity have been dealt with on an extensive basis as are discussed in the next section.

2.3 Interdisciplinarity

Portions of this section are from Hukill and Lassner, 1989.

2.3.1 Interdisciplinarity and the Academic Institution

Interdisciplinary study is seen as necessary in the acquisition of knowledge especially as it pertains to the study of information technologies and human communication endeavors. Understanding a broad range of conceptual ideas across a number of more traditional disciplines is a must to more fully understanding the implications of the information age. Advantages and disadvantages of such a study strategy are presented within the organizational structure and processes of the modern day university.

The tendency of universities to divide into specialized disciplines for easily administered organizational purposes has, in part, contributed to dividing intellectual thought and the acquisition of knowledge into ever more specialized fields. As a result, there are also ever increasing modes of protection of that knowledge in order to maintain a rationale for the continued division of resources along defensible boundaries. These are boundaries which may be set more for the convenience of administration than for the purposes of creating and acquiring knowledge.

But division and separation of intellectual endeavor may be somewhat contrary to the very nature of knowledge acquisition. As a consequence, individuals within universities or across universities begin to form informal groups in which ideas can be exchanged, say, among an economist and an electrical engineer or between a sociologist and an historian. Formation of these relationships among faculty and even students of diverse disciplinary focus at an informal lunch or discussion session is but an initial attempt at the fulfillment of a broader pursuit of knowledge in academic endeavor. It supports the belief that understanding of ourselves and our world can only be more fully realized if we try to understand each other's various disciplinary viewpoints as well as begin to try to understand their convergence and divergence.

Unfortunately, the very pursuit of wide ranging intellectual activity runs counter to the power structure and operational norms of the modern day university. At times, it is almost heretical to cross disciplinary boundaries and support for such activity is still very difficult to obtain. Yet, to be honest as academicians, to pursue knowledge and expand it, we must consider the interdisciplinary nature of knowledge and activities which foster increased interdisciplinary thought.

2.3.2 A Case For Interdisciplinary Studies

Klein (1985) admits to the complexity of the concept of interdisciplinarity. "It is linked with curricular reforms, theories of unified knowledge, attempts to solve social and technological problems, and the evolution of new hybrid disciplines (e.g., social psychology, biochemistry, sociolinguistics), new academic divisions (e.g., American Studies, Black Studies, Women's Studies, Area Studies) and new fields (e.g., immunopharmacology, oral history, and the study of written discourse) in addition to a number of complex research projects and problems..." (Klein, 1985, p. 117).

Klein presents a case for interdisciplinary studies by citing research linked with the establishment of the regional land grant universities in the United States. She points out that the land-grant tradition provided various organizational support contexts for interdisciplinary collaboration, especially in the combined efforts of agricultural, economic and biological studies. Nonetheless, Klein finds that many interdisciplinary studies through the late sixties were "plagued by disciplinary chauvinism and the psychological, social, and epistomological problems of communicating across specialties" (Klein, 1985, p. 119).

Bulick (1981) focused attention on the question of where the real boundaries of the disciplines lay. Bulick's study showed that while the social science disciplines present unique subject use profiles, all except economics show a wide range of interest outside their own disciplines. However, as might be expected, Bulick found that many activities were strictly disciplinary in nature.

The point is, of course, that interdisciplinarity is certainly not a replacement for, nor should it be a threat to, disciplinary studies. Use of materials from other disciplines should not be determined by questions of "turf," ego, and "disciplinary chauvinism." Rather, the decision should be based on the relative utility of bringing together such materials as are conducive for a better understanding, both theoretically and practically, of the various problems of broad social, political and technological importance which are to be considered.

A number of scholars have addressed the problem of the inability of disciplinary studies to adequately explain a number of complex problems and issues facing societies today. Nearly a decade ago, several researchers began to focus concerted attention on the problems inherent in disciplinary studies. Roy (1979) submits that there is an "inexorable logic that the real problems of society do not come in disciplinary-shaped blocks" [Roy, 1979, p. 163].

Ross (1981) contends that specialization in a subject has resulted in "a quickening of knowledge," and is highly pursued because of personal reward as well as for the sake of knowledge. Nonetheless, Ross indicts specialization as "the fragmentation of the mind and of subject matter" (Ross, 1981 p. 20).

Van Nieuwenhuijze (1978), on the subject of world development issues, finds that "inasmuch as development is total or comprehensive, affecting entire societies and groups in societies, there is no reason to expect that any particular discipline, any particular specialization of the social sciences or of science, is likely to succeed in mastering it" (Van Nieuwenhuijze, 1978, p. 1).

In claiming a need for interdisciplinarity in long-range planning, Olaf Helmer states, "Long-range planning, no matter what the specific subject matter, cannot fail to require contributions from a variety of disciplines" (Helmer, 1983, p. 23). Because of the length of time for long-range plans to take effect, environments will change, new technologies will emerge and socio-economic and political conditions may change. Not that disciplinary study of social, economic, political and technical issues is without merit in and of itself. However, such an approach can only be partially explanatory at best. At worst, explanations derived from purely disciplinary approaches can be misleading as to the relative importance of the findings, the generalizability of the theoretic approaches to the complex problems, and the application of various solutions.

Boulding (1981), a founder of general systems theory which he describes as evolving because "the real world was not really divided according to the usual disciplines," has eloquated that "disciplines are the strongest unit in both the academic and professional communities...[yet there remains] a hankering for a larger view, a broader perspective than can be found in single departments or disciplines." At the very least, according to Boulding, perhaps the contribution of general systems will be to show that disciplines that are too-self contained or remain too closed to outside information will fail to detect error and will remain inadequate.

The last decade has seen the emergence of interdisciplinary telecommunications programs at several United States universities (Levin, 1980). Lewin claims that it would be a mistake to see certain subjects related to the information age such as telecommunications treated too narrowly. For example, dealing only with the technical aspects of designing and operating a communication network is misleading according to Lewin. He points out the importance of understanding many factors which are determinants of the shape of the telecommunications industry such as "features concerned with government regulation at international, national and local levels, the economics, the management, the legal and social impact..." [Lewin, 1980, p. xix).

Interdisciplinarity, therefore, does not depend as much on the existence of a number of disciplines as it depends, according to White (1981), on the existence of a point of view toward the subject matter and toward knowledge in general. It is more the context rather than the content which is important.

2.3.3 Interdisciplinarity in Communication and Information Sciences

The study of communication and information sciences is in itself born out of numerous disciplinary fields. It studies the confluence of activities surrounding the emergence of information processing and exchange which Porat (1977) has shown has become the primary work activity in the United States.

The interdisciplinary nature of communication and information sciences was seen early on. Davis and Rush (1979) contend that information science is an interdisciplinary field which is concerned with all phases of the information transfer process. They see information science as a broad spectrum of activities which include the convergence of information theory, information technology and service-oriented functions.

The study of the field of communication has many facets. Communication as a social science has roots in psychology, sociology, anthropology, economics, linguistics and many other subject disciplines. Indeed, communication theory is really a body of theories (about which there is considerable disagreement) that make up our understanding of the communication process (Littlejohn, 1983). Communication as one of the humanities includes the more traditional study of speech and rhetoric as well as communication as an art form and in performance. Clearly, no one disciplinary approach to the study of human communication can provide adequate explanation of the complex processes and problems.

The combination of the study of the various mass media (print, television, etc.) and face-to-face communication has led to theories and empirical research in audience effects, media content, and interpersonal communication network analysis as well as critical analyses of media structures and impacts. When communication study is increased in scope to include more interactive media channels such as computer and telecommunications exchanges, theory and research begins to broaden from more one-way views of mass media communication toward exchange models which include not only the social considerations of communication processes but also and necessarily, the technical, economic and political as well. A multitheoretical approach to communication study is necessary, according to Littlejohn (1989), as disciplinary divisions do not provide the best method for packaging knowledge. Littlejohn sees that "interdisciplinary cooperation is essential for a useful understanding of communication" [Littlejohn, 1989, p. 4].

The case for interdisciplinary study is compelling. In the field of communication and information sciences, interdisciplinarity may indeed be necessary in order to begin to adequately understand the complex problems posed. However, it remains for those who choose such an approach to formulate the tenets of communication and information science within accepted theoretic descriptions and explanations as well as propose relevant researchable questions. This study is an attempt to do just that within the topic of telematics in the ASEAN region.

2.4 General Theoretic Approaches

2.4.1 Where to begin

When looking at subject that is as broad as the topic of telematics with a focus across several nations in a region, it may seem that one could become hopelessly mired in a plethora of theoretic positions which would be impossible to sort out. Add to that an attempt to tie together an interdisciplinary analysis across several areas of the Social Sciences including economics, political science, sociology and cultural studies as well as looking at areas dealing with management and the technology of information systems as is usually reserved for Business/Information Sciences and Engineering/Computer Science, one can easily be overwhelmed by the number and range of theory and methods of research both specific and general.

The intent here is not to account for all the theoretic positions that may be taken on the topic. Indeed, it is a formidable task to do so in just one discipline. Since the language and general premises are often different across the disciplines it would be a "Herculean" task to even begin to compare and contrast all theory of one discipline with another, and perhaps impossible to compare several at a time. Indeed, that may not even be a very useful approach.

What can be done, however, is to back away a bit from the detail of any one discipline and begin to focus on the broader concepts which bridge the disciplines. While some may claim that a loss in depth of understanding of a discipline is a loss in meaning, the case for interdisciplinarity as discussed in the previous section does not attempt to usurp that depth. Rather, it is an attempt to add breadth. In as much as it may now only be humanly possible to focus on one <u>or</u> the other (breadth or depth of study) the eventuality of increased activity in studies of breadth can only help foster a greater understanding of the depth of any one discipline. Therefore, it must be understood that there is no claim here that the selection of theoretic approaches for the understanding of the topic of telematics in the ASEAN region has taken into account the entire range of available theory from the all the disciplines involved.

So where does one begin? Perhaps a good starting point is to reflect on the theories of those that have thought in broad terms of general theories and those who have within a discipline begun to put together general theoretic tenants for the entire discipline. Such is the case of General Systems Theory and theories of scientific revolution as well as the theory of structuration in sociology and the broad tenants of the study of human communication. These examples are presented as illustrative rather than exhaustive of general theoretic approaches appropriate to both an interdisciplinary study and to the specific interdisciplinary topic of telematics.

2.4.2 General Systems Theory

Kenneth Boulding (1956), from Ludwig von Bertalanffy's ideas of the construction of theory that applies to systems in general, describes General Systems Theory as a level of theoretic model building which lies somewhere between highly generalized constructions of pure mathematics and the specific theories of the specialized disciplines. Given that, Boulding sees the quest of General Systems Theory as the need for a body of systematic theoretical constructs which will discuss the general relationships of the empirical world.

Ludwig von Bertalanffy (1950, 1968, 1975) hypothesized that there are certain irreducible wholes which must be analyzed as a system rather than as a collection of parts. Bertalanffy was particularly interested in open systems in biology and the relationship of parts of an organism to its whole and the whole to its environment.

The concept of the open system is one which can be seen in a number of general theoretic approaches in several disciplines as will be described in several of the following sections and is of particular relevance to the study of telematics.

It is contended that an optimal degree of generality is not always reached by the particular sciences according to Boulding (1956) in an article which has been one of the most influential pieces on General Systems Theory. Boulding submits that General Systems theory has as objectives the following: (a) To point out the similarities in the theoretical constructions of different disciplines, where they exist, and to develop theoretical models having applicability to at least two different fields of study and (b) to develop something of a "spectrum" of theories, or a system of systems which can direct theorists to fill in the gaps of missing knowledge to the system.

Churchman (1968) noted numerous variances in the objectives of a human system which make its study highly complex. For example, the distinction between operational objectives of a system (real) and objectives which are socially moral (legitimate) can lead to problems in quantifying system objectives and methodology for study of what are essentially human values rather than constants of the physical world. Churchman's approach however is one in which a description of a system within the five considerations above (and perhaps others) will yield a general understanding of the system from which more specific study may be accomplished. It is this approach to the study of telematics and the inter-relationship of economics, policy, social and cultural human goals, activities and resources which provides the framework for the description of telematics in the ASEAN countries. Indeed, it is the very lack of a general description of telematics in the ASEAN region which prompted this study in the first place.

General Systems Theory is certainly not without its critics and drawbacks. It has been simultaneously described as pretentious (Klir, 1978), ambiguous, vague, and lacking in providing a common language for concepts understandable across disciplines (Delia, 1977). Jonas (1951) argued early on of the lack of non-trivial homologies which were isomorphisms of any value attributable to the theory. While these criticisms have been addressed to varying degrees including by Bertalanffy (1968), some vagueness remains as is perhaps the inherent nature of a general theory to begin with.

Gvishiani (1985) assessed the progress toward the initial objectives of GST as modest but there seems to be a greater enthusiasm today for a systems approach than the founders of General Systems Theory might have expected. Its utility however is in helping arrange a structure (for the very least, in the absence of anything better) for the study of such a complex subject such as are human systems.

2.4.3 Kuhn and Scientific Revolution

Thomas S. Kuhn (1978) provides a perspective on the advancement of knowledge which is relevant to understanding the study of physical sciences which can be applicable also for the study of social sciences. This perspective has a particular relevance to the subject of telematics development as can be traced through change in thought of various disciplines concerned with its study.

Kuhn's thesis is that science has developed through a process of revolution rather than accumulation. Science does not develop in a smooth and gradual ascent, according to Kuhn, but rather in a series of discontinuous leaps. Kuhn asserts that as the adherents to the various models and theories communicate with scientists inside and outside the specialty, one of the paradigms becomes accepted by the majority, often leaving behind unconvinced followers of other paradigms and earlier theories. The established paradigm becomes the normal science, and now sets the norms and standards for defining a problem, developing a hypothesis, and measuring an outcome. Normal science then, has activities of puzzle-solving to sort out the theory. However, these activities also flush out anomalies such as unsolvable puzzles or different answers to puzzles proposed by different scientists examining the same problem. These anomalies eventually force a change in the paradigm which

Kuhn calls a scientific revolution and is a result of the crisis developed by the anomalies. Vigorous debate ensues, and the process starts over again.

According to Kuhn, any scientific discipline begins with a fact-collecting stage and is followed by successions of paradigm-based revolutions. At the early fact-gathering stage, there is no universally accepted paradigm. With a lack of theoretical and methodological guidance, scientific practice is a more random activity and restricted to readily accessible data. As a result of this initial exploration, one or more pre-paradigm schools begin to emerge. The maturity of any scientific discipline is marked then by the triumph and subsequent dominance of one school.

A scientific revolution implies a destructive-constructive paradigm change. It is preceded by a pre-revolution crisis which results from the discoveries of new phenomena and a persistent failure of normal science in interpreting new facts. As new theories emerge, the old paradigm begins to break down. In essence, Kuhn constitutes science as developing through such a continuous cycle of normal science and scientific revolution with each revolution representing a leap in understanding of the nature of the world.

Kuhn's revolution is however best construed as a shift in the thinking of the accumulation of knowledge itself and may be an attempt to develop theory that is in itself a result of certain anomalies recognized in the paradigm of paradigm development as a gradual process of accumulation and revision. Nonetheless, Kuhn presents a compelling argument that often science does make radical leaps forward in its quest for knowledge as revolutionary ideas shake up the foundations of the current knowledge base and the perspectives upon which that knowledge base is built.

Today, some twenty-five years after Kuhn's book appeared, one can still find applicability in his arguments directed specifically at changes in and the accumulation of knowledge of communication processes. We have seen over the last two decades, a practice of normal science in terms of expansions of basically linear models of communication aimed primarily at explaining the effects on humans of certain communication practices and environments. More recently however, as numerous anomalies come up in the ability of such models to adequately explain communication processes, communication scholars are beginning to look toward a paradigm wherein communication behavior itself is the dependent variable in the process of communication (Littlejohn, 1989). Thus, instead of linear models in the study of mass communication which may have some substance given the nature of the medium of communication studied, the more interesting question of explaining how our communication behavior is affected by the medium of communication may be more appropriate. This is clear in the case where an anomaly, namely the use of interactive communication technology, has cropped up. The dominant paradigm of communication effects does not adequately explain the processes of interactional communication and exchange of ideas that the new technologies can present.

Whether this can be classified as a paradigm change in the sense of Kuhn's scientific revolution may be too soon to determine. However, it is clear that a competing theory of communication is developing based in part on Rogers' notions of convergence which will be discussed in a subsequent section. It is not so much that past views are wrong, but perhaps insufficient to study new phenomenon. Thus we may be entering a period of extraordinary science as described by Kuhn as we move into the 1990s. Whether this period produces a scientific revolution and a complete paradigm change remains to be seen. Rather, a more complex building of communication theory may take place that begins to integrate the common concepts of most communication theories and begins to build toward a system of integrated communication knowledge. The change in perspective to studying communication behavior itself may simply be another level in the complex puzzle of communication, not a replacement theory of all-encompassing explanation.

The stage at which knowledge of telematics in the ASEAN region rests is at the stage Kuhn might describe as an information gathering stage. Collecting the available data is a significant part of that stage. For the subject of telematics that means a collection of information on telecommunications, broadcast and cable media systems, satellite systems, and information networks. Some of that information in each country of the ASEAN region is available from separate sources and some will still need to be gathered. Further, a means to collect that data in a reasonably agreed on form needs to be found. From that stage, which this study has as one of its goals, perhaps others may continue with the process of finding the inherent theoretic underpinnings for the process of technology related human communication activity from the breadth of information on telematics in a particular region of the world and from other similar discussions within and across a variety of disciplinary viewpoints.

2.4.4 Giddens' Theory of Structuration

Within the discipline of Sociology, among others, lies the foundation of many tenants to understanding the process of human communication. Anthony Giddens' (1984) has provided a theory from a sociological perspective which attempts to integrate into a larger explanatory theory those relevant and substantiated portions of social theories within the discipline. The result is a theory which moves beyond the discipline of sociology and has relevance to many other of the social sciences, in particular the study of communication and more generally of the activities of a human system.

Anthony Giddens' theory of structuration might best be called a meta-level theory as he is primarily concerned with the methodological implications of what he calls structuration or an integrated structural and interpretive approach to the study of societies.

Giddens begins with a critique of the dualism of structure. That is, up until now, most social processes have been viewed from either a structural approach, by focusing on social structure and not agents or from an interpretive approach which has a focus on subjective characteristics and sees the agent as interactive, not reactive to structure.

This treatment of agency and structure as a duality is indeed central to Giddens' theory. That is, the structural properties of social systems are at once the medium and the outcome of the practices they recursively organize.

Giddens proposes a duality of structure based on the assumption that structure itself is a medium of social interaction. Given this duality of structure, Giddens asserts that the knowledgeability of humans is bounded on one hand by the unconscious and on the other by unacknowledged or unintended consequences of action. Practical knowledge about permissible variations can lead to unpredictable changes within social systems. An understanding of that knowledge becomes necessary in order to better predict outcomes and further theoretic explanation.

It is this practical knowledge, set at the Kuhn-style fact finding stage of scientific revolution, that is sought in this study.

Giddens' theory has a relevance to Communication studies which could benefit from such an integrative approach. Indeed many of the concepts expressed by Giddens are also, via various interpretations, concepts which are used to explain communication processes. Giddens insists that there is not a dualistic nature to theoretical endeavor as referred to in the structure versus interpretive sociology struggle. This may indeed hold promise to similar notions in a dichotomous view of semiotic versus process schools of thought in communication (Fiske, 1982), which is described in the following section.

Perhaps more integrative approaches to communication theory and methods might be forthcoming from those who might speculate as Giddens has with social structure, on the more complex nature of communication processes. That is, rather than dwell on the differences in viewing communication as a transmission process which affects the behavior or state of mind of a person versus viewing communication as the production and exchange of meanings, perhaps a more integrative approach may provide new insight into the complex nature of communication and may help better explain communication behavior in society.

Giddens himself hints at this in his model of structuration which includes communication as a central concept in the transformational and reproductive processes of social structure as indeed human interaction is central to all social processes.

Giddens' duality of intention vs. reaction is of particular significance in describing telematics policy. As has been eluded to previously, the distinct yet somewhat overlapping areas of intentional development of policy for use of telematics versus the market paradigm of reactionary policy making as the technology is developed and is adopted must be looked at simultaneously. It is the synthesis of the two rather than each taken separately or independently which may provide a more adequate explanation.

2.4.5 Communication Theory and Rogers' Theory of Convergence

One can begin to relate communication theory to the perspective of General Systems Theory, notions of scientific revolution and integrative approaches to theory such as Giddens' Structuration theory as Littlejohn (1989) does in relation to the theory B. Aubrey Fisher (1978) presents in the book <u>Perspectives on human communication</u>. Fisher, emphasizes four aspects of human communication which can be seen as beginning to build various levels of an overall systems theory of communication. These aspects are individual behavior, sequential interactional patterns, content and relationship dimensions and finally communication in the social system. Likewise Chaffee (Berger and Chaffee, 1987) provides a representation of levels of mass media study in an effort to provide a more integrative approach. Chaffee cites studies at theoretical levels from the individual, through interpersonal, networks and macro-social analysis as essential to understand together.

From the various levels approach to the organization of General Systems Theory described above, it can be seen that aspects of theories of individuals and interrelationships among individuals may be singled out for special treatment. Focusing on theories of information and communication including Shannon's (Shannon and Weaver, 1949) concept of information as a measure of uncertainty to the semantic uncertainty in communication processes warrants further investigation toward pulling together the useful interrelated concepts of communication in general.

Cybernetics, attributed to Norbert Weiner (1961), is the science of maintaining order in a system. It deals with the continuous flow of information in a system and not just the discrete messages described by Shannon. Since all systems have a tendency to become disorderly, that is entropic, order must be continually maintained and disorderliness corrected. Therefore, for Weiner, information is the relationship to a system's performance and the feedback necessary to keep the system on course.

Of interest to the study of communication therefore, cybernetics provides a framework from which to discuss the nature of interaction between two or more people in an open system. This view may be particularly appropriate in discussing Rogers' convergence model of communication.

Indicating that new information and the new technologies of communication (telematics) are challenging the view of the communication effects paradigm, Rogers presents a model of communication which he calls convergence. This model is a marked split from the effects models of communication and might indicate a stage that Kuhn would describe as extraordinary science as opposed to normal science at least in terms of the rejection of the notion of the predominant paradigm of communication effects. The convergence model views communication as always concerned with two or more persons. Rogers thus defines communication as a process in which participants create and share information with one another to reach a mutual understanding. This transactional view of communication differs from the more transmissional and behavioristic views of communication as previously discussed. Rogers defines convergence as the tendency for two or more individuals to move toward a point or for one individual to move toward another, and to unite in common interests or focus. In this process, the individuals can also diverge as well as converge. In his model, Rogers sees a participant in a communication process as expressing himself and another participant interpreting that expression and then expressing himself to the first (or other) participants for interpretation and re-expression. This is an iterative process which results in a converging of views to the end of a mutual understanding not unlike how Giddens explains the iterative process of social construction and re-construction.

Rogers' convergence model attempts to combine aroused interaction and information flow in a social psychological domain. He emphasizes the creative aspects of information processing and therefore views communication as an intentional and goal-oriented process. This may be a somewhat weak point with the model as it completely excludes other processes of communication which tend to be reactive as has been noted.

The model however has strength in that it shows communication as a dynamic process because of the uncertainty of information processing and describing mutual understanding as a basic purpose of communication. With the cybernetic implications inherent in Rogers' model, the view that communication is interdependence-oriented and not directional in nature is significant.

Rogers also tries to show an interdependency of relationships in communication processes without utilizing more and more variables of the "effects" empirical approach. He tries instead not to make the mistake of causational study in applying communication to systems theory. This is indeed a strength of his model which indicates perhaps a paradigmatic shift in the study of the nature of communication toward a more purposeful goal-oriented perspective. Rogers however has yet to provide a framework for research which can adequately handle the interpretive processes of mutual interaction which can lead to mutual agreement, understanding and perhaps even defining the social reality of the participants in the communication process.

Nonetheless, Rogers' approach will be useful in contributing to communication research in the next decade as the focus of communication processes revolves around emerging technologies that are interactive in nature rather than of the perceived "one-wayness" of the mass media. Indeed, it may be the goal-oriented use of communication technology which may be driving the epistomological engine of the study of communication to refocus on the transactional nature of communication in a purposive state. With technologies of interaction being put into place, Rogers contends that a unique domain lies ahead for the communication scholar.

2.4.6 Management Science and Organizational Communication

Before turning attention to development communications in general and telematics policy and planning in specific, a look at the management side of the theoretical understanding of organizations as open systems is warranted. The similarities of management sciences' approach to organizations and Giddens' theory of structuration for society in general and Rogers' convergence theory of communication in specific are striking. This is important to understand since it is in part, the organizational operation of telematics which both influences and is influenced by the synthesis of intentional policy-making and market/reactionary policy formulation.

Present day theories of organizations and their design are based primarily on a process paradigm (Conner, 1980). The process view is based on a perspective of how resources, as primary organization process elements, flow through an organization. An organization's success is therefore assessed in terms of many different criteria based on the outcome of processes which are evolving and changing over time. It is from this process view that organizations can be understood as open systems with properties which can be specified and manipulated.

If indeed the theoretic notion of organizations as open systems is correct, then it follows that the organization can be designed such that structures and processes can be specified in terms of optimal combinations of characteristics to achieve desired organizational outcomes.

The process approach of organizational theory and design based on open systems parallels similar thinking in organizational communication. Although, very clearly, a distinction can be immediately drawn on the nature of the primary focus of attention of study. This will be discussed shortly after a brief discussion of organizational communication theory.

From the point of view of organizational communication as a sub-field of communication study, organizations are also considered opens systems, in process, which can be designed, on a continual basis, to produce outcomes (Littlejohn, 1989). Organizations are thus, in sum, communication systems. It is the people in organizations and their relationship with one another and to the environment which in part make up the essence of any organization. Theories of organizational communication are thus descriptions and explanations of organizations from the perspective that organizations are fundamentally composed of communication relationships in process, which are primary to the overall processes of the organization. With communication relationships being primarily concerned with information sharing, communication in organizational communication theory is viewed as the process of organizing itself and explaining structures and functions of organizations. Rogers' Convergence Theory helps explain this if still largely unsubstantiated.

Both organizational management and organizational communication areas of study have begun to evolve to the process approach of organizational study and the view that organizations are open systems with characteristics as described for open systems by Bertalanffy. While the management area has largely studied the elements of the process of organization as it relates to goals and outcomes such as corporate climate and effectiveness (Conner, 1980) organizational communication has focused on the process of organizing itself (Weick, 1974; Poole, 1985) as well as explaining communication processes in organizations (Farace, Monge and Russell, 1977).

As a result, both areas of study have begun to focus on a newer approach to theory and design based on what is loosely being called contingency theory (Conrad, 1985). Again the focus of each area of study can be divided. Elemental design and control such as motivation and performance factors and the management of ambiguity and uncertainty is the focus in management science.

Environments as communication systems and the relation between production, information technology, and communication in organizations is the focus from the organizational communication point of view.

Contingency theory, not unlike convergence theory in communication, makes the assumption that organizations are goal-oriented and operated in purposive state are not simply reacting to their environment. Similar also to convergence theory, contingency theories have yet to be widely substantiated and methods for such efforts are as yet being developed.

2.5 Theoretic Approaches to Communication and Development

2.5.1 Overview

Tied closely to telematics development in the ASEAN region are theories of development itself and communication development. It is from these theoretic perspectives that explanation for development as it has occurred as well as prescription for development have been made to varying degrees of success and failure. No one particular theoretic focus or school has an adequate explanation for communications development and it is perhaps a combination of the more powerful tenants of each in a Giddens-style analysis which can begin to focus attention toward a more integrated theoretic approach capable of broader explanation.

Communications and development policy and planning concepts and methods have taken on varying perspectives in the last several decades which have resulted in changes in direction of theories and models of development and the role of communications in development throughout the world.

Three major schools of thought, as has been suggested by Tehranian (1987), can perhaps be categorized for the purposes of this discussion. These categories should be viewed as approximate and suggestive rather than precise and exhaustive. They are, the liberal/pluralists, Marxist/critical and communitarian schools of thought. Each school of thought has gone through paradigmatic shifts over the past several decades and will be considered in turn.

2.5.2 Empirical/Pluralist Theoretic Approaches

The empirical/pluralist school of thought dominates much of the discussion of communications and development. This perspective can be seen in terms of its shift from an emphasis on mass media and power in the 1940s to the ideas of mass media effects of the 1950s and 1960s. In the 1970s and 1980s, a more systems oriented analysis of the has included technology assessments and articulations of changes in the socio-economic base of society including a shift from an industrial to an information based economy (DeFleur and

Ball-Rokeach, 1982; McQuail, 1984). In terms of development communications on an international level, the empirical/pluralist school has moved from understanding in terms of communication and modernization paradigms of Katz (1955, 1981), Lerner (1958), Schramm (1964, 1977) and others to more systematized approaches of Rogers (1976, 1986) and an investigation of the emerging information societies described by Bell (1973), Machlup (1962, 1980) and Porat (1977).

It is interesting to note that the empirical/pluralist school is centered largely in the United States and its biases and perspectives largely reflect development communications within the social, economic and political structures of the United States.

The empirical/pluralist school focuses its research problems primarily on communications and economic development (Lamberton, 1971; Jussawalla, 1982), political liberty, propaganda and public opinion (Lasswell, 1927, 1979; Lippmann, 1930; Deutsch 1953; Edelman 1967, Meadow, 1980; Shapiro, 1984) the industrial society (Bell 1973,) and mass media (Katz, 1955, 1981; Klapper, 1960;. DeFleur, 1966, 1982; Rogers, 1983). These theories have largely focused on dimensions of professional elitism, theories of the press, diffusion and innovations and have shifted from international perspectives of modernization and the bringing-up of the underdeveloped nations to a focus of attention on the interdependency of nations in the global and largely capitalistic economy as is ever expanding from the spread of transnational corporations largely centered in the Western world and Japan.

The mass media, and later other communication technology developments, are seen as largely autonomous centers of power in the free enterprise, liberal and pluralistic system. Communication technologies are seen as aids to the process of modernization and good for diffusion and political participation in developing countries. There is a tendency from these theoretical perspectives to view technologies of communication as having effects or impacts on other aspects of society including the economy, politics, social structure and cultures. In totalitarian states or even in communist societies, the empirical/pluralist school tends to view these same technologies as performing functions of propaganda and repression.

The empirical/pluralist school uses primarily the methodologies of empirical sciences including surveys, content analysis, experiments and quasi-experimentation modeling, policy analysis and statistical modeling.

The policy consequences of this approach include pluralism of both ideology and culture, the free flow of information, government licensing and regulation of public domain communications and the dominance of private enterprise in a system of mixed government, community, public and commercial constituencies. The focus of media and information policies tend toward social responsibility and various doctrines of fairness, rights of access, and privacy. It is from this perspective that technologies of communication produce effects or have impacts. Therefore, policy is formulated as a reaction to those impacts or predicted effects.

It is precisely, however, the tendency of this school of thought to provide policy explanation based on past reaction rather than a proactive policy stance to guide action based on innovative technology and its diffusion which leads it to be a less than adequate explanation of communication and development require one to look still further in terms of understanding complex systems such as telematics development.

2.5.3 Critical Approaches

The Marxist/critical or interpretive school of thought has largely based its analyses of development communication on class struggle for change and views communication technologies as ideological tools. This school of thought tends to perceive theoretical understanding and practical application of communication for development in terms of its ideological underpinnings. Curran (1979), Goulding (1979), Smythe (1980), Dan Schiller (1982), Herbert Schiller (1981, 1985), Gurevitch, et.al. (1982), Mosco (1982), Hamelink (1983) and Collins (1986) are more recent examples of scholars who take a more critical or interpretive view of communication and development.

Over the past several decades, the Marxist/critical school has shifted its focus of attention from problems of the mass media and mass communication development in the world to a broader look at the ideological conceptions of post-industrial societies and the globalization of capitalistic interests including the use of newer communication technologies to achieve various purposes. Originally, media studies in the Marxist/critical paradigm focused on ideological dimensions of how the process works and what its mechanisms are including the classical look at who owns and controls the means of production (largely of the mass media) and to what consequences (Curran, 1979, Gurevitch, 1982). The explanations of media roles in the development of societies were broadly based and utilized critical, economic, cultural, and world system dynamics analyses. Problems also focused on the dynamics of capitalism as well as center to periphery development and dependency schemes (Smythe, 1980, Hamelink, 1983).

More recently, however, the critical school has shifted its attention to the discussion of the implications of the change from industrial to information societies and a critique of the conception of the post-industrial society on ideological grounds (Schiller, 1981, 1985). The critical school challenges the notions that information is replacing industrial goods as the basis to the economic structure and is the principle commodity of the information age. This school asserts that the information society is but an intensification and extension of industrial capitalism and that the dominant ideology of the post-industrial society is self-selling within the structure of a privatized economy (Slack and Fejes, 1987). The critical school also sees optimistic presentations of communications and development as naive and short-sighted and that a new society of the future is a mere fantasy (Mosco, 1982). The argument is for an analysis along traditional Marxist schemes of understanding ownership and control of communications technologies and industries.

Policy consequences of the Marxist/critical school involve strategies for development along principles of equality and high mobilization, that there should be social ownership of the means of production including communications and the rational allocation of resources through planning (Tehranian, 1987). Communications policies therefore tend toward public (government) ownership of the means of communication and the Marxist-style rhetoric of the dictatorship of the proletariat in ideological production. Policy is seen as democratically centralized and cultural autonomy for nationals is emphasized. From this perspective however, a more proactive planning process can begin to develop. While one may argue the pertinence and utility of specific critical arguments, the view that policy can be formulated and planning activities devised which purposefully utilize communication and communication technologies for development purposes can be seen. This is in distinction to, but not entirely separate from the empirical/pluralist reactionary policy view. It is perhaps essential in the spirit of the preceding sections on integrated approaches to communication theory that an integration of the empirical/pluralist and Marxist/critical development policy approach may be indicated. This integration can be seen in part from the communitarian perspective described next.

Nonetheless, both the empirical/pluralist and Marxist/critical schools of thought tend to fail in their ability to understand development and the role of communication in development from the specific point of view of the developing nation itself. It is the contention of this study and the focus of the method for developing a base-line data taxonomy as a tool useful to policy makers in the ASEAN region as a means of instituting proactive regional policy and planning, that the point of view of the nations in question themselves must be considered on an equal footing.

2.5.4 Communitarian Approaches

A third school of thought includes a developing world's perspective on development whose scholars have been alternately labeled and mislabeled humanists, pacifists and naturalists. For want of better a categorization, the term communitarian will be used to describe this theoretical approach (Tehranian, 1987). Notwithstanding any labeling, development from this perspective is focused on the harmonious development of human potential in community and nature. This is in sharp contrast to the empirical/pluralist and Marxist/critical schools of thought were control over the environment and even future control through planning is sought in either reactive or proactive forms. Nonetheless, participants of the two previous schools of thought do overlap into the communitarian perspective.

The paradigms of thought on development and communication are complex and not so clearly drawn in the communitarian school. The radical pacifists such as Ghandi have given way to liberationists such as Nyerere (1971) and Freire (1972). In the so-called first world, counter-culture ideas have come from Schumacher (1973) among others. and in overlapping perspectives, Goulding (1979) while still others have espoused more international communal globalization via communications development (Innis, 1951 and McLuhen, 1964).

The foci of problems of this school of thought is as diverse as its participants. Problems of dehumanization, peace and non-violence, civil disobedience, psychological decolonization, and the appropriateness of technology are all included. This school also focuses on problems of self-sufficiency and endogenous development and looks to processes of access, participation and self-determination.

In the 1960s and 1970s, problems tended to focus on transborder information flows including the "imperialistic" domination of Western media (O'Brian, 1979). These issues are still important but a shift of focus has occurred in looking more at the autonomous development of developing nations and peoples in the larger context of internationalization of the means of communications (Rogers, 1976; Tehranian, 1990). Whether interdependency in an information age is just another means of oppression or domination by Western capitalism or whether developing nations should follow a course of dissociation and self-sufficiency (Hamelink, 1983) in order to preserve cultural identity and control of development is now the primary concern of the communitarian. This perhaps is not so much of a dilemma to solve as it is the view to act locally in a global context.

The methodologies of the communitarian school are those of experimentation in the empirical sense and critical analyses in the Marxist sense but with the assumptions of the developing world's perspectives rather than the First World's assumptions. Philosophical, historical, political, economic and sociological descriptive analyses, however, are the primary methodological tools of this school of thought.

The consequences for development and communication policy from this school's perspective include placing high value on fraternity and integration strategies of development. Community and social solidarity are called for and the means of communication should be utilized for these ends. Hence, policies should be goal-oriented. Media policies should focus on community access and participation, cooperation, self-sufficiency and appropriate use of technology. This approach is perhaps best characterized as a locally pragmatic approach within the context of a given society. Communication policies within the communitarian perspective also include the notion of participatory interaction and planning (Webster, 1975; Tehranian, 1982).

It is indeed the focus of the communitarian approach to communication development which may hold promise for understanding the complex problems of development and development communications as this approach begins to integrate tenants of the previous two and adds the notion of the need for participation from the countries themselves.

In terms of the development of telematics in the ASEAN region, it is clear that an integrated approach to study is necessary if for no other reason than to avoid the pitfalls of a particular school of thought and its lack of sufficient scope of explanation.

2.5.5 Development and the Relevance of the Theoretic Perspectives

It is difficult in this relative plethora of perspectives and models to attempt to make a consideration of what is more relevant for communication and development problems today. Obviously, we must make our choices for preference based on the notions of a particular perspective which whether consciously or not will affect what we consider useful or which will best serve our needs and desires. One however, cannot condone the imposition of one particular school of thought over another. None of the approaches and models have a lock on appropriateness for all situations. Rather, it is perhaps more important that researchers and scholars are well informed of each others' particular perspectives and biases in order to better relate our own views and often unconscious biases. The argument of many developing nations is valid wherein First World domination in the means of communications and the application of technologies for development does not take into consideration the people and their needs and desires in the developing nations. Unfortunately, the practice of ever expanding capitalistic venture of global communications often overlooks this point and ends up with a policy that freedom is for those who agree with capitalization and the inevitability of the information age (Tehranian, 1990).

As scholars and researchers, therefore, it seems that we must consider, in light of other perspectives, our own actions and thought processes in order to better understand if not solve, the complex issues of development and communications.

According to Rogers (1976), during the early 1970s an intense re-evaluation of the role of communication and development began. In part as a reaction to feedback from the Third World (communitarian perspective) and partly as a result of failed policies, the role of communication and development processes from both liberal and critical perspectives were in need of serious attention.

The definition of development centered around the criterion of economic growth and industrialization was seen as the main route to development. Based on experiences of the Western world and Japan, lesser developed countries (LDCs) were advised by development planners to industrialize with the goal being to become like developed countries. Since the developed countries had technologies, the implication was to introduce that technology to the LDCs which would lead them to becoming relatively more developed.

It was assumed, incorrectly, that appropriate internal social development would follow the externally introduced technology (Rogers, 1976).

With underdevelopment seen as being due to internal and not external causes, modernization of traditional individuals became the task of some governments utilizing the means of technology-based communications including the mass media and broadcasting as well as telecommunications. Even the critical view of development for the Third World had this internal bias to the problem of underdevelopment. Burris (1981) claims the reason for underdevelopment as viewed through the 1960s and early 1970s lay in the persistence of outmoded feudal economies which must be eliminated to pave the way eventually for the struggle toward socialism. However, a pre-occupation with the elimination of the feudal economies ignored the determinant role of international capital perpetuating conditions for underdevelopment and indefinitely postponing the formulation of socialist objectives. The Marxist/critical view shifted toward one of looking at development as a problem of dependency (Smythe, 1980) but even this explanation ignored the complex internal structure of the developing countries.

An attempt is being made more recently by the structuralist of the critical school to distinguish between modes of production and social relations within the formation of social classes. It is not simply a case of making a transistion from feudal to growth modes of production as was seen previously (Schiller 1985).

A new paradigm for development within the empirical/pluralist school began to emerge in the late 1970s and has characterized much of western dominated development thought throughout the 1980s. This paradigm views development in terms of equality of distribution of information and socio-economic benefits. Villagers and the urban poor were seen as the priority audience for development programs and closing socio-economic gaps by bringing up lagging sectors was sought. The issue of development thus changed to the view that popular participation in self-development planning and execution would accompany decentralized development activities. Rogers' (1976) definition of development as a widely participatory process of social change in a society, intended to bring about both social and material advancement for the majority of the people, has held as the dominant definition within the empirical/pluralist school throughout the 1980s.

However, the continual persistence of the Marxist/critical school to look at ownership and control has helped show some of the failings of development from the empirical perspective. In terms of telematics development, the telecommunication, broadcast and information systems of developing and developed countries have been largely government owned and controlled. While the United States is the notable exception and trends worldwide are beginning to usher in moves toward deregulation and privatization elsewhere (as will be discussed subsequently), the means of technology-based communication remains in the control of the few and can hardly be classified as popular-based participatory development. Even in the United States, where communications are largely privately owned, Schiller (1982) advances the thesis that it is a small group of business users who are demanding advanced telematics services. It is business that has garnered policymaker's (government) support so as to enhance private control over telematics technologies, their applications and therefore control of the United States economy and society. Schiller implies that it is private business considerations which have effectively created the government policies and regulations in telematics with government as simply a reactionary policymaker. This view however, grossly discounts the ability of policymakers to develop goal-oriented policy for social, political and economic development of telematics. The break-up of AT&T in the United States is perhaps the most striking example.

It is perhaps in this vein, that a new shift, into the 1990s, in communications paradigms for development will have to be recognized although it is unclear at this point what that will be. The very issue of development as a First

World defined priority for the Third World may simply be the wrong issue to confront. Global interdependencies are making national borders more and more obsolete despite nationalist efforts to consolidate them. Interdependent perspectives of communications and development in the world will mean that more interdependent and integrated theory will need to be constructed which may help better explain the complexity of human endeavor.

Of relevance to this study then is the idea that an integrated approach to problem-solving is necessary if more adequate solutions are to be found. It is in this spirit then that a description of telematics in the ASEAN region is offered which takes into consideration the multiplicity of theoretic perspectives which might motivate the acquisition of information to provide a comprehensive description. It is also the interdependent nature of policy and planning efforts such as the development of regional data taxonomy which require more comprehensive input for decision making in determining action to achieve development goals as espoused by each country and the region as a whole.

2.6 Telematics Policy and Planning

Perhaps it is Harold Lasswell, as is later developed by Wilbur Schramm (1964), who may be credited with developing a focus on studying communication policy and planning for development. Concerned with the issues of mass media and in particular broadcasting in national development, Schramm begins to crystalize the problem-oriented nature of communication and development and the necessity of a broad perspective. Schramm saw that mass communication might be used to push economic and social development forward and hence communication policy and planning ought to be thought of as goal-directed and intentional rather than as a reaction to the market use of technology.

From Schramm's perspective, Hancock (1978, 1981) presents a framework of communication planning for development in which the assumption is made that planning is initiated by some perception of a need for change. This framework is not intended to present any theory or methods and techniques of communication planning. Indeed, in response to the complex nature of this more problem-oriented subject, Hancock simply provides a framework which categorizes relevant communication activities and their interrelationships.

Without specific theoretic guidelines, a systems approach to communication planning for development evolves as the framework is explained. While focused specifically on operational planning design, Hancock endeavors to formulate parameters of planning which integrates a system view rather than a prescriptive model of how to plan as might be developed and tested from a particular theoretic perspective. The implication is that a wide perspective on operational communication planning, while lacking perhaps some initial depth, may provide a basis from which specific planning and policy tools can be molded to meet specific situations. If a specific theoretic foundation can be derived from that exercise, then, a complex formulation of a systems analysis would most likely result.

Since Hancock's initial framework, however, scant progress has been made in developing such a theoretic foundation other than in the limited areas that have been discussed in the previous sections. This should not be surprising, however, due to the complexity of the issue. Few researchers have both the knowledge and tools to deal with a multi-disciplinary or even an interdisciplinary approach to the problem. At best, perhaps we can build incrementally on a systems approach, which through multiple efforts will point to new ideas which can produce the kind of theoretic revolution suggested by Kuhn to advance science. As a postscript, Hancock states, "Group analysis, from the point of view of a number of disciplines and professions, would afford the best approach." (Hancock, 1978, p. 50).

Central to Hancock's framework is the interrelationship of a number of information sources for policy formulation which can lead to planning choices and evaluation of those choices. A description of the communications environment is therefore critical. Such a description needs to include economic, social, cultural, political and technical factors, institutions and structures of communication as well as their relationship to other policy environments including education, among others. However, the means by which to gather and organize this information is not discussed by Hancock.

Hancock (1981) has also contributed a widely acknowledged definition for communication planning which Middleton (1985) simply re-states as the "conscious effort to adapt a system to its environment in order to achieve system goals" (Middleton and Wedemeyer [eds.], 1985,p. 41). The planning process according to Middleton therefore must include analysis, strategy, decision, action and learning in order to focus key environmental system factors of resource needs, relationships to other systems, values and social image. Thus, Middleton sees communication and development planning as a system which "establishes an adoption strategy through which resources are acquired in return for achieving goals" (Middleton, 1985, p. 71).

It would appear that the multi-disciplinary nature of communications and development cannot be over-stressed. One cannot neglect for instance, the role of economic conditions in development and the development of communication systems. Nor can one simply ignore the politics of communications and development, which may have consequences for policy and planning that cannot be explained by rational economics. Both subjects, and others, are therefore important.

Until recently, the economics of communication was scarcely recognized, although, the economic role information plays has become the subject of a large body of literature (Lamberton, 1971). Neo-classical economic theory generally assumes that accurate and complete information relevant to market conditions and production techniques is available to all system participants. Given the obvious lack of realism of this assumption, many economists have examined various conditions about which less-than-perfect information is available and their impact on production and economic efficiency (Jussawalla and Lamberton, 1984). Also, from this perspective, an argument is sometimes made for the free flow of information and ideas as essential to effective production, as well as beneficial to social development and individual opportunities (Coates, 1973).

However, the free flow of information is also a political and social issue. Unlike explanations in which productivity and economic gain are explained by the various roles of communications and information, the political control and manipulation of communication resources may well dictate the structures and functions of communications in a particular society, overriding many economic factors. Simply put, how telecommunications, broadcast systems and information networks are developed in a particular country may not find its complete explanation in economics and the forces of degrees of free markets of information and trade, but rather in politics and especially the politics of prestige. The decision to set up a satellite system such as the Palapa system in Indonesia for example, has as much to do with political and socio-cultural priorities as it does with economics and demands for such telecommunication services (Alfian and Chu, 1981).

It appears then, that a multi-disciplinary description of a system is a necessary pre-requisite for goal-oriented, intentional policy and planning. This study therefore endeavors to provide a description of the telematics environment for the ASEAN countries heretofore unavailable. It is presented in order to understand the nature of that environment and carry us to the next step of purposeful data gathering through the construction of a data taxonomy scheme for the system which can be used as a tool for policy development and planning decisions.

CHAPTER III

METHODS

3.1 Introduction

There is a deliberate attempt in this study to begin to integrate the various theoretical perspectives in terms of the choice of methods for the study of telematics in the ASEAN region. The results of the applications of the methods described in this chapter appear in Chapter IV and Chapter V. Chapter IV is a descriptive analysis of telematics policy, infrastructure development and investment in the ASEAN countries which is mindful of liberal, critical and communitarian theoretic perspectives. Empirical economic, social, cultural and technical descriptors are provided along with a critical analysis of the means and control of telematics. In addition, development of telematics from the perspective of key policy makers in the ASEAN countries themselves is included.

The development of a base-line data taxonomy, as described in Chapter V, for the collection of relevant information on telematics infrastructure and investment useful for telematics policy and planning across the nations of the ASEAN, takes into account both a reactive and proactive stance to policy and planning from both liberal and critical perspectives. Communitarian input to the process of developing the data taxonomy is taken into account by enlisting a perspective from the countries themselves through a selected survey of key policy makers in telematics policy in four of the six ASEAN countries and feedback from authorities in two countries in the actual application of the data taxonomy.

It is perhaps too difficult a task to undertake here to describe all of the methods of telematics research from the perspectives of economics, sociology, psychology, political science, business applications, technical sciences development and many, many others. From a particular theoretic view, many valid and reliable methods of study exist. Indeed, it may also be presumptuous at this stage to speak of a methodology for telematics research given its complex nature as an multi-disciplinary concern. Rather, in this chapter, a critical review of the methods of research of just one particular area of telematics, namely, the social-psychology of telecommunication is presented. The intention is not to be exhaustive in understanding the methods of this particular disciplinary focus, but rather to present a mosaic of various means by which it is possible to understand telematics and the problems and limits of such undertakings. It is indeed the limits of such a disciplinary view of the largely empirical/pluralist theoretic perspective of social-psychology that helps point toward a more interdisciplinary effort and more broadly focused methods. One could choose equally to describe the methods of economics, such a cost-benefit analysis, in regards to telematics or the particular methods of any other disciplinary focus on telematics. The result would be similar, however. The limitations and problems of more narrowly focused methods point to the possibility and promise of a more broadly focused endeavor. A broader multi-disciplinary or even interdisciplinary view is not of course without its own problems, including the circular arguments of scope in terms of breath versus depth. Given the current depth of understanding of telematics that is evident from the social-psychological disciplinary view presented here as an example, this study chooses to take a broader view. The idea is not to undercut disciplinary depth, deliberately or otherwise, but, to add some much needed breadth.

In this chapter also, methods of communication planning are explored. These methods have evolved largely from the view of the operational framework of communication planning for development described in the previous chapter (Hancock, 1979, 1981).

From this finally, descriptions and justifications of the methods used for this study are presented.

3.2 A Critical Review of the Methods of Research in the Social-Psychology of Telecommunications

3.2.1 Overview

The study of the social and psychological effects of telecommunications has been given extensive attention in recent years. With a plethora of new telecommunication devices being designed, tested and marketed, person-to-person communication can no longer be considered only on the basis of face-to-face interaction. This section is concerned with critically reviewing the methods of the research investigating the social-psychology of telecommunications or, more specifically, how telecommunication technology has impacted on human communication behavior.

Largely motivated by Gratification Theory in communication (Katz,et.al, 1973; Galloway and Meek, 1981) and numerous social-psychological theories including but not limited to Symbolic Interaction (Mead, 1934; Blumer, 1969; Kuhn, 1964), research on the impact of telecommunication technologies on human communication behavior has been an area of interest to researchers for more than three decades. Therefore, the critical examination of the research methods used in the examples of research cited in this section will attempt to take into account the varied theoretical perspectives upon which the research is based. This includes an examination not only of the validity and reliability of the various methods used to answer research questions in the area of the impact of telecommunications technologies on human communication behavior, but also the scope and ability of the various methodologies to adequately answer research questions within a particular theoretical perspective and beyond to a more interdisciplinary view.

One area of research which has focused on the impact of telecommunication technology on human communication behavior has been predicated on the Telecommunications Impact Model first described by Reid (1971). This model has four stages dealing with the amount, type allocation, mode allocation and locational change impacts of telecommunications. This model was perceived as being useful in predicting the impact of new forms of telecommunications in a variety of social settings. The methods of research in this area have largely been field surveys and controlled laboratory experiments. Critiques of these methods have often been focused on the generalizability of the controlled experiments and their adequacy to explain complex human behavior (Short, 1976).

A second and related area of research into the impact of telecommunication technology on human communication behavior has been characterized by Williams (1987) as technological concerns related to interpersonal, group and organizational communication. For example, Williams describes how various technologies enable us to extend our personal communication behaviors and their importance in the use of communication for social ends. An example of research in this area is the focus on interpersonal gratification of telephone use. Again, survey and controlled experiment research methods are prominent in this area, but also, case study methods have provided insight as well as their own limitations to answering questions of telecommunications impacts.

This section will provide examples of research in both areas and discuss the methods used to answer the questions posed by researchers of how technology impacts on human communication behavior. The examples are meant to be more illustrative than representative, although many are typical of the methods used.

3.2.2 Telecommunications Impact Model

There have been numerous studies which explore the effects of performance of various kinds of tasks when the link between participants is varied. In the 1960's and early 1970's, research focused to varying degrees on the question of what sort of tasks have been found, experimentally, to be sensitive to various communication media as well as the nature of that sensitivity. Research in this area has focused on the effects of the presence of others (Bergum and Lehr, 1963; Zajonc, 1965), conformity and anonymity (Blake and Mouton, 1961), media differences (Cooke and Lalljee, 1972), information transmissions (Champness and Reid, 1970), attitude change (McGuire, 1969; Wall and Boyd, 1971; Lang and Lang, 1981) and problem solving (Champness and Reid, 1970).

The method of all of these researchers has been the controlled laboratory experiment in which tasks or sets of related tasks were performed by the participants in various tele-mediated environments. Often these environments are compared with face-to-face settings as a control group. The experimental group often involves the telephone as the telecommunication link between participants. The researcher assesses in nearly all of these cases the success of task completion and makes a theoretical "leap of faith" that such assessment is a measure of the sensitivity of the medium of communication.

Although easily criticized for the lack of generalizability, the method of controlling the environment in which a task is accomplished has helped factor out many of the complicating factors of human interaction in order to get a better look at the effect (albeit partial) of the communication mode on the participants behavior. The method of the experiment, however, has meant a cautious interpretation of the results by many (Short, 1976). Nonetheless, it has had a significant influence on the shaping of social psychological theory in telecommunications.

A related and often overlapping area to the sensitivity studies is research focusing on conflict and conflict resolution in tele-mediated environments. From the perspective of sociological conflict theory (Coser, 1956; Darhendorf, 1968) it is assumed in many of the studies dealing with conflict and various mediums of communication that the negotiation situation is one which might be particularly sensitive to the communication mode utilized. The methods of investigation for many such studies have been simulations of a conflict situation and role-playing, often involving the use of the Prisoner's Dilemma game (Wichman, 1970; Laplant, 1971) or a zero-sum game (Dorris, Gentry and Kelley, 1972). Comparisons are then made on the degree of cooperation of participants across various communication channels. Morley and Stephenson (1969 and 1970) used a simulation design experiment in which relevant variations of the medium of communication were applied to realistic tasks. This often cited experiment points to the reservations of the conclusions made based on experimental simulation methods. The difficulties arise in the interpretation of the term 'stronger' effects in terms of failures to reach an agreement or favorability of outcomes in the various tele-mediated environments.

Important implications for the methodology of laboratory studies of negotiation and conflict in tele-mediated environments are evident (Short, 1976). In the Morley and Stephenson studies, adding in the realism of industrial disputes is made at the expense of control of the experiment. Ideological differences of the negotiating parties are not considered and differences are attributed to differences in the communication medium between parties. Also, pre-existing relationships are not considered which may have an influence on the outcome despite the communication channel of the negotiation. Thus, while these experiments add a dimension of realism by using real industrial disputes, the lack of control of many intervening and complicating factors necessarily limits the strength of the reported results. While well controlled experiments can factor real world situations into parts, such as the particular complication of role-playing in simulation, they simultaneously leave out real world relationships and attitudes which necessarily cast doubts as to the strength of the results reported. It thus has been a frustrating experience for many researchers who are inevitably caught with a set of methods which can only help partially answer their complex research questions.

In an attempt to address the methodological difficulties discussed, several further studies in this area make use of multiple factor analyses in order to determine more precisely the contribution of the communication medium to human communication behavior in the conflict and negotiation situations (Short, 1974). In the Short studies, comparisons were made between face-to-face, video, and audio mediated negotiations and the degree of opinion change of the participants. These studies attempt to factor in conditions of pre-existing attitudes and relationships among the participants and make comparisons across various communication mediated environments. Although the method used meant more precise data on main and interaction effects of the experimental variables, the method itself has theoretic implications which limit somewhat the interpretation of the results. The question of whether the effect of the medium of communication can be measured by interpretation of opinion change (often short-term) is side-stepped. It is again the method of the experimental simulation which nearly forces such assumptions to be made. The experimental method is ill-equipped to deal with change processes which generally occur over long periods of time and are a result not so much of causation of factors but a multiplicity of relational influences. This tendancy is indicative of correlational studies on a macro-level between operationalizations of telecommunications development and Gross Domestic Product, GDP, for example as will be explained in section 3.3.

As a simplification of real-world settings, the experiment may be more misleading in terms of the reliability of the results describing the effects of the communication medium in various settings than it is helpful to understanding. In an attempt to overcome some of the shortcomings of the laboratory experiment, various interview studies and experimental research tecchniques incorporating questionnaire ratings have been conducted.

After subjecting participants to various tele-mediated environments, researchers have asked participants to evaluate the communication medium used and make judgement ratings as to the factors of the pleasantness or unpleasantness, friendliness or unfriendliness etc., of the various media (Williams, 1987). The focus of the methods of having participants rate the effectiveness of various telecommunication media on their interaction has added much needed insight beyond the purely experimental design of the telecommunication medium's impact.

One noteworthy example in which an experiment has incorporated participant ratings, points to the advantages and disadvantages of such a research method and its theoretic implications. Williams (1975) investigated the effects of various telecommunication media on the formation of evaluative feelings between equals. Pairs of individuals interacted across a particular communication channel and were subsequently asked to evaluate the effectiveness of that channel as well as rate their feelings toward the other as a result of the interaction. The results of this method of investigation brought forth a large array of explanatory factors hitherto unaccounted for in previous research. Unfortunately, numerous weaknesses are also evident which has largely limited the scope of the findings.

For example, much of this type of research, including the Williams study, makes use of Likert-like scales to measure attitudes. These scales, as is often argued in the social-psychology methods literature (Kidder, 1981) assume many times that the subject has some sort of organized predisposition to begin with. This is often simply not the case. The measurement technique often obscures the different components of attitudes and makes no attempt to measure behavior although results of attitude predisposition are often and mistakenly imputed to affect behavior (Williams, 1987).

The problems inherent in measuring attitudes on Likert-like scales, self report biases and demand characteristics have necessarily restricted the interpretation of results from this method. Nonetheless, the added dimension of participant rating in the experimental design has proven useful in understanding some more complex factors involved in human communication behavior across various communication channels and environments.

The focus on user response to the communication medium has led research through the mid 1970's to investigate more thoroughly the decision to use various channels of communication.

Christie and Holloway (1975) conducted an experiment in which subjects took part in simulated business meetings using one of five different teleconference systems. Subjects were randomly assigned to groups and participated in a hypothetical meeting using a particular teleconference system. Subjects were then asked to fill out questionnaires asking for their opinions of the system they used as well as how the use of the system might affect their acquaintance with others, travel habits and telecommunication choices. Although rigorously constructed and internally valid, the experimental nature of the research leads to problems in external validity typical of similar studies. That is, questioning subject's opinions to equate with possible behavior responses to telecommunication systems over the long run cannot simply be measured in a laboratory administered questionnaire. How people behave will not be a direct function of an opinion expressed shortly after a controlled exposure to a particular stimuli. This is analogous to the more general criticisms of operant conditioning in psychological research which takes into account little of the complexity and continuity of the participants environment and multiple stimuli and circumstances (Williams, 1987). In the Christie and Holloway (1975) study, the particular criticism of using questions related to the satisfactoriness of a teleconference system to make implications of an actual decision to telecommunicate or to travel is an example of the measurement used in an investigation not being well adapted to the research question. One must be somewhat skeptical of the interpretation of a result that simply being satisfied with a teleconferencing situation would imply that a decision to telecommunicate rather than to travel would result. Such an interpretation leaves out some more obviously simple questions as to the economics of both.

The question of the effectiveness of a teleconference as compared with face-to-face meetings was initially reported as dependent on how visual the meeting was (Short, 1976). Often experiments investigating these types of questions were conducted along lines of a single variable control analysis when in fact multiple variable conditions were evident. Many of these experiments simple "threw the baby out with the bath water" in their attempt to single out a particular variable as explanatory of a system's effectiveness. Due in part to a problem of the pragmatics involved in obtaining, organizing and manipulating the multiple samples of sufficient size necessary to conduct more complex investigations using multiple independent and dependent variables, often little more than two by two analysis of variance was used as an all encompassing explanation of a phenomenon. Again, although rigorously applied as an experimental design, the appropriateness of the experiment method to the complex research question remains problematic. Problems of accessibility, cost, familiarity, and ease of use among others more often compound the question of teleconference effectiveness than a simple comparison of the visualness of a teleconference with an audio-conference or face-to-face meetings.

It should not be surprising therefore, that the methods of investigation of much of the research into the social psychology of telecommunications through the 1970's took the form of the experiment and attitude questionnaires as these were precisely the tools of traditional study of social-psychological phenomena. Furthermore, the approach of the Telecommunications Impact Model was to assume that measurable effects could be validly hypothesized and investigated and that the effects of telecommunication technology were operationally measurable as well. The shortcomings of this approach to be even reasonably predictive of communication behavior has turned research to new directions using a methodology which attempts to better operationalize the theoretic problems.

3.2.3 Case Studies of Technology Effects

The logic of the Telecommunications Impact Model was basically that of substitution. That is, it was presumed that telecommunications systems would substitute as the medium for communication instead of face-to-face meetings. It became increasingly clear, however, that new electronic systems would be used for applications to fulfill needs which may not have occurred before the systems existed. Therefore, perhaps more important than the study of effects of a system, when used as a replacement for face-to-face communication on a micro-level, is the study of the effects of new applications of systems on communication behavior in general.

In part due to the failure of research focused around the Telecommunications Impact Model to forecast more general impacts of electronic systems and the lack of use of methods more appropriate to the forecasting task, attention in the late 1970's turned toward developing theoretic models which took into account such factors as the rate and extent of change so that planning could be more effective. Before turning to studies focusing on the implementation of telecommunications, several studies investigating the effects of telecommunications technology in terms of promoting change are worth noting.

Many studies which have focused in general on the change process in organizations due to the introduction of new technologies have made use of the case study method of investigation. For example, Johansen, De Grasse and Wilson (1978) studied the effects of computer conferencing on working patterns of groups in a number of organizations including NASA. The case study method, which employed participant and non-participant observation, questionnaires and automated data collection on use of telecommunications equipment resulted in a wide ranging set of findings on the communication behavior of individuals and groups within the specific organizations studied.

The case study approach is useful in understanding what effects the technology produces directly and how the technology moderates the effects of other variables (Christie, 1981). Unfortunately, in terms of introducing change, this after-the-fact approach of studying the effects of technology may not be altogether useful to the manager concerned with introducing change and going about it in the most effective way possible, that is, affecting proactive rather than reactive policy. The problem of generalizability of the case study approach is also a concern where results of a study of one particular organization are applied to the evaluation of the likely impacts of new systems in another organization. While the results may be useful in terms of not actually having to introduce new technology in order to discover what possible impacts it will have, it should not be assumed that the particular impacts of the technology on the 'guinea-pig' organization studied will be similar in the new situation. Similarly, this method of investigation may not result in significant findings as to the factors involved in the technology implementation process which could influence the success of the changes being promoted. This is because of the focus on adoption as an event rather than as a process as suggested by Rogers (1983).

Nonetheless, the case study approach has been used with considerable success in the understanding of organizational development where change in the communication behavior over time due to the introduction of telecommunications systems can be evaluated. In the medical field for example, Abrams (1975) studied the use of a computer communication systems among doctors in England who were using real-time, on-line computer systems in their offices. The case study method allowed for an evaluation of the system which had been in place for about a year and implied suggestions for implementations of similar systems in similar contexts in the future.

Despite the problems of the generalizability of an individual case study, the multiplicity of case studies in this area offers an opportunity for meta-analysis where a summerization of the findings of many studies may provide clues to more general conclusions about the impacts of telecommunication systems on organizations. Johansen, De Grasse and Wilson (1978) did just this with respect to the four organizations they studied and were able to pull out several conclusions about pre-requisites for organizational acceptance of new technologies. Likewise, Dordick and Goldman (1978) found factors which they felt influence acceptance of telecommunications technologies on organizations by analyzing the common elements of a number of case study examples. Perhaps the most well known of this type of meta-level analysis in the field of communication can be seen in Rogers (1983) Diffusion of Innovations which reviews scores of case studies and formulates a broader theory of the communication processes in the adoption of innovations.

The case study approach to the investigation of technology impacts on human communication behavior has been driven, in part, as well as shaped by the models of expectancy-value and conflict-harmony within an organization

(Christie, 1981). Understanding a certain resistance to change from these social-psychological models, predicated on gestalt psychology and the assumed ordering of reality that individuals engage in, has lead researchers to investigate effects of technologies assuming the inherent conflicts involved in change processes. Indeed, the principles of social influence including such understandings as that of group dynamics, are often assumed in the case study method for the introduction of change in an organization. Therein lies a major strength of the case study method.

3.2.4 Implementation Research

In an attempt to expand the case study method of investigating telecommunication impacts on human communication behavior, more recent research has focused on the implementation of telecommunications technologies in organizations. This includes but is not limited to research on the implementation of word processing systems, electronic mail, electronic funds transfer systems, teleconferencing and management information systems.

It is often agreed by managers and evaluators of telecommunications technology alike, that the process of implementing the technology is typically one of the most crucial factors affecting successful use (Williams, 1987).

That is, a focus on getting people to use a new technology and not necessarily focusing on the technology itself, is the critical challenge. As a consequence, studies of the implementation process have grown in importance and number.

The methods employed in implementation studies also include experimentation, case studies and evaluation based on observation. Many of the strengths and weakness of these methods have already been discussed.

However, a number of studies have used survey methods, a technique which is arguably more appropriate to research questions of implementation impacts. It is presumed in the survey method that the user, most notably managers and workers, can provide, when furnished with well conceptualized questions, answers directly relating to the implementation of technology on an individual level as well as provide individual perspective to the broader scale implementation of technology in the environment in which they work. It is then often assumed that an aggregate of answers will provide a conceptual picture of the implementation process.

Of particular note is the recent Johnson and Rice (1987) investigation of the adoption of word processing in different office environments. The researchers used the method of the telephone survey to interview nearly 200 organizations which have been using the technology for at least two years. In a second phase, the researchers conducted 60 site visits which included interviews with managers and users. Based on the technology needs and uses perspective, the researchers used the method of interviewing on the telephone and in-person to seek answers to questions of inter-organization variability of technology use and determine the processes of technology adaptation for prediction.

In part due to the large sample size in the Johnson and Rice study, the survey method of investigation has been seen as especially effective for understanding and predicting adoption processes in organizations (Williams, 1987). In this study, the strength of the survey research methods is in its potential for handling external validity. Although the interpretive nature of classifying answers of open-ended questions can be argued as problematic and may lead to internal validity problems when attempting to explain causation, other methods of research are even less suited to naturally occurring variables which are not readily assignable or manipulable (Kidder, 1981).

The success of the survey/interview process to take into account the complexity of factors involved in the implementation of technologies is particularly appropriate from the perspective of predicting adoption as the results of this investigation have generally concurred with Rogers

(1983) well accepted general five-stage model of adoption processes.

Indeed, it is the ability of the open interview survey method, despite its limitations, to more adequately handle some of the complex questions of telecommunications implementation and the apparent policy implications, that may make it a particularly suitable base from which to conduct an investigation across a number of different entities.

3.2.5 Summary

What do we know about the social-psychology of telecommunications and more specifically the impact of technologies on human communication behavior?
The answer to that within the scope of this section is vague given the problematic nature of the methods of investigation used to understand complex social and psychological processes. Often the methods of investigation, based on theoretic notions of user gratifications and symbolic interaction among others, have not been able to fully address the significance of technology impacts. Perhaps this is due to the more post-hoc nature of the methods of research in general. The presumption is that the results of methods which help explain what has occurred can be applied

to predict what will occur. Prediction of this nature is, of course, far from foolproof.

Of interest is the success of large scale survey methods to begin to adequately answer research questions of technology implementation. In part due to the shortcomings of the other described methods of research to completely answer the research questions of the Telecommunications Impact Model, especially that of impact prediction, new research efforts have focused on 'futures' methods which are largely an extension of survey methods. Methods such as the Delphi technique, among others, which are used as input for modeling analyses including cross-impact analysis for further insight into impact forecasting are beginning to be utilized in research (Helmer, 1983; Wedemeyer, 1985). These and other operational methods will be discussed in the next section.

It is perhaps the problematic orientation of the research questions being asked that may require a new set of methods, or more modestly, a combination and modification of existing methods, to more adequately explain and forecast the impact of technology on human communication behavior which in turn can be used for more proactive policy formulation, planning and implementation.

3.3 Methods for Communication Planning

3.3.1 Overview

Based on the conceptual framework for communication planning defined by Hancock (1981) and Middleton (1985), a number of methods for communication planning have emerged. These methods include a range of disciplinary perspectives from economics to sociology and communication sciences. They cover techniques used widely in many disciplinary efforts as applied to communication policy and planning. While many of the methods described include prescriptive detail for how to conduct a particular research endeavor, these methods must be viewed as essentially suggestive. Their actual application to a particular problem or set of problems in communication policy and planning must be flexible and adaptive.

Middleton and Wedemeyer (1985) suggest a categorization of various methods for communication planning as (a) analysis, (b) strategy, (c) decision, (d) action, and (e) learning. Several of the relevant methods of these broad categories will be described. Particular attention will be paid to two methods of analysis (system analysis and resource assessment) and three methods of learning (communication development indicators, surveys and case studies). These methods have a primary applicability to this study and follow from the evolution of methods described in the previous section. These particular methods will be synthesized into two procedures for accomplishing the objectives of this study as will be described in sections 3.4 and 3.5. They draw on the applicability of the success of survey techniques to problems in telecommunications studies as described in the previous section.

Methods for strategy development, including scenarios (Spence, 1985), simulation gaming (Root, 1985), cross-impact analysis (Wedemeyer, 1985), input-output analysis (Jussawalla and Porat, 1985), and compact policy assessment, Compass, (Hudson, 1985) as well as methods for actual communication planning decisions and action require as initial input, in some form, the basic information of historical data. In order to apply any or all of these methods, it is assumed that relevant (if not necessarily complete) information for the subject of the planning process is available. These methods will not be discussed here as the primary objectives of this study are to essentially generate the initial information on telematics in the ASEAN which could then be subsequently applied, in future investigations, to many of these planning techniques.

3.3.2 Methods for Communication Planning Analysis

Methods for communication planning analysis include systems analysis (Gomez-Ortigoza and Wedemeyer, 1985), resource assessment (Hancock, 1985), trend extrapolation (Sutra, 1985), brainstorming (Beal and Dissanayake, 1985) and the Delphi technique (Wedemeyer, 1985). Two of these methods, namely, systems analysis and resource assessment are of particular interest to this study and will be discussed after a look at trend extrapolation and the Delphi technique which also have some relevance.

3.3.2.1 Trend Extrapolation and the Delphi Technique

Trend extrapolation is a family of quantitative forecasting techniques which extend time-series data according to mathematical rules (Sutra, 1985). Trend extrapolation has many variants in many disciplines and may be called many different names depending on the language of a particular discipline. This method usually includes the group of mathematical techniques known as regression analysis. Trend extrapolation methods generally consist of a series of steps which take historical information and combine it with mathematical models for making judgements on direction and magnitude of trends. Sutra (1985) notes that the application of models and formula require a relatively small amount of time and money once the appropriate time-series data are available. Generating that data, however, as a first step can be an enormous task.

Of interest to this study is the need for historical information in order to be able to begin to apply trend extrapolation techniques. In the absence of such time-series data, the largely post-hoc mathematical analyses and judgements cannot proceed. In terms of information for trend extrapolation on the subject of telematics infrastructure and investment in the ASEAN region, there is first the need to collect the historical, time-series information.

The Delphi technique was developed at the Rand Corporation in the 1950's by Olaf Helmer and Norman Dalkey and was intended as a systematic means of soliciting expert opinion for forecasting (Helmer, 1983). It is one of a number of techniques for systematically eliciting expert opinion including nominal grouping techniques as well as traditional survey techniques which target experts as the respondents. Wedemeyer (1985) describes the use and procedures of Delphi to the communication planning environment. Delphi is seen as particularly useful in forecasting trends and events for discussion and as input for consideration of the decision process of communication planning. While the strengths and limits of the Delphi technique will not be discussed here, of interest is the first procedure of a Delphi process which identifies the subject to be considered for making forecasting judgements by a group of experts. Information is gathered on a subject matter from informed people and from literature reviews as well as creating scenarios in order to specify a large number of plausible developments. It is the process of gathering information for the input of the Delphi technique that is as critical and similar in applicability to the historical, time-series data gathering of trend extrapolation techniques. Further forecasting and consideration as input to decision-making requires this initial information.

3.3.2.2 Systems Analysis

Gomez-Ortigoza and Wedemeyer (1985) define systems analysis as, "a method for applying the 'systems approach' or general systems theory (GST) to problems of planning" (p. 85). As such, systems analysis, as it relates to communication planning, is a technique to encourage planners to take a broad view to problems. There is an assumption in systems analysis as it relates to communication planning, and indeed to all systems planning, that a change in one part of the system will somehow affect the entire system which acts as a whole. This assumption is derived directly from Bertalanffy's concept of wholeness.

Systems analysis is useful for developing an overall scheme of a problem and for finding alternative solutions (Gomez-Ortigoza and Wedemeyer, 1985). While systems analysis is not without limitations, it does provide a broad and comprehensive framework useful across disciplines and complex systems. Essentially the limits of systems analysis are the limits of the analyst. Selecting an appropriate level of detail and appropriately defining the levels of analysis may affect the outcome. Gomez-Ortigoza and Wedemeyer offer four important areas of analysis not to be overlooked:

> 1. Specifying boundaries of the system and its environment.
>
> 2. Defining the key objectives of the system.
>
> 3. Identifying the key subsystems and determining the structure and relationship of each to each other.
>
> 4. Specifying the relationships of the decision-makers and agents involved with planning, evaluating, implementing and controlling the system under study. (Gomez-Ortegoza and Wedemeyer, 1985, pp.92-93.)

The actual procedures will vary with each application and it is up to the analyst to select appropriate means in order to best represent the four areas of analysis. Systems analysis provides a framework from which information about a defined system can be organized by an analyst and therefore represents a means by which complex systems may be described and communicated to others.

3.3.2.3 Resource Assessment

Similar in scope to systems analysis, resource assessment as proposed by Hancock (1985) provides a framework from which techniques useful in information acquisition and processing can be placed. Resource assessment is not a technique itself with a set of procedures or formulations for the evaluation and distribution of communication resources. Rather, it provides a context from which techniques useful in the assessment of communication resources may be based.

Communication planning is concerned in part with the estimation and evaluation of resources. It is assumed, according to Hancock, that the information-handling has been carried out and is available to the planners or decision-makers. This assumption cannot be taken lightly as often information relevant for communication planning is lacking. In that event, Hancock provides an extensive and suggestive check-list of the kinds of information that need to be made available as input to planners and decision-makers in terms of communication resource allocation. This check-list includes the need for information on socio-economic and political developments as well as technical information on communications itself. Included in the socio-politico-economic information check-list are general statistical data on geography, population, the economy, political institutions, employment, language, education, etc, as well as historical growth, organizational structures, laws, regulations, goals, norms, values and future trends, among others. Information on communications itself and the technology involved ought to include statistical data on telecommunications (telephony), radio, television, postal services, cinema, print media and news agencies, publishing, advertising, popular culture and various sectoral communication agencies and services as well as import and exports of technology, investments, and markets.

As a check-list, Hancock's framework for resource assessment is valuable in terms of describing a communication system and will be applied directly in this study.

3.3.3 Methods of Learning for Communication Planning

In this section, three methods of learning for communication planning are described, namely, case-studies, communication indicators, and surveys. These are not entirely unique and separate from the methods described above. They do, however, suggest ways in which information can be specifically gathered for the purposes of communication planning.

3.3.3.1 Case Studies

John Middleton (1985) suggests that case studies are useful in terms of studying complex social processes from a holistic perspective. The method is to examine processes as they occur in an environment with the purpose of increasing understanding about a system rather than specifically to verify hypotheses or propositions. Middleton makes clear that case study methods are not necessarily to be favored over hypothesis testing methods. Both are valid and important. Rather he provides for the means by which detailed analysis and description of a real-life process can be carried out. It is not unusual then, for further research, which may include hypothesis testing methods, to follow from the information and insight that may be provided through the case study. Case studies do have the limitations imposed on the study of a particular environment. The conclusions of one case study of one environment are not necessarily those of another similar environment and indeed may not necessarily be generalizable.

Nonetheless, case studies can be used effectively to expand understanding of complex phenomena as they seek to expand, rather than reduce the scope of inquiry. Data collection and analysis is a continuous process with no clearly defined start and stop point. A case study may draw conclusions when various patterns and positions can be identified. Such will be the utility of the case study method in this study as information on each ASEAN country will need to be presented on a case-by-case basis as each country varies enormously in many areas including priorities for and rates of development of telematics.

3.3.3.2 Communication Indicators

Tehranian (1985) suggests the use of communication development indicators in the process of learning for communications planning. Indictors are widely used in any number of disciplines to provide information on the current state of affairs as well as to forecast future trends. In the study of telecommunications and economics for example, the indicator of gross domestic product, GDP, per capita is widely used as an indicator of telecommunications development as measured by telephone densities (CCITT, 1968; Frey 1973; Wellenius, 1972 and 1984). The strong correlation between GDP and telephone densities in a country suggests a link between the two, but cannot be equated with being a causal relation (Wellenius, 1984). Many factors such as GDP may indeed be correlated with telecommunications development defined as telephone density and it may not be surprising to find other factors which may statistically correlate even more strongly. O'Brien, et. al., (1979) in fact provide a review of such efforts and find that the results suggest, that not surprisingly, all communication indicators are highly correlated with GNP per Capita. However, the utility to policy and planning of such correlational evidence is very limited. Since no causal relation can be established, the predictor value of such correlated indicators is diminished. In any case, the point is moot as to whether GDP gains or information sector gains or any other factor or set of factors can predict telecommunications development. Such a linear, effects view of development as a paradigm has passed (Rogers, 1986). Policymakers and planners need information which indicates current and passed trends which can be extrapolated into the short term future (usually by way of statistical methods) or from which scenarios for development can be constructed and goals and implementation plans set based on decisions involving likelihoods, desirability and probability forecasts (Helmer, 1983; Wedemeyer, 1985).

Thus the use of communication indicators, as suggested by Tehranian (1985), can provide a means by which trends are measured both in a qualitative and quantitative fashion to assess different levels of telematics development. Communication indicators are used to describe and explain factors for policy development and "to suggest and quantify a desired model for social change" (Tehranian, 1985, p. 413). Tehranian offers the following definition:

> "Communications development indicators are those normative sets of quantitative or qualitative data that provide a link between communications development theory, and policy and planning, in order to assign numerical values or properties to social communication concepts. As such, communications development indicators could monitor the progress made or the bottlenecks reached on the path toward certain social objectives and targets in the field of technologically mediated, institutionally organized or spontaneously expressed forms of social communication" (Tehranian, 1985, p. 414).

A dialectic approach to development as suggested by Tehranian views the development process as inherently contradictory in terms of processes of accumulation, mobilization and integration. Tehranian also offers that in lesser developed countries, the development process has often also produced increasing levels of dependency, dualism, fragmentation and alienation as well. Therefore indicators of both structure and process need to be looked at in order to understand development.

This view is echoed by Kuo (1989) who presents a model for telecommunications policy development through indicators of both structure and process. Kuo provides indicators for the "informatization of society" to understand the relative level of information technology penetration and use. Kuo uses indictors for telematics infrastructure including telecommunications, mass media and computerization (telematics) in tandem with economic indicators such as measurement of the information sector and what Kuo calls "people" indicators. These are indicators which not only measure such quantities as information sector employment but also assess the information capability of a society in terms of education and literacy among others.

A descriptive approach to indicators uses methods which are more atheoretical, or simultaneously, in a dialetic spirit, take into account a variety of theoretical positions in their construction and tend to be taxonomic (Tehranian, 1985). They are used to discover regularities without necessarily providing immediate explication. The use of such descriptive indictors, such as a population census or census on numbers of radios and television sets, and statistical time-series, provide powerful tools for the construction of useful communication indicators for policy making and planning. The descriptive indicators are often a much needed pre-requisite for many other types of analytically based assessments and evaluations. They are a primary source of data from which other research can be based. In their absence, neither qualitative nor quantitative analysis for policy and planning may be adequately accomplished.

This study attempts to build such a taxonomic data resource base for basic information lacking for comprehensive telematics policy and planning in the ASEAN.

3.3.3.3 Surveys

From the analysis of methods in the social-psychology of telecommunications, as just one area of concern in telematics, it is evident that surveys as a method of investigation and learning may be useful. Nielson (1985) provides an argument for the use of surveys as a method of data collection in determining information useful in the communication planning process. As a method to collect data from a human population through direct contact (Warwick and Lininger, 1975), surveys are used widely in nearly all disciplines in order to make generalizations about a human population from a sample of that population when it is not feasible to question each member of the population (Rigsby in Kidder, 1981). Data gathered in surveys are used in any of a number of ways including descriptions of populations, for causal explanations, forecasting future conditions, the evaluation of social programmes, and the measurement of social, political, cultural, economic and technical indicators, among many others (Nielson, 1985). Surveys must be carefully constructed so as to avoid possible problems. Abuses in survey research can arise from any of a number of quarters including the misuse of expert judgement and procedures, problems in recall of historical events, biases in both questioning and responses, as well as problems arising from sensitive information. Good procedural methodology which is cognizant of these problems and attempts to minimize them, helps to reduce the disadvantages of surveys. Results, therefore, can be established with a level of confidence (measured statistically in some cases) of the generalizations made. While survey research has many variations and no strict conventions can apply to all survey research given the variety, Nielson (1985) provides six general steps (not necessarily sequential) to take in conducting any survey. These are (a) conceptualization and design; (b) sample selection; (c) instrument development; (d) data collection; (e) data management and analysis; and, (f) reporting and feedback.

A survey of key policymakers and telematics stakeholders in the ASEAN region forms a part of this study in order to assess the viability, and refine the developed telematics data taxonomy. Nielson's guidelines will be followed in order to construct a survey methodology to meet these goals.

3.4 A Method for the Development of a Description of Telematics in the ASEAN Countries

It appears from the previous discussion that the first step in studying telematics development policy and planning in the ASEAN would be to collect relevant information which can be useful later for application and adaptation in any of a number of analysis techniques for communication planning. To this end, this study has proposed as objectives:

(1) to identify, through a macro-level, interdisciplinary description, key developments of telematics policy in each of the ASEAN countries under study and the social, political. cultural, economic and technological factors which influence and are influenced by telematics policy development.

(2) to develop a base-line taxonomy data scheme for the measurement of telematics infrastructure and investments relevant for policy development in each country as well as for cooperative planning in the ASEAN region.

From this, conclusions may be drawn and firm recommendations for the development of telematics in the ASEAN region may be made. This will include, the demonstration of the need for a developed data collection scheme necessary for telematics development policy and planning in the ASEAN through the participation and feedback of telecommunications authorities in the region.

In order to meet the objectives, a synthesis of the ideas from the previous methods described will be utilized.

To meet the first objective, a descriptive analysis of telecommunication and information system policies, infrastructure, investment, and markets will be presented in order to identify and examine current and near future (approximately five years) policy trends. Areas of broadcasting, as the third major part of telematics are not described in detail as many other sources provide these kinds of descriptions including but not limited to the World Radio TV Handbook, UNESCO source books and in the ASEAN region in particular, Asia-Pacific Broadcasting Union, ABU, reports. It is indeed from these types of more narrowly focused descriptions that the description of telecommunications and information systems in the ASEAN is styled.

In order to provide a comprehensive description, information on telematics in the ASEAN were gathered from a variety of sources. These include a traditional literature search of journals, newspapers and other periodicals, books and papers as well as reports of the telecommunications authorities in each of the ASEAN countries. Also included is the input from numerous resource people in the region and elsewhere who have provided information and/or comments and critiques of the information provided.

An invited article to the Columbia Journal of World Business (Vol. 24, No.1, 1989) by Mark A.Hukill and Meheroo Jussawalla and a background paper by the same authors prepared for a workshop held in Singapore (Joint East-West Center, Honolulu, and Asian Mass Communication Research and Information Center, AMIC, May, 1989, Singapore) provide the basis for the descriptive analysis. A list of the resource people utilized for this purpose is listed in Appendix 1. In addition, the following articles and a monograph co-authored principally by Mark Hukill with Meheroo Jussawalla are used to complete the descriptive analysis to meet the first objective. These include Hukill and Jussawalla (1990, July; 1991, January) and Hukill (1990, September) and a monograph on the subject to be published by the East-West Center by Hukill and Jussawalla (in press).

These articles and the subsequent chapter in this study have been organized and written using the guidelines of resource assessment and a systems analysis along with a view toward providing telematics indicators on a case-study basis (country by county) in the ASEAN region.

The results of this method appear in Chapter IV which provides a comprehensive description of telematics policies, infrastructure, investment, and markets in the ASEAN region.

3.5 A Method for the Development of a Base-line Data Taxonomy of Telematics in the ASEAN Countries

To meet the second objective, a process has been developed to create a base-line data taxonomy scheme for the measurement of telematics infrastructure and investments relevant for policy development in each ASEAN country under study as well as for cooperative planning in the ASEAN region. This process is described in detail following a brief overview.

3.5.1 Overview to the Process of Developing a Base-line Data Taxonomy

In part, inspired from the developments identified in the description of telematics in the ASEAN and from other more narrowly defined information resources described subsequently, a data taxonomy scheme was initiated. This draft scheme was a listing of data items, each item over a thirty year period including ten year future projections. The relative newness of the field of telematics makes it difficult to obtain data from more than twenty years ago and most individual country policies and plans in the ASEAN region do not make projections much beyond ten years hence in any detail. The draft data scheme was critiqued by several key resource people and further refined.

Next, a survey of key telematics policymakers and stakeholders in the ASEAN region was conducted. Through open interviews, the goal of the survey was to further refine the data items in the scheme and to test the scheme for indicating common areas of developing telematics policy and planning across the ASEAN region.

Finally, as a cross-check of information and for feedback on the utility and need for the data taxonomy, telecommunications authorities in each country were asked to attempt to fill out the data scheme. Responses to date from two of the five ASEAN countries under study, the Philippines Long-Distance Telephone Company, PLDT, and Syrikat Telekoms Malaysia Berhad, STM, are included and suggest both the need and utility of the data scheme. The data taxonomy, and when subsequently operationalized by further efforts beyond the scope here, thus becomes a new tool for telematics policy and planning as a descriptive indicator of telematics infrastructure and investment development.

3.5.2 The Draft Data Scheme

Numerous statistical resource books are available which provide descriptive information in any of a number of the more specific areas of telematics. None, however, provide a comprehensive means for the description of the broad range of telematics as it is emerging worldwide. Further yet, none provide the means by which to evaluate the need for such data or for its use in policy and planning development either within a country or in cooperation across countries.

AT&T Yearbooks (1972-1982), United Nations Statistical Yearbooks (1972-1986), the World Radio TV Handbook (38th - 43rd eds., 1984-1989), International Telecommunications Common Carrier Statistical Yearbook (7th ed., 1989) and numerous country-specific telecommunications, broadcast and information sector statistical schemes (e.g. General Conditions of Communication Equipment Production, Exports and Imports of Japan, New Breeze, 1990) provide examples among others of the descriptive data schemes in various sectors of telematics to date.

In order to arrive at a draft data taxonomy scheme for telematics which includes proposed information which would be useful to policy makers and planners on a cooperative level across the countries of the ASEAN region, a number of combinations of information resources were utilized.

First from the description , two major areas of information relevant to telematics development policy and planning emerge which are similarly comparable across each country despite the variety of cultural, political, and social factors presented in each country. These are infrastructure development and investment means for that development. The structure and process of telematics policy development in each of the ASEAN countries appear from the description to hinge heavily on these two major areas and it is assumed that these would be two major areas of concern for policy makers and stakeholders in the region for regional cooperative planning. This research assumption is examined in the survey portion of this study through the open-interview survey process.

The base-line data taxonommy therefore accounts for levels of technologies of the infrastructure of telematics and the investments involved in each country under study. Data items were developed from suggestions of data items in the above mentioned data resource books, tailored to the infrastructure and investment focus. Items were drafted for each of the major areas of telematics, namely, telecommunications (telephony), broadcast systems and information systems. In addition, a fourth category, satellite systems, is added due to the importance of telematics development with this set of technology developments. These broad categorizations do overlap and are merely suggestive as a bridge from narrowly focused areas to the merger of the various technologies involved which is the broader telematics. It also helps in the execution of the data scheme as the extent of the telematics merger varies and many "category" authorities can provide information in various sections more easily. For example, information compiled from the ITU (1989) common carrier statistical yearbook across each of the ASEAN countries relating to telephony, as provided by Hukill and Jussawalla (in press, reproduced in Appendix 3), or information on broadcast equipment as compiled by the ABU (1984) can be subsequently entered in the telematics data taxonomy scheme for the region. The result is a broader picture of the telematics infrastructure and investment environment.

In order to pre-test the data scheme as a draft for its comprehensiveness of telematics infrastructure and investment, several people knowledgeable in the area provided critiques. One such critique came from a round of discussions at the East-West Center in Honolulu, from Research Associates in the Institute of Culture and Communications. A second critique was provided by the participants to the workshop held in Singapore in May 1989 mentioned in section 3.4 (see Appendix 1 for a list of participants). The limits of the formation of such a comprehensive data scheme are the limits of the information available from which they are formulated. Items developed in the draft scheme depend to a large extent on previous more narrowly defined schemes and the opinions of the few people, albeit informed people, who could be called on for their critique.

3.5.3 Survey: Open Interviews

An open interview survey of selected key telematics policy makers and stakeholders in the ASEAN region was conducted with a goal to refine the data items in the taxonomy under the assumption that the taxonomy indicates common areas for developing telematics policy and planning across the ASEAN region. Nielson's (1985) guidelines for conducting surveys were followed.

First the survey was conceptualized on the basis of the need to refine the data points to be included in the taxonomy and the need to test the ability of the scheme to provide information relevant for cooperative policy and planning across the countries of the ASEAN. This includes examination of the assumption that infrastructure and investment data are primary to that endeavor. The open interview method was selected as perhaps the only viable means to elicit this information. Face-to-face, less structured interviewing as described by Merton, Fiske and Kandall (1956) allows for obtaining a range of perceptions, attitudes and information from selected people involved in a common situation. This definition can be broadened to include "...any interview in which the interviewer knows in advance what specific aspects of an experience they wish to have a respondent cover in their discussion..." (Kidder, 1981 p. 189.).

Other methods of soliciting the information needed to refine the data taxonomy and test it for its ability to provide useful information for policy and planning were considered but judged inadequate. It was considered highly unlikely that the selected sample, described next, would respond in a timely and complete fashion to a mailed or telephone interview questionnaire given especially the detail of the taxonomy that needed to be covered. In addition, from a purely cultural level and the level of interest of both interviewer and interviewee, face-to-face open discussion could probe the detail and many aspects of the data taxonomy. By being present in each of the countries, the credibility of the interviewer and the general interest level of the selected participants is considerably increased and the information can be gathered in a timely fashion.

The limits of the open interview are taken into consideration. Biases, especially cultural biases can be troublesome in this case. Interviewing people in four different countries each with there own unique cultures and languages, can lead to inevitable interviewer bias and perhaps some misunderstanding of the responses given. The common language of all participants, however, is English.

The subject matter, being more technically oriented, and one in which the respondents are well versed, helps eliminate at least some of the biases across cultures. Yet, the ability to ask specific questions in person and re-direct questions as a result of responses is also the very strength of open interviews which allows both the interviewer and interviewee to reflect on such biases and cultural differences during the interview. The response to open interviews cannot generally be viewed as quantitative data. It is the compilation of the responses which provides evidence for input to refine the data taxonomy.

A selection of key policymakers and stakeholders in telematics was made in each of three ASEAN countries which could be covered in the open interviews, namely, Indonesia, Malaysia, and Singapore. As was discussed in the introductory chapter, these countries are seen as representative of all six ASEAN countries. These people are listed in Appendix 1. The respondents were selected from a broad cross-section of government officials, business people, and academics who are key in telematics policies and planning in each country. It was assumed that approximately ten key individuals might be interviewed in each of Malaysia, Indonesia and Singapore. Specific interviews depended to a great extent on the availability of the people for an interview during the time frame that the interviews could be conducted. As the logistics worked themselves out, it was actually possible to interview a few more people. Nonetheless, this selected group is the best available and has the requisite expertise in various areas of telematics as they are individuals responsible for policy and planning in their respective countries.

A questionnaire for the interviews was developed and pre-tested on several graduate students in Communication at the University of Hawaii who are from the region (see Appendix 2 for the list of questions). The pre-testing was to determine the appropriateness and culturally acceptable way to ask questions of people in the positions of pre-eminence that many of the selected respondents hold in their countries. In addition, a working group on the subject of ASEAN telecommunications policy developments was conducted with participants from the ASEAN region to the Pacific Telecommunications Conference, PTC, held in Honolulu, January 1990. Several of the stakeholders and policy makers from the region that would be an actual part of the survey were present and offered guidance.

The open-interviews were structured to contain (a) an assessment of the draft data taxonomy and (b) follow-up probing questions on what is considered the more important items for a common data taxonomy for ASEAN-wide planning considerations. Specific questions aimed at the assumption that infrastructure and investment data were primary for regional planning efforts were also posed.

The aim of the questions posed dealing with an assessment of the data taxonomy was essentially to determine what data items are important to include in the taxonomy and the degree to which they are important for regional planning. In addition, questions were posed to understand the various reasons and degree to which actual data may or may not be available and/or how it might be made available.

The survey was conducted in February and March 1990. Interviews were conducted in the offices (and in two cases, the homes) of each selected participant and hand-written notes were taken during the course of the interview. The use of a voice tape recorder for the interviews was advised against by the participants. Some of the information discussed, including military use of telematics is considered quite sensitive in each country. The willingness of the respondents to cooperate depended to a great extent on the anonymity of their responses although all agreed to the use of their names.

All interviews were scheduled for approximately thirty minutes and a network of collaborators in each country (see Appendix 1) were instrumental in making the interview dates and organizing the meeting logistics. Nearly all of the interviews ran much longer than the scheduled thirty minutes due to the interest so many of the participants took in the subject. Interviews carried over into lunches and dinners on several occasions as is the hospitality of the people in these countries. This provided for frank and very detailed discussions.

The information provided in each interview helped in part to reshape the description of Chapter IV. The results of the survey, which are a compilation of the responses, therefore, appear in both Chapter IV and Chapter V. In Chapter IV, some added detail and new information for the description could be made from the interview responses which in nearly each instance ended with a very broad ranging discussion of telematics from each of the participant's point of view. The results of the interviews to refine the data taxonomy scheme for common areas of telematics development are presented in Chapter V.

3.5.4 Feedback

Requests were made of the telecommunications authorities in each country under study to begin to attempt to fill in the actual data for the base-line data taxonomy scheme. In Malaysia, the Minister of Energy, Posts and Telecommunications provided the overall authority for the data tables to be completed. In the Philippines, where telecommunications are privatized, the Vice-President of the

Philippines Long Distance Telephone Company, PLDT, agreed to attempt to fill out the taxonomy. In Thailand, the Managing Director of TOT took the matter under advisement and help from the Asia-Pacific Telecommunity based in Bangkok was promised. In Indonesia, the Director General of Telecommunications also promised to make an attempt to actually fill out the data tables. These requests must be viewed in the magnitude of the what the request involves. Often only sparse and incomplete information is provided from each of these resources to the specific databases compiled officially by the United Nations and others on the specific areas which comprise telematics. The requests were made through an East-West Center project under the direction of Dr. Meheroo Jussawalla, who has lent a tremendous legitimacy and credibility to this research effort. There perhaps is really no other reason for these otherwise very busy people to become involved other than through their own keen interest and judgement of the worthiness of such an undertaking. The responses have been more than encouraging as are presented in Chapter V.

CHAPTER IV

TELEMATICS INFRASTRUCTURE AND INVESTMENT IN THE ASEAN COUNTRIES

Major portions of this chapter are from Hukill (1990) and Hukill and Jussawalla (1989, 1990, and in press). Some economic and telecommunication statistics are reported and sourced in the tables in Appendix 3.

4.1 Overview

The results of the development of a description of telematics infrastructure and investment in the ASEAN countries are presented in this chapter. While telematics policies are changing and markets are expanding in the ASEAN region, both a country-by-country case study presentation and a view to the region as a whole must be taken in order to understand its potential and to participate within changing developments to further planning efforts.

The telematics regulatory policies of each of the ASEAN countries vary considerably and tend to be organized and administered, as in many countries, along the lines of the various component categories of telematics. However, with the evident merger of telecommunications, broadcast and information systems, a view toward understanding the entire sector of telematics must begin to evolve.

Despite country to country differences, policies across the ASEAN can be characterized by trends toward various forms of privatization and deregulation of the telecommunication authorities, increased private participation in all areas of telematics development, the liberalization of markets and an increase in various forms of competition within those markets.

The very dynamic nature of telematics technology development over the past several years has forced a re-examination of policy in many countries both developed and developing. These changes are driving trends toward various forms of deregulation of telecommunication authorities and industries, pushing toward the privatization of telecommunication operating entities and an increasing liberalization of telematics markets for equipment and services provision. In addition, rapid advances in technology and the need to be interconnected in the expanding global information networks has brought on new opportunities for international cooperation. These opportunities may simultaneously benefit national interests and development as well as call into question social, cultural, and political values and traditions. Current and potential cooperation in policy and planning development in the ASEAN region points to a new direction for sector-specific inter-regional development which can benefit from the diverse experiences of each country.

It appears that the growth and change of telematics is especially implicated in the socio-economic change of any nation in the world today. An understanding of the trends and changes in policy of telematics infrastructure and investment and their impacts upon the economies, political and social structures of each nation is especially warranted.

Therefore, perceived needs and strategic choices for telematics technology development are analyzed based on ASEAN financial and human resources within the broad context of social, political, economic, cultural and technical factors. Policies for telematics development are evaluated in terms of their strengths and weaknesses for enhancing the overall economic and social development of each country.

While the term telematics is preferred here to represent the merger of telecommunications and information systems, the term telecommunications will be used extensively throughout this chapter and should be viewed as interchangeable with telematics in this context. Since most telecommunications and information systems policies are the domain of the various official "telecommunications" authorities in each country, the term telecommunications will continue to be utilized and includes the scope of telematics beyond simply the use of telecommunications to mean telephony. Also, since other sources (e.g., ABU, 1984;

World Radio TV Handbook, 38th-43rd eds., 1984-1989) have provided excellent descriptions of the broadcast systems as part of the overall telematics systems in each country, the analysis in this chapter focuses more on telecommunication and information systems. Nonetheless, since broadcast systems are increasingly becoming a major part of the merger that telematics represents, they are included in the overall data taxonomy presented in Chapter V for a comprehensive view of telematics.

An analysis of five of the six ASEAN countries, namely, Indonesia, Malaysia, the Philippines, Singapore and Thailand are presented here. Regrettably, Brunei, the sixth ASEAN country, is not included due to lack of availability of sufficient information and resources to execute the study in that country. It is hoped that further research efforts in this regard can include Brunei in the future.

4.2 ASEAN in Perspective

While the ASEAN pact is essentially political, the six countries of ASEAN represent diverse economic, socio-cultural and political entities. Although each associates to the ASEAN pact, which on a diplomatic level has had success in promoting regional interests, the countries tend to pursue independent policies as they continue to evolve through a process of development at different rates. Despite the differences in each country, the ASEAN nations do share a number of commonalties including placing a increasing focus on the development of telecommunication and information system infrastructures and services.

Cooperation in telematics within the ASEAN is organized on a diplomatic level through the Committee on Transportation and Telecommunication, COTAT, of the ASEAN Secretariate based in Jakarta, Indonesia (see Appendix 5). Cooperative efforts have been largely between the various government telecommunications authorities in building the ASEAN submarine cable communication system and the use of the Indonesian Satellite, Palapa, for regional and domestic communication.

By the year 2000, the ASEAN countries will be linked to Korea, Japan and the United States by fibre optic undersea cable. Planning for traffic distribution among the ASEAN nations has begun as well with the building of the Kuala Lumpur-Brunei-Philippines cable links. Plans are also underway to connect to Bangkok in 1994 or 1995. In addition, undersea cables link each of the ASEAN countries with the Transpac cable system across the Pacific to Hawaii and on to North America. An undersea fibre cable linking Singapore with Marseilles, France, to be completed in 1994, will result in a complete fibre optic connection from Europe to Japan via Southeast Asia.

ASEAN is also partially linked through satellites. In addition to each country's participation in INTELSAT, Malaysia, Singapore, Thailand and the Philippines, have signed leases for the use of Palapa's transponder capacity for domestic telecommunications. Papau New Guinea (a non-ASEAN country) will also be using the Indonesian Palapa satellite system.

While Palapa is an Indonesian government owned and controlled satellite, the introduction of low access-cost private satellites such as is promised by Asiasat opens new pressure on government monopoly telecommunications systems to liberalize policies for use. How far governments will be willing to allow the establishment of private telecommunications networks remains to be seen in each country. Asiasat will provide a test for Thailand in particular which is under great strain to vastly improve its telecommunications systems.

The worldwide trend in telecommunications toward deregulation and privatization has been well publicized in the popular press as well as receiving extensive coverage in official proceedings of a number of telecommunications organizations worldwide including the International

Telecommunications Union, ITU, based in Geneva and the Pacific Telecommunications Council, PTC, based in Honolulu.

The United States, Great Britain and Japan have set the stage and provide examples for moves in other countries. In responding to ever stronger market forces and the need to move more forthright in terms of capital-intensive infrastructure development, government telecommunications authorities are under pressure to allow a freer access to telecommunications markets. The provision of services by competitive enterprise and the concerted look toward the deregulation and even privatization of the telecommunications entities is now a part of the development agenda.

While the privatization of British Telecoms and NTT in England and Japan respectively, and the break-up of AT&T in the United States provide examples of the worldwide trends, they are by no means necessarily models for deregulation and privatization in other countries. In essence, the need for deregulation arose from the declining benefits of economies of scale and scope within the natural monopoly framework. For value-added services, in particular, the concept of the natural monopoly could no longer be established or justified. The general trend, it appears, may be somewhat cyclical, as in just less than a decade after deregulation, the long-distance market is so shaped that re-regulation is being called for in the United States.

Indeed, each country must respond to its own needs and priorities within its social and political context in determining the form and extent to which deregulation and privatization may be useful. The ASEAN nations may provide an example of the varied forms the trends in deregulation and privatization are taking in many other countries. They point to the need to reflect not only on the regional transformations, but also on the individual country differences as well.

It has been suggested that the overall economic success of the East and Southeast Asia region will be due to adopting export-oriented policies which generate greater competitiveness and more market responsiveness (Okita, 1988). The development of transportation and communication technologies along with trade and capital networks have helped to accelerate these exchanges. However, a major drop in oil prices and the recession in commodity prices in the 1980's have meant that the ASEAN countries have had to implement major structural adjustments. Thus, the switch to export-promotion strategies from import-substitution strategies and the development of private rather than government led economic growth is characterizing the ASEAN countries into the 1990's. These macro-economic shifts are mirrored in the telematics sector which are part and parcel to the overall social and economic development of each nation.

Each ASEAN country is on a different growth pattern and has its own established priorities for development. From the more developed Singapore and the near NICs (Newly Industrialized Countries) of Malaysia and Thailand, to the lesser developed Indonesia and the Philippines, the ASEAN countries have pursued rather independent courses for their telematics sectors despite some regional cooperative efforts. The response to telecommunications growth and development is quite different in each country as can be seen in the traditionally cited indicator of telecommunications development, the density of telephone sets per 100 inhabitants (see Table 16, Appendix 3).

More recently, however, world economic changes and pressures have necessitated that the ASEAN region act in concert in such forums as the Uruguay Round of international trade policy talks of the GATT (General Agreement on Tariffs and Trade). The position of the ASEAN is shifting vis-a-vis other lesser developed countries in terms of the highly protected services sectors including telecommunications (Ariff and Tan, 1988). While liberalization in trade services is being supported by ASEAN as a whole, the reasons are different in each country and there is a fair amount of divergence in views. It would therefore be premature to refer to the ASEAN as a trade block. An understanding of the characteristics of each country is required and is the focus of analysis here in terms of the trends in telematics policy.

There is one very important common element in each of these countries in terms of providing basic telephone service which provides an insight into the level at which policy trends may be operating. Apart from Singapore, problems of simply providing a telephone, let alone all telematics services, to remote and rural areas still require a heavy subsidization by a government monopoly. For social distributive reasons, competition in basic services may not yet be justified.

4.3 Indonesia

Indonesia is a country made up of approximately 13,700 islands with a total population of 170 million. Sixty percent of the population lives on the island of Java wherein lies the capital, Jakarta. The military government is comprised of a large number of people close to the President and his family comprising an "oligarchy" of control. Law and government policy is essentially by presidential decree.

For Indonesia, 1988 and 1989 might be characterized as an attempt to begin recovering from the recession of the mid-1980's brought on by a collapse in oil prices which dried up consumer demand and all but ended an import-oriented development strategy. With a 2.2% annual economic growth rate in 1985, Indonesia climbed back to a more positive growth rate of 4% for 1988. However, with a deficit of over $5 billion and debt service ratio of nearly 40%, it has become necessary for Indonesia to be more export-oriented and court more foreign investment. With this in mind, the focus into the 1990's will be on industrialization and the expansion of commercial and tourist centers.

Nonetheless, 50% of foreign exchange earnings and 50% of all government revenues still come from oil and gas sales. Japan, which is Indonesia's largest trading partner, has stepped up its aid to Indonesia with a $900 million untied loan in 1988. Japan depends heavily on Indonesia for raw materials especially oil and natural gas. However, war-related mistrust of the Japanese still remain, even 15 years after the riots which flared-up when Mr. Tanaka, then Japan's prime minister, visited Jakarta in 1974.

Japan has invested over $5 billion in some 200 joint venture projects in Indonesia and its investment there ranks second only to its investment in the United States.

Japanese investment accounts for most of Indonesia's major industries. As a result, the Indonesian's are now looking to other markets and investors in a effort to diversify away their dependence on Japanese capital. For example, Indonesia has turned to South Korea and Taiwan as markets for its exports of liquified natural gas, which had previously all gone to Japan.

In Indonesia, the State has a quasi-corporate nature and private business interests are often intermixed with public office. Combined with a low labor productivity rate and continual shortages of technical and management talent, efficiency is a major economic concern. A corporate culture which will negotiate additional "taxes" on the price of goods and will accept "commissions" ranging up to 30% on infrastructure development projects only exacerbates otherwise well intentioned development schemes.

The recession, financial uncertainties and political control over foreign investment, have all contributed to an uncertain business climate in Indonesia (Carey, 1987). However, a very realistic 5% annual growth rate will probably be attained as the current Development Plan indicates for 1989 and 1990. There appears to be an attempt however, to scrutinize more closely state business operations which may be reinforcing structural inefficiencies in the economy.

While market forces may now be dictating the telecommunications environment in developed countries where a high degree of deregulation and privatization are pursued, the developing world must be looked at differently according to Jonathan Parapak, President of PT Indosat (see Figure 1), Indonesia's state-owned monopoly company which handles international telecommunications. "In most cases, telecommunications still play the role of an 'agent of development.' In some instances, telecommunication services have to be provided ahead of real demand: in other words, demand is created," (Parapak, 1988). There is therefore a perceived need to provide services ahead of demand and develop the infrastructure necessary to support services. However, since this may not provide an immediate recovery of invested capital in terms of significant revenues, added stress is put on an already over-reach budget.

Like many developing countries, Indonesia is struggling with the need to improve its telecommunications systems while at the same time trying to justify capital outlays which cannot be measured on a conventional return on investment basis. Government development policies therefore dictate priorities given to the telecommunications sector.

Indonesia has the lowest density of telephones per population in the ASEAN region with on 0.5 per 100 as of the

Figure 1

Organizational Chart for Telecommunications in Indonesia

Department of Tourism, Posts and Telecommunications

Directorate General of Post and Telecommunications

PERUMTEL	PT INDOSAT	PT INTI	POST & GIRO
Domestic Telephony	Int'l Telecom.	Telecom. equip. production	Postal Services and Money Orders

end of 1989. Twenty-five percent of all the telephones are in Jakarta alone (roughly 4 per 100). However, many islands and outlaying rural areas have no phone service at all. The provision of basic service is still a major priority for the Ministry of Posts and Telecommunications and PERUMTEL (Perusahaan Umum Telekomunikasi), the state-owned monopoly corporation charged with domestic public telephony.

The International Independent Commission for Telecommunication Development (IICWTD) recommended that Indonesia work to achieve a goal of having a telephone "within easy reach" of everyone. Easy reach is defined to be within a one hour walk from every person. While being a seemingly modest goal, Indonesia's vast archipelago which stretches across an area roughly equivalent in length the continental United States, makes attainment of this goal a formidable task.

Despite the lack of basic service provision to its population, Indonesia has pushed forward on an ambitious satellite development program. Indonesia installed its first satellite earth station (Intelsat Standard A) in 1969. PT Indosat, which had been established as a subsidiary of ITT, a United States based corporation, operated and maintained the station in Jatiluhar. In late 1980, the Government of Indonesia nationalized PT Indosat and declared it the sole provider of international public telecommunications.

In 1976, two domestic telecommunications satellites were launched (Palapa A series) and a second generation Palapa B-1 was launched in June 1983. The launch of Palapa B-2 in 1984 was unsuccessful and in March 1987 Palapa B-2P was launched to replace it. The Palapa B-2 satellite was subsequently rescued from space by the U.S. space shuttle program and was refurbished under the ownership of private Indonesian interests. It was relaunched in early 1990 as Palapa B-2R and subsequently resold to the Indonesian government (PERUMTEL) upon successful attainment of orbit.

Tenders of offer are currently out worldwide for a third generation satellite (Palapa-C) for launch in the 1990's. It is hoped that the new satellites will stimulate more telecommunications services both domestically and internationally for Indonesia.

The Palapa satellites are also used on an ASEAN regional basis for television broadcasting within each country and trans-border data communication with the Philippines, Malaysia, Thailand and Singapore. These countries also lease transponder capacity for domestic information systems use as well.

PT Indosat calculates that it becomes efficient to use the satellite link for telecommunications when terrestrial links exceed 500km. By the year 2004, Indonesia therefore hopes to have a backbone systems circuit distribution of 75% terrestrial links and 25% satellite (Parapak, 1988).

In many respects, Palapa is becoming a regional system. Although inter-country exchange through Palapa is still limited, Palapa has the potential for data, voice and video exchange between Southeast Asian nations as well as providing alternative routing for the ASEAN undersea cable systems. In addition, Palapa could conceivably provide access for private as well as public networks. However, the political will to cooperate and the structural, economic and financial advantage to cooperating parties would require comprehensive negotiation. Strategies to overcome regulatory differences would also need to be addressed.

It seems clear that there is an economic necessity to keep Palapa under government control. Reaching a large number of islands with basic services may only be feasible through the cost benefits of thin-route communications provided by the Palapa satellites. These are costs which are largely distance insensitive as opposed to land-based systems. This advantage could also be utilized by the Philippines and Malaysia as well. Interestingly, the future status of Palapa as a regional system may be in some question with Asiasat now in orbit. Whether the government controlled Palapa system will or should be geared to compete with Asiasat or other satellite systems in the region remains unclear.

Marketing efforts in Indonesia, as in many developing countries, cannot be limited to selling equipment and services. The establishment of local contractors, training, technology transfer, and financing arrangements need to be the primary concern.

According to Indonesian Law (#5/64), only PERUMTEL and PT INDOSAT can provide public telecommunications services in Indonesia unless providers have consent or the project is in cooperation with them. This law has been supercede by a new law put into place in April, 1989 which will be discussed shortly. The only exceptions to ownership of telecommunications facilities outside of PT Indosat and

PERUMTEL are several state-owned companies and government organizations such as the PERTAMINA oil company and civil aviation which have their own telecommunications facilities and acquire them through their own bidding and vendor selection processes.

There is, however, a new regulatory environment being established in Indonesia. Law #3/89 has provided the foundation for private participation to increase and will have profound effects on financing, ownership and operations in Indonesia into the next century.

Equipment procurement for PERUMTEL and PT INDOSAT comes through open bids, limited bids, direct determination contracts and direct purchase. Foreign contractors must be cooperating with Indonesian contractors to participate in the telecommunications equipment procurement market. However, since the fall of revenues for oil and gas exports, the Indonesian government is beginning to relax its monopoly grip on telecommunications and has begun new efforts to cover the shortage of funds needed for the telecommunications development program. Increasing private participation been sought in financing and installing new telecommunication infrastructures. This was previously accomplished by providing outside organizations the opportunity to recover their investment through a share of the generated revenues. Initially called the BOT scheme (build, operate and transfer), a foreign vendor provides financing for building systems, helps to operate the system while training Indonesians and subsequently transfers control as the investment is recovered. While the term BOT is no longer being used, the revenue sharing concept remains an important component to the telecommunications policy for Indonesia into the 1990's. For example, in 1990 alone, 125,000 additional telephone line units are being installed through revenue sharing schemes.

Perhaps the most significant recent development in Indonesian telecommunications regulation change is the adoption and implementation of Law #3/89, known as the Law on Telecommunications, dated April 1, 1989. It is probably more accurate to say that the law, as approved, now more closely reflects the actual business practice in Indonesia which had been going on for some time prior to the official implementation of the law. The new law supercedes Law #5/64 which previously only allowed PERUMTEL and PT Indosat to provide telecommunications services in Indonesia unless provision is made with their consent or in cooperation with them.

One of the more significant aspects of the new law is the opening of non-basic telecommunications services to other than the government telecommunications organizations.

Specifically Chapter IV, Article 12, Paragraph 2 of Law 3/89 reads:

> "A body other than the organizing body [government authorities]...may organize basic telecommunication services on the basis of a cooperation with the organizing body, while non-basic telecommunication services may be organized by another body <u>without</u> a cooperation with the organizing body" (emphasis added).

The law further states in the same Chapter, Article 19, Paragraph 3 that:

> "The organizing body and other bodies referred to in Article 12, paragraphs (1) and (2) in providing and promoting telecommunication services, shall be authorized to import, control and own telecommunication equipment for the provision of telecommunication services" (Kramadibrata, 1989).

In effect, the new law will allow for ownership and control of telecommunication equipment for non-basic services provision by private organizations. In addition, more private participation will be allowed in providing basic telecommunication services in cooperative arrangements between private organizations and the governmental telecommunication bodies, namely, Perumtel and PT Indosat.

While not changing the structure of government ownership and control of basic telecommunications in Indonesia, the new law will allow for improved access to Indonesia's telecommunications markets and will, it is hoped, help improve the capitalization problems of developing telecommunication infrastructure as well as operating and maintaining services. Private organizations from outside Indonesia will still have to do business through joint-venture arrangements with an Indonesian organization. While it is doubtful that further privatization will occur in Indonesia in the near future and that the government entities will maintain control, Indonesia has, in its own way, begun to address the problems common to many developing countries in terms of realization of capital and services for the ever growing demand in their country.

In an attempt to close telecommunications services provision gaps, two strategies, namely, increasing accessibility in rural areas and increasing phone density in high demand areas have been prioritized. This includes the increased provision of services for tourism-related activities, banking, financial institutions and commercial centers as well as industrial plants which are highly dependent on telecommunications. In addition to World Bank loans and "soft" loan financing with cooperating foreign governments and financial institutions, funds from the private sector have been sought in terms of private participation as allowed for under Law 3/89 (Roestam, 1990).

The National Development Planning Board (BAPPENAS) released a list in June 1988 of telecommunications projects which the Government of Indonesia is offering for financial assistance from donor countries including major micro-wave transmission systems, extension of data networks and the establishment of a regional training center and a research and development center for telecommunications.

The Directorate General of Post and Telecommunications reports that 17 major telecommunications projects are planned over a six-year period through 1994 at an estimated cost of US$1.35 billion. By 1994, plans in Indonesia are to increase automatic telephone lines from 910,000 to 2.3 million lines. Projections are to increase this to 7 million lines by the turn of the century. Plans for 1994 also include adding 15,200 new telex lines and 75,000 public payphones.

PERUMTEL and PT INDOSAT however, represent only a part of the major telecommunications markets in Indonesia. In addition, civil aviation, the national oil company PERTAMINA, and other state organizations continue to spend as much or more than PERUMTEL and PT INDOSAT each year on telecommunications equipment. Currently, in terms of U.S. sales to Indonesia, expenditures for communications equipment by the Indonesian military may be three times that of the public systems.

Indonesia is also continuing its policy to develop and manufacture telecommunications equipment in-country. PT

INTI (Industri Telekomunikasi Indonesia) is the state-owned and controlled monopoly manufacturer of telecommunications equipment in Indonesia. This company produces digital exchange switches for the public switched network in a joint effort with Seimens of West Germany, PABX exchanges and pay-phones in a long standing arrangement with Bell Manufacturing of Belgium along with a host of transmission equipment ranging from high frequency transceivers to small earth stations. However, 60-65% of the telecommunications equipment for Indonesia is still obtained through local contractors working in cooperation with foreign vendors.

PERUMTEL and PT INDOSAT currently provide telephone, telegraph and telex, leased circuits, television and facsimile services. By 1994, PERUMTEL plans to increase automatic telephone lines from the current 910,000 to 2.3 million lines and projections are to increase to 7 million lines by 1999. Plans also include adding 15,200 new telex lines and another 75,000 public payphones.

The initial 1.4 million access line increase planned by 1994 will cost a projected US$2.8 billion. Although more recently on the rise, the fluctuating prices for Indonesian oil has meant uncertain levels of foreign exchange necessary for expansive development projects. Indonesia's edge, therefore, has been to look toward much more private participation. This should not be construed as privatization however. Government will continue to wholly control telecommunications systems despite private financial participation. International financing will be sought to provide 600,000 of the 1.4 million new access lines with revenue sharing sought for 250,000 more. Also, in an interesting cross in responsibilities, PT Indosat will build 200,000 of the 1.4 million domestic access lines. This corresponds to PT Indosat's preference to be called and "Information Company" in the 21st century. PT Indosat is beginning to provide training for information technicians and is developing value-added services. This according to PT Indosat President, Jonathan Parapak, is to position the organization for competition as it develops in Indonesia.

Through the public switched telephone network, new services are being added. These include database access, electronic mail boxes, computer time-sharing and applications for banking, insurance and other financial and business institutions. The relative level of use of these services and the extent to which they are available remains very low. Nonetheless, Indonesia is pushing forward with new technologies. For example, PT Indosat is setting a pattern for the growth of VSATs which will also be wholly manufactured in Indonesia.

Indonesia is also looking to digitize its current networks as well as build only new telecommunications ystems which are digital. In terms of switching equipment, the current plan calls for the complete digitization of systems by the year 2004 with a complete phase-out of analog switches by that time. PERUMTEL has already installed a number of different classes of digital switches into the public switched network.

The policy for PERUMTEL is to increase rural telephony through cross-subsidy and to subsidize telephones for community use. The average cost to PERUMTEL to install one access line is $2,060. The ASEAN average is $1,800. These high installation costs have caused PERUMTEL to begin to run a more efficient operation. Although government owned, PERUMTEL is being operated on a private management basis and made a gross profit of US$70 million in 1988.

Perhaps the most interesting development for PERUMTEL is that according to top government officials, it may "go public" by 1995-2000. While the terms of this have yet to be defined, the need for additional capital to build and maintain infrastructure development is clearly forcing a change in policy direction from the strictly state-owned position.

An important issue to emerge in the 1990's for telecommunications policy in Indonesia, as well as other countries, will be tariffing. The question is how to charge for jointly operated international networks. The push toward low tariffs may put the lesser developed countries such as Indonesia at a disadvantage with revenue exchange. Obtaining a uniform policy in tariffs will constitute a major debate internationally. INTELSAT has a newly approved (May, 1989) resource based tariff policy which favors the lesser developed countries in this regard. With PT Indosat President Jonathan Parapak as the newly elected Chair of the Board of Governors of INTELSAT, such a policy is likely to be fostered over the next several years.

4.4 Malaysia

Malaysia seems to be beginning to recover from the recession of the mid-1980's even though the political arena remains clouded due to continued ethnic rivalry. Commodity prices are rising again and according to the World Bank's annual report (1987), "the recovery [is] led by 26% growth in manufactured exports" and "inflation is well under control." Predictions of GDP growth by an annual rate of 7% for 1988-1990 appear to be conservative. This indicator is a positive swing for the Malaysian economy which had been posting near zero growth rates just a few years earlier with a 0.5% official growth rate reported in 1986. Despite a deficit of 1.2 billion ringgit ($472 million) in 1987, there was a surplus for 1988 and that trend should continue when the accounts are tallied for 1989 and 1990. Only 18% of the Malaysian export earnings are needed to service its $20.5 billion long-term debt which puts it in a considerably better position than Indonesia or the Philippines. However, similar to Indonesia, oil export revenues remain low at the end of 1988. In 1989, electronics led other exports including agriculture in terms of earning foreign exchange with a total of 16.7 billion ringgit ($6.21 billion). U.S. investment in integrated circuits may reach 1.5 billion ringgit according to the Malaysia American Electronics Industry trade group.

The direction of foreign corporate manufacturing investment in Malaysia may be changing. The role of the western multi-nationals operating in Malaysia especially in the Penang region seems to be diminishing. The semi-conductor industry enjoyed a 20% annual growth rate for over a decade but that has since fallen off. Malaysia's free trade zone policy was intended to lure foreign business that would train and employ Malays, transfer technology and export nearly all of the products to bring in foreign currency. Little technology transfer has actually taken place and unfortunately for Malaysia, cheaper labor could be found in Thailand. Also, because of automation, labor needs have been greatly reduced in the semi-conductor assembly business.

Malaysia has had to retreat from its previous ambitious policies for development and seems now to be taking a more prudent path of encouraging resource-based, consumer and export-oriented industries while simultaneously courting foreign capital. With the seeming positive change occurring in the Malaysian economy, difficult political problems resulting from a race mix which has separated classes along ethnic lines still remains. It is therefore unclear whether or not the economy may fall back again.

While comprising only one-third of the total population of 14 million, the ethnic Chinese have been in control of business in Malaysia. The Bhumiputra, "the sons of the soil" as the Malay citizens are called, comprise 55% of the population. This group has generally been under-represented in the economic activity of Malaysia although they do enjoy political control with a very strong base in the rural areas. In an effort to even out the Malay participation in business, the government instituted a National Economic Policy (NEP) which has set a distributional target of achieving a 30% general Malay stake in share equity in the country by 1990. Whether this target has been reached has yet to be officially confirmed. The NEP, in effect, was a rationale for restructuring wealth according to race (Lowe, 1988). The NEP may be able to claim success in certain areas. For example, the Malaysian plantations systems now have 70% Malay controlling interest according to government figures.

However, as it has become clear that the 30% Malay corporate equity share goal would not be achieved in many sectors, a new privatization policy to support the NEP was begun in the mid-1980's announced through a civil service circular called, "The Basis and Guide for Transfer of Shares Owned by the Government to Bhumiputra." The guidelines issued included telecommunications as an opportunity for investment. On this basis, privatization and liberalization of telecommunications has begun in Malaysia.

In place of state-controlled entities in telecommunications, a new breed of organizations has begun to emerge, formed in part as a response to pressure on civil servants who have been given a personal as well as an ethnic stake in policy reforms. Public enterprises in telecommunications are now being replaced "with the new privatized firms largely owned and managed by retired or ex-civil servants of the same government enterprises" (Lowe, 1988). The former state controlled telecommunications authority, Jabatan Telecom Malaysia (JTM), is now basically a regulatory body. Syrikat Telekom Malaysia, Berhad, STM, has been given a license as a private organization for telecommunications development and operation. Among other conditions, STM has been given a mandate for developing telecommunications in the rural areas and maintaining the public telephones. The new system of regulation for Malaysian telecommunications is intended to protect Bhumiputra interests. This means that foreign investment will have to be conducted under proxies allied in joint ventures.

Currently, Malaysian policy is for wholly owned, limited liability companies such as STM to be floated publicly. As a consequence, STM is in the process of being privatized. As a semi-autonomous corporate organization, STM is scheduled to offer public shares by the end of 1990.

In reality however, the government of Malaysia controls and will continue to control a majority share in STM. The government interest will insure that control of STM is not entirely the private affair of STM.

In such a state of semi-privatization, STM has been able to begin a reorganization process to make the company more efficient. Yet, it is still under the policy control of the government which, lacking an overall strategy for services provision, continues to saddle STM with problems of unclear guidelines for service development.

The direction of privatization of telecommunications in Malaysia is step-wise with deregulation perhaps to follow the financial stabilization of a privately financed STM. With ever increasing demand for more and higher quality services, government licensing for private provision of non-basic services such as radio paging will continue. The question of a license being granted for a second operator to provide basic services in competition with STM is also not out of the realm of possibilities in Malaysia. However, firm mandates for providing rural services would need to be established so that STM would not bear the entire burden of capitalizing rural services which generate less revenue or operate at a loss as compared to services in the urban areas. This could put STM at a severe competitive disadvantage to a private telecommunications provider and has been the argument in many countries for a continued government monopoly. Thus, the Malaysian government must strike a balance between encouraging private sector telecommunications development and the necessity to maintain a monopoly in public switched networks to subsidize rural telecommunications development.

It has been suggested that STM's role be reduced to that of a common carrier in the future and that competition will be introduced in other telecommunication services areas. However, policy for telecommunications development will continue to be the pervue of the government. In fact, with increasing liberalization for the provision of services, regulatory policymakers may be ready to re-assert themselves again with the placement of conditions to privatize. Whatever the final path that is set for STM, clearly increasing privatization is leading to further deregulation and liberalization of markets for more competition in telecommunication services in Malaysia.

Currently there are approximately 28,000 staff and employees of STM. While this number will remain fairly constant, new skills are needed in the areas of computers and software, marketing and finance. The costs of retraining are high. In terms of sales, normal marketing activities of a completely private firm are somewhat stymied since it is difficult to lower the previously high sales salaries in exchange for commissioned sales. Changing attitudes is a slow process both for employees of STM in a new, more competitive environment as well as for the government to learn the advantages of keeping hands-off of the business activity of STM.

In the next five year period, 1990-1995, STM plans to invest approximately 1 billion ringgit (US$370 million) per year for network and services expansion. Approximately 20% will be for switching, 20-25% for local networks and cabling, 20% for transmission equipment, 10% for international direct dial services and 5% for computerization of operations. The remainder will be primarily in building and land acquisitions. This investment does not include the operating expenses.

STM has no intentions of getting funds from the government for investment purposes and likewise the government is not looking to sink further capital into STM. Supplier credits and competitive financing packages will be important determinants for selection of vendors. While STM has approximately 1/2 billion ringgit (US$185 million) in back reserves, its debt equity is about 1.6 billion ringgit (US$593 million). That will need to be brought down to about 1 billion ringgit before floating of public shares on the Kuala Lumpur Stock Exchange. The offer of public shares, due for the end of 1990, will be the major source of corporate financing for STM.

STM has done rather well in terms of keeping up with demand for telephone service. Even with approximately 11.5% demand growth for phones per year, wait lists have been trimmed over the last several years although some 68,000 potential customers still remain waitlisted. Interestingly, STM admits to an over capacity of main lines available which could in effect eliminate the waitlist entirely. Unfortunately, that capacity is not located in areas where recent rapid urbanization and development have occurred. This problem is not unique to Malaysia. Efforts such as those by the Asia-Pacific Telecommunity, APT, based in Bangkok, to set-up databases for communications traffic forecasting are needed in order to better plan the infrastructure development patterns.

Improvement of services, including new installations, along with the restoration and upgrading of existing systems are important. With approximately one million home customers and four thousand business customers, STM, in Kuala Lumpur especially, will look for local service improvements which are needed in terms of quality upgrades in the network.

Perhaps the most difficult questions in terms of the privatization process for STM still remain. Government decisions on service provision mandates and allowance of private sector competition in services is unclear. For instance, STM has spent considerable funds in research and development of some mobile services which the government has just recently decided will be licensed to a competing entity. Without a strategic policy, it will be difficult for STM to operate effectively as a private competitor. In addition, more competitive tariffing policies will need to be considered in order to make use of STM services over other leased services (Daud, 1989). While STM is promoting its data services (MAYCIS and MAYPAC) to businesses, it may be too late to include in terms of options to users who see private leased lines as a cheaper and more efficient route.

Nonetheless, the moves toward privatization of telecommunications in Malaysia are expansive and far-sighted. It is important to note that private telecommunication organizations are playing a leading role in the privatization efforts in Malaysia. The participation of Cable and Wireless of Hong Kong in the moves toward privatization and for other multinationals such as Alcatel in gaining access to the large customer premises equipment (CPE) market cannot be ignored. Market stimulation for services through more competitive tariffing and increased private financing will help create stronger and higher quality network infrastructure and services in Malaysia.

In addition, there appears to be a growing demand in Malaysia for data transmission both within the government and for private industry. A difficulty remains in terms of addressing the market size and level of computerization. The Malaysian Administrative Modernization and Management Planning Unit, MAMPU, of the Prime Minister's Department has been charged with studying government computerization and telecommunications network needs. A Malaysia Federal Telecommunications Review study was begun in 1989, however, the results are as yet unavailable. In the private sector, the Association of Computer Industry Malaysia, PIKOM, has undertaken a survey of the Malaysian computer industry to assess the market size and level of computerization among the different industries. Preliminary results are due late in 1990. These efforts should help policymakers in determining the direction of data telecommunications regulation in Malaysia in the future.

The political necessity of increasing the Malay stake in the evolution of telecommunications businesses will probably slow somewhat the expected growth and competition in this area. Foreign businesses will need to understand that success will be measured only in the long-run and that short term sales gains will be very difficult to realize. In addition, the current policy structure will also force foreign investment in Malaysian telecommunications to take on the demands of rural telephony as well as invest in the more lucrative urban markets. Firms unwilling to make this investment into the development needs of Malaysia will be effectively shut out of the market.

In general, the implementation of the privatization scheme in Malaysia has led to the deregulation of the telecommunications industry (Ahmad, 1988). The effects of this are already seen in the area of the rapidly expanding data communications networks. The Malaysian Packet Switched Data Network (MAYPAC) was launched in two phases in 1984 and 1985 offering packet switched services nationally and internationally. This network continues to expand with an emphasis on the provision of new services. Beside the numerous government agencies, a number of financial and insurance companies are now using MAYPAC. The number of subscriber organizations to this service was expected to reach 600 by the end of 1988. In addition, market trials have just begun for Telita, an on-line information retrieval system based on Britain's Prestel.

A number of new data communication services have been proposed for Malaysia including a circuit switched data network called MAYCIS to complement MAYPAC. Other new services proposed include a teletex service to provide rapid transmission of text on the MAYPAC network, telemarketing services and phone-in buyer's and entertainment guides, and a public Electronic Mailbox service (PEMS) which will also operate on the MAYPAC network as well as the public switched telephone network. Other new data networks are also being developed among the various educational institutions of the country.

Currently, Malaysia is investigating the development of ISDN (Integrated Services Digital Networks) and its applications in the Malaysian context. Based on the Malaysian Industrial Master Plan, a niche-oriented strategy for ISDN services and equipment provision has been adopted. That is, firms will be required to invest in new technologies before the market potential is fully known. While this may appear to be a risky investment opportunity for American telecommunications firms, again it must be seen in the context of a climate which may only allow a long-term return on investment. It should also be noted that Malaysia has been very active in the formation of policy for standardization in telecommunications and has aligned itself with regional and international standards. The Standards and Industrial Research Institute of Malaysia (SIRIM) and JTM are moving toward the establishment of Malaysian standards for communications which are within CCITT and CCIR standards (Hamid, 1988). While not necessarily placing stringent conditions, Malaysian policy will be to adopt technologies and implementations that adhere to these standards.

As in many developing countries, modernization and change often put traditional values and development goals in conflict. There are those in Malaysia who see telecommunications development as a two-edged sword. On the one-hand, the need to improve telecommunication infrastructure and services is viewed as a necessary ingredient to meet economic and social development goals. On the other hand, telecommunications opens up the country to international economic, political and cultural influences as well. With a precarious stability in the ethnic composition of the country, a gradual erosion of traditional Malay culture will bring into conflict the highly prioritized cultural identity policy with pressure to "westernize" in order to develop socially and economically (Awang and Wan, 1986). This leaves policymakers with a paradox in terms of trying to enhance a cultural base of indigenous Malay and Islamic values while pursuing ever increasing economic expansion and private enterprise in the global marketplace.

4.5 The Philippines

Telecommunications ownership, authority and control in the Philippines are a marked contrast to that of the other ASEAN countries. Due to American dominance since the end of the Spanish-American War when the U.S. acquired the Philippines as a territory, the structure of telecommunications in the Philippines is essentially that of private ownership with government public utility regulation not unlike the structure of telecommunications in the United States. Until 1967, the primary telephone company, Philippines Long Distance Telephone, PLDT, was wholly owned by GTE of the United States. GTE divested to a group of Filippino businessmen when it was discovered that equipment supplies for telecommunications were being monopolized through payoffs.

Although the telecommunications systems are privatized in the Philippines and are therefore unlike the monopoly, state-owned and controlled telecommunications authorities of the other ASEAN nations, the conditions of the telecommunications networks in the Philippines are not unlike those of Indonesia, Malaysia and Thailand in particular. With a high concentration of the available services provided in urban areas, there are still 13 provinces in the Philippines without phone service.

A single carrier (operator) per service area is franchised to provide local telephone service. A total of 58 different companies provide telephone, telex and telegraph services. PLDT is the largest telephone company and accounts for 94% of the total telephone line units. PLDT provides local telephone service in addition to domestic and international long distance service. Radio Communications of the Philippines, Inc. (RCPI) controls 65% of the domestic market for telex and telegraph while Philippines Global Communication (Philcom) and Globe-Mckay Cable and Radio Corporation (GMRC) control the major share of the international telegraph and telex markets respectively. There are a total of four private international records carriers and nine domestic carriers. The government-owned Telecommunications Office, TELOF, (formerly the Bureau of Telecommunications, BUTEL) operates

68% of all telegraph stations in the Philippines predominantly in rural areas and areas not covered by the private companies as the TELOF charter requires. However, TELOF has a less than 5% share of the total telephone market and a less than one-third share of the telex and telegraph market. In seven municipalities, TELOF competes directly with private companies (Aquino, 1988).

The urban/rural dichotomy of service witnessed in the other ASEAN countries (except Singapore) is repeated in the Philippines with 73% of all the telephones concentrated in the metro Manila area and an additional 13% in other major cities. Of the 216 telephone exchanges, 147 are on the island of Luzon wherein lies Manila. The national teledensity for the Philippines is only 1.61 per 100 people (projected for 1990) and 9.64 per hundred in the metro Manila area.

In 1979, the Ministry of Transportation and Communications (later called Department) was created with the goal of providing infrastructure for development. A National Telecommunications Commission (NTC) was set up as a regulatory agency on the model of the U.S. Federal Communications Commission (FCC). Policies to rationalize the industry continued through 1982 encouraging mergers of telephone companies and giving directives for a single, compatible network for voice and data. Development of telecommunications in rural areas has been given higher priority recently as the complex problems of poverty and the long history of rural insurgency is finally being addressed in more than just political terms. The development of the telecommunications sector is only a part of the overall rural transformation goals. Under the Aquino administration, a much greater development priority has been placed on telecommunications expansion.

International communications are provided by five submarine cables and links with Intelsat and Palapa. Undersea cables link the Philippines with Okinawa, Hong Kong, Singapore, Taiwan and Guam. A new US$709 million fibre optic cable system is being constructed with participation from eight international organizations including AT&T which will link the Philippines with digital circuits spanning the Pacific.

Satellite services have been used since 1966 when the Philippines Communications Satellite Corporation (Philcomsat) became a member of Intelsat. Philcomsat also joined Inmarsat in 1981. With 85% of the Philippine's merchandise transported by sea, growth in the use of Inmarsat will continue with many Philippine ports clamoring to be linked with the maritime satellites.

Domestic satellite service is provided by Domsat which has one master station in Manila and 11 earth stations in the rest of the country. Domsat leases a half transponder from the Indonesian satellite, Palapa, primarily for television transmission.

On a local level, one paging service is in operation in the Manila area and the NTC has recently has as many as seven service applications for new paging services. Also, one application to provide an electronic mail link between the Philippines and the United States has been before the NTC.

PLDT operates a cellular radio telephone service primarily in the metro Manila area and is increasing capacity to accommodate 3,000 subscribers. Express Telecommunications Company, Inc., has been authorized to also provide cellular radio telephone service in Manila and will connect with the PLDT network.

It is clear from the above that the communications sector is extremely complicated in the Philippines. It exhibits all the characteristics of competition based on the U.S. model, but, is subject to more intervention and control by the government. Competition is nominal, however, as PLDT in conjunction with its subsidiary Philtel account for 97% of the telephone market. Rural telephony is provided principally by the government. Only the cities of Manila, Baguio, Cebu and DaVao have good domestic and international service. As a result, many corporations and individuals operate illegal private high frequency radio telephones.

The administrative regulatory structure of telecommunications in the Philippines is presented in Figure 2.

The existing framework for telecommunications regulation consists of three major principles. The first principal is that only franchised corporations are allowed to provide telecommunication services whether or not a company has the technical and financial capabilities to do so. The national Congress of the Philippines approves operating franchises. Secondly, the policy on protection ofprior investment puts an effective cap on competition in areas where it is deemed that adequate service is already provided. This policy in effect creates a monopoly for PLDT in many areas. Thirdly, rate structures for various telecommunication services are regulated with the aim to provide a fair, reasonable and non-confiscatory return on investment.

The official Telecommunications Policy established in May of 1987 has begun to pave the way toward some deregulation. Subject to type approval, some customer premise equipment, CPE, are no longer required to be operator provided. Since rates for the rental of CPE are still included in the rate charges (rates are "bundled"),

Figure 2

Administrative Regulatory Structure of Telecommunications in the Philippines

Department of Transportation and Communications (DOTC)

Office of Under-Secretary of Communications

Formulates and recommends guidelines for network systems and directs research and development programs.

National Telecommunications Commission (NTC)

The regulatory arm of DOTC which controls public and private service except for military communications and has quasi-judicial powers.

Legal Department:

Drafts regulations for NTC and formulates all negotiations with ITU and ASEAN.

Telecommunications Planning and Development Department:

Monitors the regulatory activities of the 8 regional offices of the NTC.

adding non-operator provided CPE to the network is still subject to rate and tariff approvals.

The major problem with the development of telecommunications in the Philippines is finance. Some funding has come from the government of Germany and the Seimans corporation which is a major supplier of telecommunications equipment to the Philippines. In February, 1988, Seimans offered to donate optic fibre cable linking two islands. Although previously tried in Singapore, the Philippines is providing the first commercial test of this technology, called Minisub, combining radio and satellite transmission for interisland linkages.

The Japanese government's Ninth Yen Fund for Overseas Cooperation (OECF, Overseas Economic Cooperation Fund) provided for a 960 channel backbone transmission network with 24 repeater stations. The Japan International Cooperation Agency conducted a feasibility study for a Regional Telecommunications Development Project (Phase A). The total cost of the project is estimated at 7.6 billion yen and the Toyo Corporation of Japan serves as a major contractor. Phase B of the project will be completed in 1990 with a thirteenth year Yen Credit Loan Program amounting to $38.7 million. NEC is likely to provide the equipment for 8000 new lines, five microwave links and nine cable transmission links.

PLDT has sought funding from the International Finance Corporation, the private investment arm of the World Bank. The $24 million loan will be for modernization of its virtual monopoly long distance service by providing a digital electronic exchange to service a 10,000 line telephone network using fibre optic cable.

For the future, the Department of Transportation and Communications has launched a new program designed to provide equity in teledensity across the Philippines called the National Telephone Program (NTP). It will provide a public sector operated telephone backbone running from north to south in the archipelago. For this purpose, the Department hired the firms Teleconsult International of Washington, D.C., and Sycip, Gorres, Velayo (Manila based) to design a least-cost strategy to implement the NTP. The plan calls for 380,000 new telephone lines to be added to the approximately 900,000 existing lines (mostly owned by PLDT) which will be installed at a cost of one billion U.S. dollars in 188 cities and municipalities (Teleconsult International, et. al., 1988). The implementation will occur in three major phases. The first phase, anticipated to be completed by the end of 1990 will add 138,000 new lines in 85 municipalities at a total cost of US$369 million. Funding will be provided through the World Bank and local credit institution loans and an Equity Contributions scheme which will issue stock under a subscriber investment plan.

ISDN is also being introduced in the country for which officials from the Deutsche Bundespost had been invited to conduct seminars. None of the carriers except PLDT are enthused about ISDN because of the current voice and data services operational dichotomies. Since ISDN calls for the integration of voice and data exchange into a single digital network, it is easy to understand the position of the relatively small records carriers who fear they would be pushed out of the market by the near monopoly voice carrier, PLDT.

There is, however, enthusiasm for Datanet which is a proposed 539 node packet-switched network system to operate with the PLDT plant. NEC is also currently testing mobile telephone systems with 500 subscribers for the busy highways on Luzon.

On the whole, the Philippines will continue to have a complex network system that leaves a wide gap for telecommunication services between the urban and remote areas. The objective for the future is to bridge this gap through the NTP but the hurdles are formidable.

With a foreign debt in excess of $30 billion, the Philippines has been forced to reschedule some debts maturing after 1986. Political problems make it unlikely that significant financing can be raised from international organizations and bankers. The IMF, in return for supplying standby credit, has required the Philippines to accept a financial discipline including limits on budgetary deficits. Since the country provides such a large potential market for the use of telecommunications including space sector equipment, it appears that supplier's credits would probably provide a partial solution to the paucity of funds for the development of the telecommunications infrastructure.

4.6 Singapore

Singapore's economic and social development over the last thirty years is nothing short of phenomenal. By 1976, the contribution of the primary information sector to GDP was 26% in Singapore (Jussawalla, 1988). The information sector, which includes telecommunications activities, has been growing ever since. The Republic now stands as the economic and technological leader of Southeast Asia and ranks proportionally with Japan and the industrialized West in terms of information economy activity (Kuo, 1987).

Singapore became self-governing in 1959 when Britain was decolonizing its possessions in Southeast Asia. Singapore was included in a plan along with Sabah and Sarawak on the island of Borneo to form the expanded

Federation of Malaysia. This federation was formally setup in September 1963. However, the predominantly ethnic Chinese leadership of Singapore was constantly in disagreement with the Malay leadership in Kuala Lumpur. Singapore was separated from the Federation on August 9, 1965 and formed an independent state.

A policy to allow multi-national corporations (MNCs) into Singapore began an industrial building process for the new nation on a level unmatched in the region. Many MNCs were looking to relocate away from Taiwan and Hong Kong which were perceived as too close to China during the troubled Cultural Revolution in 1966. The new semi-conductor industries came to Singapore and quickly absorbed its large unemployment pool. In the late 1960s, a key policy to enhance education with a stress on technical schools and universities began a process of transformation from what had been characterized as just another third world a few years previous.

The availability of skilled-workers and the continuation of MNC development in Singapore created a new engine for development. As a result, Singapore has become one of the world's largest producers of computer, peripherals and various electronic sub-assemblies (Swee, 1988). In addition, financial institutions could find a solid base in Singapore and economic activity was broadened.

Singapore is a city-state with a population of 2.6 million people on 233 square mile island off the southern tip of western Malaysia. This tiny but dynamic nation has a long-term goal to become a major global information and knowledge center. Consequently, the development of telecommunications services are regarded as an essential infrastructure to national economic and social development. According to Chia (1986), "The development process of our [Singapore's] economic system and of telecommunications go hand in hand as economic development creates demand for more and better telecommunications. The availability of better, reliable and faster telecommunications in turn makes it possible to develop the growth of efficient industrial and commercial organizations that rely more and more heavily on dependable high quality communications."

The Singapore government has a strong commitment to the building of a high quality, supportive telecommunications infrastructure (Kuo, 1989). Singapore Telecoms is the state-owned and operated monopoly organization which deals with all domestic and international telecommunications matters. Telephone density has increased steadily over the past two decades to nearly 47 per 100 population. While ranking even with Hong Kong, only Japan has a higher telephone density in Asia. Without the encumbrance of a large rural population or geographical area, the telecommunication systems have very quickly become first rate. The entire country of Singapore is a concentrated, moderately sized urban area smaller than just the capital cities of four other ASEAN countries. It has been possible therefore to provide extensive telecommunication coverage and services without the burden of the other larger country's development problems.

Singapore Telecoms has revenues of approximately S$800 million (US$421 million) annually and is planning to invest S$2 billion (US$ 1.053 billion) through 1992. It has already invested S$1.7 billion in the passed five years. As of 1990, Singapore is the 33rd largest telecommunications equipment market in the world, a remarkable position considering the relatively small size of the country. The estimated value of this market is US$427.7 million for 1990 and is projected to increase to US$625 million by 1995 (Telecommunications Research Centre and Research Logistics, 1989). Switching equipment will account for the major portion of expenditures, amounting to US$135.6 million in 1990 and reach US$176.9 million by 1995. Transmission equipment expenditures will reach US$121.7 by the end of 1990 and then slow somewhat. In addition, data communications expenditures will increase to US$72.6 million by 1995.

Singapore Telecoms is expanding beyond the borders of Singapore with more and more foreign investment and is beginning to provide services and expertise to other telecommunications authorities in other countries. Currently, Singapore Telecoms has joint venture investments in Thailand, Sri Lanka, Mauritius and Saudia Arabia. In addition, Singapore Telecoms is looking to establish itself as a multi-national corporation in Brunei and Indonesia with an eye on China as well. Its strategy is to provide international marketing, form alliances to provide services and provide consultancy services for planning, operations and maintenance.

With its aggressive policies for telecommunications infrastructure development, Singapore Telecoms has succeeded in developing and maintaining a highly sophisticated telecommunication system and continues to lead in technology adoption. In 1983, the Republic became the first nation in the world to have a 100% push-button telephone system. Just this past year, Singapore Telecoms was the first organization in the world to install AT&T's new 5ESS digital switch as an international gateway switching system. At a total cost of $40 million, a first switch was installed in July 1988 with the second installed in late 1989.

Singapore is also positioning itself competitively to take advantage of future global markets. The evolving push toward ISDN coupled with making affordable and profitable broadband networks based on ITU standards of compatibility will help put Singapore on the forefront of telecommunications development. With 6,000 miles of fibre optic cable already laid in Singapore, 26 telephone exchanges are now completely digitally linked. Limited commercial ISDN service began in December 1988 developed by Fujitsu of Japan. Currently, Singapore Telecoms is seeking bids for 300,000-500,000 digitally switched lines which will be compatible with the Fujitsu developed ISDN terminals. This contract alone is worth $75 million (Telecommunications Research Centre and Research Logistics, 1989). Clearly, Singapore is putting its pocketbook in full support of its policies.

In addition, Singapore has progressed though a series of tariff reductions in the past several years making telecommunications among the cheapest in the world. This in turn has begun a cycle for greater utilization of international communications by businesses and residents. Outgoing international calls have increased to an average of 12 per person per year from 1987-1989, which are among the highest rates of use in the world. These examples show that the argument for the liberalization of markets for competition of services is limited in context in each country.

The shift in Singapore's economy to high-technology, information-intensive industries is based on the premise that, as these activities expand in scope and volume, there is a concomitant increase in the share of GDP arising form the value-added which originates from the production and distribution of information intensive goods and services. This feature characterizes Singapore's information economy (Jussawalla, 1988). The growth of export-oriented production has boosted the information services sector. Being linked to the operations of transnational corporations, the information systems of subsidiaries located in Singapore have become interconnected with a worldwide network of computers and satellites.

An aggressive policy to achieve the complete digitization of telecommunications networks is a major goal in Singapore and Singapore Telecoms is committed to a strong development plan in information technology. The National Computer Board (NCB) was established in September 1981 to coordinate and implement national computerization plans. A plan was advanced in December 1986 which has become a part of the national economic development plans. The NCB is seen as a strategic partner of Singapore Telecoms and is using the telecommunications infrastructure to promote NCB globalization. The extent of digitization in Singapore is impressive. Along with France and Japan, Singapore is the only other country in the world today that has installed fully equipped digital switches ready to provide ISDN services in the public switched network.

Singapore spending for information technology is now the highest in Asia at a rate of US$13.3 per $1,000 GDP (Mitsubishi Research Institute, 1986). The distinctions between the mass media, telecommunications and computerization are blurring rapidly in Singapore with the introduction of information technology on a large scale. The telematics merger is clearly seen in Singapore. Numerous databases and value-added services are now available or being planned as nearly 60% of all businesses with 10 or more employees are computerized (Zaobao, 1988).

Singapore has also recently launched (late 1988) a two-year field trial for a videotex information service called Teleview. This extensive telecommunications network will include both broadcast and telephone line transmission of information to businesses and homes with an array of end-user terminals to access the network's envisioned services. These services include tele-banking and tele-shopping, business communications, directory services, brokerage services, interactive on-line education, travel information and a host of entertainment services including magazines and games. Like most videotex systems being developed and implemented world-wide, Teleview is facing a similar problem of providing the actual services which the system is capable of delivering. A major challenge will be to provide incentives for businesses to create and maintain services for Teleview.

Singapore Telecoms already provides an array of services on its public switched telephone network (PSTN). Services include Telepac, a remote computer packet-switching data service; Travelnet, an airline reservation network, Telebox for electronic messaging; Remote Memo Service, a portable radio paging systems and tele-metering, alarm and control systems as well as telephone features services through Phone-Plus offering call-waiting, transfer, three-way conferencing, speed-dialling and answering services. Growth in telephone service has averaged 13 percent over the last decade. Telephone access lines are expected to increase to 962,000 by 1990 up from 796,482 in 1985.

Most equipment is procured through competitive bids put out by Singapore Telecoms. In addition, direct acquisition contracts for specific equipment needs are awarded as well as concessionary and developmental contracts. It should be noted, for example, that while Singapore is spending $40 million for its 5ESS switches from AT&T, the later in turn is providing Singapore with a $40 million investment commitment including training center over the next five years.

Already as of 1985, there were over 150 telecommunications firms in Singapore and over 750 computer, peripheral, software and network services suppliers (Asia Computer Directory, 1985). Competition is keen, however, and the market is projected to remain strong over the next several years for telecommunication and information system technologies and services.

Perhaps the most significant trend in Singapore has been the ability of a government owned and controlled entity to keep abreast of technological developments and provide complete telecommunications services. Where economies of scope for the public sector telecommunications authorities are being constantly reduced by innovative technology developed in the private sector, Singapore Telecoms has been in the position to simply purchase that new technology outright and incorporate it into its systems. The erosion of economies of scale which may compel a shift to more liberalized policies in other countries is simply not taking place in Singapore.

Singapore Telecoms is also the monopoly provider for data transmission lines for the flourishing financial businesses of Singapore and also provide the connections for such networks as the Singapore Mercantile Exchange linked with the Chicago Mercantile Exchange and TradeNet, an international trade document exchange network created in a collaboration of government agencies and trade associations and now operated by Singapore Network Services Pte. Ltd.

Nonetheless, other factors are beginning to shape a structural shift in Singapore. With reciprocity in telecommunications trade at issue in the Uruguay Round of the GATT talks, Singapore is concerned that holding its position vis-a-vis other countries will be more difficult if it does not begin to open its own markets and services. With Singapore's expanding interests into markets of other countries, it will be under increasing pressure to liberalize markets at home. In addition, the need to change the cumbersome nature of internal procedures as a Statutory Board is cited as a reason to move toward a more efficient private organization.

This liberalization and privatization process will be slow and well planned in Singapore. It is not likely that services, even non-basic services such as paging, will be opened to competition in the next several years. However, the first steps toward opening Singapore Telecoms to outsiders will be in the form of nominal privatization. Currently, Singapore Telecoms has under study plans to implement a privatization program. Nine companies have been invited to submit proposals for the privatization scheme. It is expected that one or more of these companies will then act as an advisor for the privatization program. Singapore

Telecoms has a possible market capitalization of S$10 billion (US$5.26 billion). It is expected that flotation of Telecoms stock on the Singapore Stock Exchange (SES) could come in 1992 or 1993. Singapore Telecoms will be the first Statutory Board to be privatized in Singapore. Nonetheless, it is expected that initially, the government will continue to hold a 90% share.

The Singapore telecommunications systems are already among the most advanced in the world and will continue to expand. With an aggressive planned growth approach, Singapore will be well positioned in global telecommunications markets of the 21st century. With the push to become a major international telecommunications center in the world, Singapore is now beginning to face very critical issues in trade policy and data trade as a part of overall international trade. The merging of telematics and trade issues will become the most critical in terms of policymaking for Singapore into the 1990's .

4.7 Thailand

Thailand, meaning "Land of the Free," is the only Southeast Asian country never to have been colonized by a Western power. Except for a brief occupation by the Japanese in World War II, Thailand has remained independent for nearly 700 years. Thailand is also relatively unhampered by racial and religious prejudices which tend to divide other ASEAN countries. Thailand is a Buddhist kingdom with a unique form of constitutional monarchy and enjoys its own very distinctive culture in art, literature, dance, music and architecture.

Agrarian activities primarily engage seventy-five percent of Thailand's population although these activities now represent only 20% of GNP. A dynamic private sector in Thailand has initiated major growth and expansion in new industrial areas in recent years and with relatively limited government control over private industry, a free enterprise system has emerged in Thailand.

As a result, Thailand is beginning to perform in ways similar to Asia's "four tigers", namely, Taiwan, Singapore, Hong Kong and South Korea. Thailand could become Asia's newest NIC (Newly Industrialized Country) by the end of the century. GDP growth was just over 10% for 1988 and exports were up by one-third over the previous year to 400 billion baht (US$46B).

The strain of this rapid economic growth on Thailand's transportation and communications systems is being felt. The telecommunications system is often described as appalling from the point of view of the public user.

Despite the strong private sector in Thailand, telecommunications development and control is still largely a government affair with very little signs of movement toward a more deregulated, less monopolistic environment. Despite the rapid economic growth, the telecommunications sector has not kept pace as rather myopic correlations between GDP and telecommunications development would otherwise indicate. Phone demands have increased sharply and the Telephone Organization of Thailand, TOT, is extremely hard pressed to provide even adequate basic service.

Three agencies, namely, the Telephone Organization of Thailand, TOT, the Communications Authority of Thailand, CAT, and the Post and Telegraph Department, PTD, are responsible for Thailand's public telecommunications and postal services. The somewhat overlapping functions of each organization tend to create tensions over turf rights resulting in inefficiency and disharmony for Thailand's telecommunications systems.

TOT and CAT are wholly state-owned autonomous corporations managed by a government appointed Board of Directors. PTD is a government department within the Ministry of Communications.

TOT is responsible for the operation of domestic local and long-distance public telephone services and international services largely to neighboring countries. CAT operates the public international telephone service except to neighboring countries and interconnects with TOT. PTD regulates, manages and monitors radio frequencies and licenses private and public radio communication stations. PTD also represents the government on all international telecommunications matters including representation to Intelsat. Somewhat confusingly, CAT operates the postal service, not PTD, as the name of this government department might imply.

Despite steady growth, Thailand's overall debt burden caused a major cut back in government spending in 1984 and an annual cap of $1 billion was placed on public sector foreign borrowing since 1985. While Thailand's debt service ratio fell to 13% in 1986, the borrowing ceiling has affected telecommunications which is especially vulnerable due to the need to import most of the telecommunications equipment for improvement and expansion of the system (White, 1988).

Thailand now faces similar questions that South Korea faced several years ago. Should government borrowing be stepped up heavily to build infrastructures and to develop education to make Thailand competitive? Even if the debt ceiling were to be raised, the ability to achieve efficiency in spending in state-managed projects remains questionable and could result in Thailand not living up to its growth and development potential.

So far, Thailand has not been altogether successful in advancing its position in the field of telecommunications. Recently, an "offshore" data processing zone (DPZ) was proposed where international companies could store and move data through a Thai-based telecommunications zone equipped with high-speed ground cable and satellite links. These links would be separate from the existing domestic telecommunication systems. The major impetus for the project was Thailand's insistence that a new airline reservation system (Abacus) between Thai Airways, Cathay-Pacific Airlines and Singapore International Airlines be based in Thailand. Unfortunately, Thailand lost the battle; Abacus is based in Singapore and the Thai government has stated publicly that Thai Airways should not therefore join the system. This move will of course put Thai Airways at a disadvantage to its two major competitors and the DPZ will also not be built anytime soon. This is but one example of how inefficiencies in politics and management result in a slowing of the economic development potential for Thailand (Handley, 1989).

There are only 1.8 telephones per 100 population in Thailand and the phone system is plagued with static and numerous wrong numbers. It can literally take hours to place a long distance call when TOT lines are tied up and the interconnect to CAT is functioning erratically. The installation of a new phone is extremely difficult to obtain. While many new business complexes are getting one phone per tenant office, it is difficult to get more. The waiting list for a telephone is estimated at approximately 300,000 people, some of whom have been on the list for 10 years. Despite the relatively low monthly charges for phone service, installation costs are very high. The application deposit, usage deposit and installation charge can total anywhere from $600 to $1,500 (see Table 2 for an ASEAN comparison). The use of a voice-grade circuit for data communications costs much more.

TOT began a $1.72 billion five-year program in 1987 to expand to 2 million access lines and also to install 10,000 lines for mobile cellular telephone service. It is reported that this project is already behind schedule and will not meet its 1991 completion date. In addition, with the emphasis on expansion, maintenance on existing lines is also falling behind.

Despite the fact that CAT and TOT post similar annual net revenues of approximately 2 billion baht ($80 million), CAT is in a much stronger financial position compared to TOT. This is due to the capital spending needs of TOT and heavy debt of 24 billion baht. This debt was serviced at

Table 2

Comparative Costs ($US) for Installation Charges and Monthly Charges for Telephone Service in Selected ASEAN Countries

	Malaysia	Indonesia	Thailand
Wait Period for Service:	1 day to 1 month	1 week to indeterminable	6 months to 10 years
Installation Charges:			
Business	No charge ($100 deposit)	Up to $3,000	$600-1,500
Residential	No charge ($100 deposit)	$120-300	$600-800
Monthly Line Charges: (local service)			
Business	$20-40	Time sensitive, Approx. $0.04/3 minutes	$20-30
Residential	$10-20	$0.04/3 minutes	$5

	Singapore	Philippines
Wait Period for Service:	1 day to 1 month	2 months to 3+ years
Installation Charges:		
Business	$25	$60-100
Residential	$25	$15-40
Monthly Line Charges: (local service)		
Business	$12.50	$20-30
Residential	$8	$3

Sources: Various telecommunication authorities in each country and a small informal sampling of business and residential users in each country.

one-fifth of TOT's gross income of 7.5 billion baht in 1987 (Charmonman, 1988).

The current plan (Fifth and Sixth Development Plans) which are to run through 1991, call for the installation of 1.2 million phone lines in Thailand. To date, approximately 750,000 of those planned lines have been installed. In addition, TOT's urgent Sixth plan called for the installation of another 200,000 phone lines for the Eastern Seaboard industrial plants. The first 100,000 of these is being installed under two separate contracts to Ericsson and NEC. When the plans are complete, TOT estimates that there will be approximately 2 million phone lines in operation with the need for at least 1 million more to cover the existing waitlist and anticipated further demand. A target of 3 million lines is being set for the Seventh Development Plan (1992-1996) although some estimates have put that demand as high as 6 million new lines. However, under current budget and debt limits set, only about 200,000 additional lines per year could be financed by foreign loans guaranteed by the government and through the TOT budget.

Providing basic telephony service in Thailand is still critical. The high capitalization costs to install the needed phone lines, upgrade current systems and to operate and maintain at a higher level than is now undertaken has put growing pressure on the Thai government to begin to make changes in the structure of TOT. While Thailand would seem to be a likely candidate for the privatization of its telecommunications entities, that is unlikely due to the internal political conditions of the country.

Under one scheme, of which the United States is a strong proponent, TOT would be privatized. The U.S., through the NTIA (National Telecommunications and Information Administration), recently called for the rapid privatization of TOT and a merger with CAT, the Communications Authority of Thailand, responsible largely for international telecommunications. The privatization plan, however, is looked at with considerable doubt by Thai officials as the assumptions under which a privatization scheme would work in Thailand are, according to them, not correct. The need for the Thai Parliament to amend the statutes of TOT and CAT is highly unlikely in the vulnerable period the government now finds itself in. In addition, the very strong trade unions of TOT and CAT have consistently opposed any privatization scheme. In any case, it would take at least another two years for a first offering of TOT stock which would not help the more immediate needs.

Although understanding that telecommunications development is important, the Thai government does not see the need for such an urgent priority to be given to the telecommunications sector and is unwilling to make rapid changes in TOT structure. Instead of a structural change, the government is encouraging investment in and operation of public communications services by private sector participation.

In this regard, The Sixth National Economic and Social Development Plan of Thailand (1987-1991), which is a concurrent update of the Fifth plan, states that "...the role of the private sector in national development should be enhanced both in production and in provision of infrastructure services hitherto provided by the government" (National Economic and Social Development Board, p. 5). The plan further concludes that the state should "Encourage private sector participation in investing in and operating public communications services. For example, joint investments, leasing and partial or total takeovers will be allowed" (ibid, p. 285).

The government is beginning to support, therefore, private concession developments for some telecommunications services as a response to the need to find sources of funding not met by the state budget. These developments include the allowance by the Ministry of Transportation and Communication for the establishment of domestic satellite-based data transmission links with banks and other institutions and manufacturers who need reliable data services. This move toward the privatization of telecommunications markets apart from the public switched network may prove fruitful and could eventually help to push for overall improvement in domestic services.

Thus, in order to be able to meet its targeted plans, TOT is proposing a Build, Operate and Transfer (BOT) scheme similar to that in Indonesia several years ago before the change in the latter country's telecommunication law. Given the extended period needed in Thailand to make structural changes, the BOT scheme is seen as a means by which to finance the infrastructure development proposed. Under such a scheme, no laws would need to be amended and TOT will remain the monopoly operator of telephone services. While this solution may not satisfy those who wish to see a more rapid improvement in telecommunications in Thailand, it is a solution which is politically acceptable and for now will have to suffice. Of the 3 million lines proposed to be built in the Seventh Economic and Social Development Plan of Thailand, TOT is proposing that 2 million be installed in Bangkok and 1 million in rural areas. Firms interested in the BOT scheme are required to put up 1,000 million baht (US$40 million) in a bank guarantee and will also be required to build switching systems in Thailand for the project.

Apart from basic telephone service, the worldwide trend in liberalization of telecommunications services can be observed in Thailand today. Due largely to the financial constraints of the State budget, the Ministry of Transportation and Communications is giving approvals for private concession development of other telecommunications services. Included are such projects as a domestic satellite-based data transmission networks for banks, commercial institutions and manufacturers who need reliable data services. Recent equipment purchases from Northern Telecom and Alcatel and the rapidly growing customer premises equipment (CPE) market point toward how the liberalization of telecommunication markets apart from the public switched network may prove fruitful and could eventually help speed overall improvements in domestic services.

In general, the role of the private sector in telecommunications in Thailand is limited to equipment and service providers on contract and to donations to the government which are then "rented" back for use by the provider. There are over 100 companies registered in Thailand to provide telecommunications equipment and services and foreign expertise is heavily sought for training and installation assistance. For example, in addition to tax incentives and specific consideration for contracts that include training programs, the Government of Thailand has sent TOT and CAT personnel to the United States for specific and general training in educational institutions including the East-West Center in Hawaii as well as to a number of private corporations.

Procurement of telecommunications equipment and services are conducted under the rules and regulations of the Office of Prime Minister for all government agencies. There are a number of basic procurement procedures including provision for small procurements of less than $800 by quotation and department Head approval, cost-survey for acquisitions of $800 to $16,000, bids for projects over $16,000 and special case procurements. In addition, the Thai government will enter concessionary loan agreements with specific vendors. Several committees are often set up within the procuring agency to monitor and process the acquisition and this often causes lengthy delays in the actual awarding of a contract as consensus among the committee members must be obtained.

Two types of purchasing tenders are let by the government of Thailand. International tenders invite all eligible vendors from various countries to bid in their respective currencies and then be paid in their currencies upon awarding of a contract. Local tenders usually have very strict terms attached and payment is only in Thai baht.

TOT makes procurements on a competitive basis in three major areas: telephone switching equipment; outside plant equipment which includes cabling, PCM equipment and civil engineering work; and transmission equipment. CAT makes procurements for satellite earth stations, undersea cable, HF, UHF, VHF and micro-wave equipment, telex machines, cellular mobile telephone equipment, facsimile, videotex, and paging equipment among others.

As has been stated in the previous sections, it is important for businesses to have a long-range focus in Thailand as well. Foreign companies may set up their own representative office, appoint a local company as their agent or form joint ventures with local entrepreneurs or companies. While competition for telecommunication contracts is strong, the market to provide services and equipment is expanding. TOT has set an objective to have all digital switch and transmission facilities by 1994. Data communication network plans are increasing and radio frequency subscriber telephone services are planned. Plant, switching and transmission equipment procurements will remain strong through the mid-1990's with an increasing emphasis on centralized network management, the development of videotex services and national data services.

There is also a steadily growing market for PABX systems in housing projects and office buildings due to the shortage of telephone access lines. Also facsimile systems used by private and government companies is expanding rapidly. Each subscriber to the telephone system must now purchase their own telephone set on the market as TOT no longer provides telephone sets to new subscribers. The estimated annual market in 1988 for telephone sets was US$7.6 million; for PABXs, US$6.5 million; and, for fax systems, US$1.9 million.

Thailand is also courting foreign investment in telecommunications production for export. The overseas unit of AT&T is investing $40 million in a telephone set manufacturing plant in Thailand. While 95% of the anticipated five million units to be produced annually beginning in 1990 must be exported, AT&T will be able to sell 250,000 sets in the Thai market.

Another significant development for Thailand is Asiasat which has been launched by China's Long March Program (China Great Wall Industries Corporation) in 1990. This satellite is owned by a private consortium made up of Cable and Wireless, Ltd. and Hutchison Whampoa, Ltd. of Hong Kong and China International Trust and Investment Corporation which reports directly to the Chinese State Council (Sedon, 1989).

Asiasat may provide the basis for expanded telecommunication services in Thailand. One of the high powered C-band spot beams of the satellite is focused on

Thailand and has the potential to provide cost-efficient television transmission as well as rural telephony and data exchange services. As yet, a clear policy for the use of Asiasat has not been established and it remains unclear to what extent private enterprise will be allowed to erect and operate satellite transmission and/or receiving equipment for private telecommunications networks or to add to the infrastructure of the public network. Not surprisingly however, several Thai television systems are looking to utilize Asiasat for domestic program distribution.

4.8 Summary

While the general policy trend worldwide is for deregulation, liberalization of markets and moves toward privatization on the part of the telecommunications authorities in many countries, each country must be looked at separately to understand the economic, political and social factors surrounding the development and implementation of such policy changes. For example, while British Telecoms has been privatized in Great Britain, the telecommunications authorities of France and West Germany remain powerful government entities. Deregulation in France is in the form of a management overhaul of France Telecoms and in Germany a mere opening of telecommunications equipment and service markets to outside bidders is evident. In both France and Germany, the monopoly over telecommunication networks and services will remain.

In the ASEAN region, countries are characterized by their different governments, social and cultural milieus, and economic policies and strategies. The priorities for development are different and so it is no surprise that the development of the telecommunications sector is quite different in each country. While the ASEAN countries vary significantly in terms of social, political, economic as well as telematics development, there is a global trend and regional need for telematics coordination. The challenge is to a find a common path for coordination efforts. This challenge is met, in part, by the development of a base-line data taxonomy policy and planning tool presented in the next chapter.

While the Philippines is the exception in the ASEAN region to state-owned and controlled telecommunications systems, there is a high degree of regulation in the Philippines similar to the other ASEAN countries. However, it is acknowledged that the growth in the economies, and perhaps the success of the ASEAN region as a whole, requires a concomitant growth and change in the telecommunications sector. The impressive economic results of a country like Thailand for example are accompanied by a very sharp and frustrating increase in the demand for telecommunications services which are lagging.

Competitive forces in at least some parts of the telecommunications systems in each of the ASEAN countries are beginning to coexist with the various monopoly or near monopoly operations and telecommunications authorities. The U.S. and other western industrialized countries are moving more and more toward very restrictive areas for their "natural" monopolies (i.e. basic service and thin-route areas) and are allowing free competition in newly liberalized markets even by the previous telecommunications monopolies.

Innovative technology developed in the private sector is key in the constant driving-down of economies of scope of the public sector telecommunications authorities. This in fact also erodes economies of scale in the public sector undertakings compelling a shift to more liberalized policies. The only exception to this in the ASEAN region seems to be Singapore, which keeps abreast of technology. Although, for reasons of increased international trade, Singapore is also moving toward more liberalized policies.

Whether telecommunications in any country can become a leading sector for development as seen in Singapore or suffer the evident neglect which can be seen in some of the systems operations in Thailand is largely a policy question.

With the high capitalization costs of telecommunications systems and the pressure to build higher capacity and better quality infrastructure, governments are reconsidering the policies of the state owned and controlled monopoly operating entities. The need to liberalize telecommunications markets, especially in terms of non-basic services, and to look at the privatization of the telecommunication authorities and/or the private participation in the government controlled enterprise is confronting each nation.

The following listing provides a summary of the trends toward various forms of deregulation, privatization and private participation, and the increasing liberalization and competition in telematics markets in each of the ASEAN countries studied.

Indonesia:

(a) Increasing private participation in government owned and controlled telematics systems.

(b) New law allowing private ownership and control for non-basic services.

(c) No plans for further liberalization, deregulation or privatization of the telecommunication authorities, PT Indosat, Perumtel, PT Inti and the Post & Giro.

(d) View toward developing infrastructure for prioritized sectors (i.e. financial institutions, manufacturing and tourism).

Malaysia:

(a) Complete privatization of the telecommunications authority, STM.

(b) Increasing private participation and competition in all areas of telematics.

(c) Increasing liberalization of markets for telecommunications equipment provision.

(d) Moves toward a deregulated operating environment.

The Philippines:

(a) Increasing private competition for telematics markets.

(b) Increasing government participation in infrastructure development not provided by private interests.

(c) No moves toward deregulation of the telematics environments.

Singapore:

(a) Increasing international competitive focus of the telecommunications authority, Singapore Telecoms.

(b) Increasing liberalization of markets for equipment and services provision.

(c) Increasing private competition for equipment provision to Singapore Telecoms.

(d) Proposing plans for partial privatization and deregulation of Singapore Telecoms. Will be the first Statutory Board in Singapore to be considered for privatization.

Thailand:

(a) Looking at long-range plans for possible privatization of the telecommunication authorities, TOT and CAT.

(b) Increasing private participation in infrastructure development through a build, operate and transfer, BOT, scheme.

(c) Increasing liberalization and competition in equipment and non-basic services provision.

It will become increasingly more important for ASEAN to establish strong regional linkages in order to continue to attract capital flows for infrastructure development from Europe. With an inevitable focus of Europe 1992 on the opening of Eastern European markets, countries of the ASEAN cannot afford to lose one the three major sources of private financing (Japan and the United States are the others) for its telecommunications sectors. In order to do this, a focus on regional policy and coordination of the trends in policy change may provide a better platform from which to remain an attractive investment opportunity to Europe.

Faced with high costs and the need to provide better service, financing from outside the government for telecommunications is required. This is perhaps the single most important factor driving the trend toward liberalization of telecommunications in the lesser developed countries of ASEAN. In the more developed Singapore, the need to respond to international pressures as it moves well beyond domestic basic service provision into the world market for telecommunications services, requires it to substantially re-evaluate its position vis-a-vis privatization and monopoly control of services.

It will be important for the World Bank and Asian Development Bank to step-up support for the development of telecommunications in the region. Loans and grants however are not enough and private participation in the form of capitalization through privatization of the telecommunication authority and/or of private participation through various politically acceptable schemes in network development projects are inevitable. The form that these changes take place are different in each country but unavoidable.

The problems faced by these countries in telecommunications are not unique. The policy solutions for each country may be somewhat different, yet, the need to fully comprehend the options available and to look to examples beyond those provided by the developed countries is very much needed. It may be possible for the ASEAN region as a whole to further develop cooperative efforts in terms of understanding telecommunications policy development. In turn, this could provide a substantially more appropriate example of the implementation of different forms of deregulation, liberalization of markets and privatization schemes for other countries of the world. Perhaps the ITU (International Telecommunications Union) and other regionally based organizations could promote more exchange and cooperation on these critical policy issues. Already the Center for Telecommunications Development (CTD) of the ITU and regional organizations such as the Asia-Pacific Telecommunity (APT) provide technical telecommunications training and skills formation programs. The annual ITU Telecoms Asia conference held in Singapore brings together vendors and users to promote new technologies and their development in the region. Perhaps similar efforts could be made in terms of the development of cooperative efforts in education about and the formation of regulatory policies.

In order to further this goal, this study has proposed the development of a base-line data taxonomy scheme which could be used across the countries of the ASEAN as a policy and planning tool for development for an entire range of telematics as it emerges. The results of the development of this base-line data taxonomy is presented in the next chapter.

CHAPTER V

A BASE-LINE DATA TAXONOMY FOR TELEMATICS IN THE ASEAN

5.1 Overview

Kamman (1989) suggests that a growing number of telematics technologies could be a part of the everyday infrastructure by the year 2000. Drawing from the European Community Green Paper (1987), Kamman presents a listing of numerous telematics-related technologies which already exist in various stages of development and which are possible candidates for the infrastructure for at least the developed countries in the near future. From such listings, comes the idea that the ever growing plethora of communication technology which is evolving needs to be organized coherently and in the spirit of the merger of telecommunications and information systems for further study. With various parts of the telematics realm largely organized and administered from the major areas which make up the field of telematics, new means must be developed by which the increasingly overlapping areas can be viewed together effectively.

An efforts has been proposed to organize parts of the complex information that is telematics as represented by the mergers of telecommunication and information technologies. One such effort, looking specifically at information systems as but a part of overall telematics, is by the Asia-Pacific Foundation of Canada (Roy, 1990). Roy proposes that information networks should be accounted for in the Asia-Pacific region and recommends the development of an inventory of information systems for the specific purpose of assessing the feasibility of an information network pilot project. Roy's point is that new data gathering schemes are necessary for further development and planning of specific pilot projects. The information systems section of the base-line data taxonomy presented in this chapter responds to such a need.

From previous work in basic data collection, data taxonomy schemes have largely and separately focused on matters of telephony (e.g. ITU Common Carrier Statistical Yearbook, 1989) broadcast systems (e.g. World Radio TV Handbook, 1989) and UNESCO statistics on mass communication (UNESCO Statistical Yearbook, 1986), as major examples.

In the examination of policy in a region such as the ASEAN, as has been presented in the previous chapter, it becomes evident that the plethora of technology and the policies for its implementation are rapidly blurring across traditional categorizations. To speak of television in Thailand for example, is to simultaneously speak of satellite systems in the region including the Palapa system of Indonesia and Asiasat. To speak of financial data transaction services in Singapore is to simultaneously speak of the telephony and information systems infrastructures on domestic, regional and international levels. It becomes apparent that for the formation of policy and for planning, a broader perspective of the telematics technologies is needed. Therefore, this study has proposed the development of a base-line data taxonomy scheme which may adequately begin to cover the wide range of telematics. It is intended to present in a cogent manner, the range of data that might be needed by policy makers and planners in a particular region, in this case the ASEAN, and organized such that it is consistent for comparisons across the range of the ASEAN countries. A summary framework of the developed taxonomy is presented later in this chapter in Figure 5.

Given the need to collect and organize base-line information on telematics in the ASEAN so that other methods of planning might be carried out as was discussed in Chapter III, a base-line data taxonomy for telematics in the ASEAN was initially drafted. The draft was subjected to critiques and was refined. A survey of key policy makers in the ASEAN helped to further refine the taxonomy and add insight as to its possible operationalization. Finally, as confirmation of the need and utility of the scheme, the taxonomy has been used in a data table format by two ASEAN countries to begin to organize telematics data.

5.2 Draft Base-line Data Taxonomy

From the description of telematics presented in the previous chapter, two major areas of concern of telematics development are evident, namely, the growth and development of the infrastructure itself and the investment involved in terms of capital and human resources. Both infrastructure and investment concerns permeate the discussion of telematics policy across each of the ASEAN countries. Although each concern is subject the various political, economic and social arenas in each country, it is therefore assumed and by this work substantiated, that both infrastructure and investment are important areas for policy makers and planners within each country and as a means for comparison and cooperative planning across the countries.

The initial data taxonomy was constructed from the point of view of the importance of levels of infrastructure and investment as major headings for describing telematics in each country. The field of telematics itself is broken down into the major component parts described throughout this study as telephony systems, broadcast systems, satellite systems and information systems. These areas of course overlap as indeed all are a part of telematics as a whole, and all make use of part of the others.

In an effort to organize the taxonomy, which could be at once be understandable and operationalized later to capture data, it was determined that utilization of categories most familiar and similar to current, separate area efforts in describing the parts of telematics could be made. This allows those who are more familiar with one or more area in depth, to better situate infrastructure and investment in that area with the others.

From the country description presented in the previous chapter as well as previous schemes which have been utilized in each of the areas of focus which make up telematics, a draft base-line data taxonomy was developed by listing as comprehensively as possible, components of infrastructure and investment within each area category. Since the nature of the information on infrastructure and investment may be either quantitative or qualitative, both are represented.

The draft data taxonomy scheme was therefore intended to be comprehensive if not necessarily 100% complete. Indeed, it may be somewhat presumptuous to try to include every possible type of equipment given not only the numbers involved but the ever changing types. The taxonomy is not meant to be a fixed structure but rather a flexible listing to which items could added or subtracted. The intent was to include what might be presumed to be useful for further policy and planning efforts. This intent is put to a test in terms of reactions and critiques to the draft taxonomy and later refined through a survey of key policy makers in the ASEAN region.

The initial base-line data taxonomy (Figure 3) for telematics follows. The overall term telematics is not used until the refined data taxonomy as a means to give an overall category heading descriptive of the merger of these technologies as has been described in Chapter II. The term telecommunications was used somewhat in a cumbersome manner in this initial draft.

Figure 3

Draft Base-line Data Taxonomy

Telecommunications Infrastructure and Investments in the ASEAN Countries

I. TOTAL INVESTMENT IN TELECOMMUNICATIONS

II. TELEPHONE TELECOMMUNICATIONS

A. Telephone Telecommunications Systems
B. Investment in Telephone Telecommunications
C. Government Policies and Regulations
D. Principal Suppliers of Telephone Equipment and Services (By country and vendor)
E. Important Means of Financing

III. BROADCAST TELECOMMUNICATIONS (television, radio)

A. Broadcast Telecommunications Systems
B. Investment in Broadcast Telecommunications
C. Government Policies and Regulations
D. Principal Suppliers of Broadcast Equipment and Services (By country and vendor)
E. Important Means of Financing

IV. SATELLITE TELECOMMUNICATIONS

A. Satellite Telecommunications Systems
B. Investment in Satellite Telecommunications
C. Government Policies and Regulations
D. Principal Suppliers of Satellite Equipment and Services (By country and vendor)
E. Important Means of Financing

V. INFORMATION SYSTEMS TELECOMMUNICATIONS

A. IS Telecommunication Systems (LAN, WAN, Modems, videotex, etc.)
B. Investment in IS Telecommunications
C. Government Policies and Regulations
D. Principal Suppliers of IS T-Com Equipment and Services (By country and vendor)
E. Important Means of Financing

I. TOTAL INVESTMENT IN TELECOMMUNICATIONS

1. Total Investment in Telecom, $US -
2. Total Investment in Telecom as % GDP -
3. Total Investment in Telephone Telecom, $US -
4. Total Investment in Telephone Telecom as % Total Telecom -
5. Total Investment in Broadcast Telecom, $US -
6. Total Investment in Broadcast Telecom as % Total Telecom -
7. Total Investment in Satellite Telecom, $US -
8. Total Investment in Satellite Telecom as % Total Telecom -
9. Total Investment in Info Sys Telecom, $US -
10. Total Investment in Info Sys Telecom as % Total Telecom-

II. TELEPHONE TELECOMMUNICATIONS

A. Telephone System

1. # of telephone lines (voice circuits) **domestic.**

   # satellite circuits
   # undersea circuits
   # copper cable circuits
   # fibre optic circuits
   # over-land circuits (incl. cable,microwave,etc.)

2. # of telephone lines (voice circuits) to **other ASEAN countries.**

   # satellite circuits
   # undersea circuits
      # copper cable
      # fibre optic
   # over-land circuits (incl. cable, microwave,etc.)

3. # of telephone lines (voice circuits) **international** other than to ASEAN countries.

   # satellite circuits
   # undersea circuits
      # copper cable
      # fibre optic
   # over-land circuits (incl. cable,microwave,etc.)

4. Total # Telephone subscriber lines

   # government subscriber lines
      # civil
      # military
   # business subscriber lines
   # residence subscriber lines

5. Wait List, Total # demand for subscriber line installations.

6. Total # of single -line telephone handsets (subsets) in use.

   # in urban areas
   (pop. > 100,000)

   # business
   # government
      # civil
      # military
   # private (residence)

7. # of multi-line handsets (subsets) in use (2 or more circuits)

   # in urban areas
   (pop. > 100,000)
   # business
   # government
      # civil
      # military
   # private (residence)

8. Total # of analog switches in use

   # handling
   > 100,000 circuits

9. Total # of digital switches in use

10. Total # of PBX's (PABX, PMBX)
    (Private [Automatic/Manual] Branch Exchanges)
    # of PBX's in Business
       # with <50 extensions
       # with >100 extensions

    # of PBX's in Government
       # civil
       # military

11. Total # of Cellular Mobile Systems
    - Cell sites
    - % penetration
12. Total # of cellular subsets
    - # civil
    - # military

13. Total # of Paging systems
    - # of pager units

14. Total # of Public Payphones
    - % public payphones in urban areas (pop. > 100,000)

B. <u>Investment in Major Telephone Equipment, $US</u>

1. Telephone handsets (subsets) $US

   single-line $US
   multi-line $US

2. Telephone Switching systems $US

   analog $US
   digital $US

3. Total domestic voice circuits $US

4. Total voice circuits to ASEAN countries $US

5. Total international voice circuits $US

6. Total Copper-cabling $US
   - # of Kms
     - # of kms over-land
     - # of Kms under-sea

   Twisted-pair wiring $US
   - # of kms

(Figure 3 Continued)

7. Total Fibre Optic cabling $US
    - # of kms
        - # of kms over-land
        - # under-sea

8. Total Micro-wave equip $US
    - # of stations
    - # of kms covered

9. Total Radio Freq. equip, $US
    - # HF stations
    - HF station $US
    - # VHF stations
    - VHF stations $US
    - # UHF Stations
    - UHF stations, $US

10. Total Long Distance Equipment, $US

11. Total PCM equipment, $US

12. Total Repeaters, $US

13. Total PBX's (incl. PABX and PMBX), $US

    - PBX's business $US
        - PBX's < 50 extensions, $US
        - PBX's > 100 extensions, $US
    - PBX's Government, $US
        - PBX's civil, $US
        - PBX's military, $US

14. Total Cellular Mobile Telephone systems, $US
    - Mobile sets, $US
    - Base Stations (cell sites)$US

15. Total Paging Systems, $US

16. Total Public Payphone, $US

17. Total Maintenance and Test equipment, $US

18. ISDN TECHNOLOGY:

[Total ISDN circuits] (Projections)
Std 2xB + D Channel
(2x64Kbs + 16kbs)

-maintenance and test equip.
-subsets (telepc's)

C. <u>Government Policies and Regulations</u>

1. regulation by government telecommunications authority.
2. trends in deregulation and liberalization of markets
3. policies for competition

D. <u>Principal Suppliers of Telecommunication Equipment and Services</u>

1. % of Total by country

	Supplier					
Equip.	Domestic	U.S.A.	Japan	E.C.	ASEAN	Other
Cabling (incl. connection equip)						
copper						
twisted-pair						
T-1						
trunking						
fibre-optic						
Switching						
Analog						
Digital						
Handsets (subsets)						
single-line						
multi-line						

PBX
  PABX
  PMBX

RF equip
  HF
  VHF
  UHF

Micro-wave

LD equip

PCM

Repeaters

Mobile
  stations
  interconnect
  subsets
    mobile
    portable

Payphone

Maintenance
  and Test

2. Market Share in Equipment by Vendor (%)

Vendor	Cabling	Switching	Handsets	PBX	RF	MW	LD	PCM	other

E. Important Means of Financing

1. Considerations for purchasing equipment terms and other provisions, i.e. training.
2. joint-ventures
3. mixed credits
4. World Bank and IMF loans
5. joint operations and payback schemes

III. BROADCAST TELECOMMUNICATIONS (television, radio)

A. Broadcast Telecommunications Systems

RADIO:

1. # of radio stations
   AM
   FM
   HF (shortwave)

2. Military radio

3. Government Radio other than public transmission (i.e civil defense)

4. Radio Coverage
   % of country covered by a radio signal

   Area covered by each station

5. # of radio transmitters (and antennae)
   AM
   FM
   HF

6. # of Radio repeaters (for each station)

7. # of Micro-wave stations used for radio (for each station)

8. Description of Program Content hours, language, music, edu., etc.

9. # of radio sets in use
   AM/FM
   HF
   Combination

10. % pop. that owns a radio

11. ave. # radios per household

12. % households with at least one radio

13. % households in urban areas
    (pop. > 100,000) with radios

TELEVISION:

14. # television stations
    # VHF, location, coverage
    # UHF, location, coverage

15. Color Standard (PAL, SECAM or NTSC)

16. # of transmission towers, power
    location and coverage

17. # of repeater stations
    (for each station)
    power, location, coverage

18. # of micro-wave stations
    (each tv station)
    coverage

19. Description of Long-line use
    for television

20. Description of Satellite use for
    television (will overlap with
    section below)
    # and types of sat. transmitters
    # and types of TVRO stations

21. Description of program content
    domestic production- type, hours, language
    imported programming - type, hours, language
    entertainment
    news

22. # of tv sets in operation
    # B&W; ave cost
    #Color; ave cost
    % total households with at least one tv
    % of total households with tv that are in urban areas (pop. >100,000)
    % households in urban areas with a tv (pop. > 100,000)
    % households in rural areas with a tv (pop. < 100,000)

23. # public viewing sets

CABLE TELEVISION:

24. # of cable operators

25. # of cable stations
    location
    penetration

26. % households with cable

27. % cable households in urban areas (pop. > 100,000)

28. description of cable programming

VCR's:

29. # VCR's in use

30. % households with VCR's

B. Investment in Broadcast Telecommunications, $US

RADIO:

1. Total radio $US
   Broadcast
   Military
   Government (non-public broadcast)

2. Total radio Gov owned $US

3. Total radio Privately owned $US

4. Production facilities $US
   (by station type)

5. Transmission Equipment $US
   Broadcast towers
   Repeaters
   Micro-wave

TELEVISION:

6. Total television $US
   Gov. owned
   Privately owned

7. Production facilities
   by station $US

8. Transmission Equipment $US
   by station
   broadcast towers
   repeaters
   micro-wave
   long-line
   satellite
   transmit
   transmit and receive
   tvro

9. Television sets $US
   B&W
   Color

10. Cable Television
    Head end $US
    Cable Trunking $US
    Downlinks
    Engineering and test

11. VCR's
    cost (domestic) $US
    projected market size

C. Government Policies and Regulations

1. ownership/control
2. operation
3. licensing of sets, taxes
4. regulations governing programming and
5. advertising, radio, tv, cable tv

D. Principal Suppliers of Broadcast Equipment and Services (By country and vendor)

1. % Share broadcast equipment market by country

Equipment	Domestic	USA	Japan	E.C.	ASEAN	Other
RADIO:						
production						

transmission
  towers
  repeaters
  micro-wave

engineering
  and test

Sets
 AM
 FM
 HF
 Combination

TELEVISION:

 Production

 Transmission
   Towers
   repeaters
   micro-wave
   satellite
     TV Transmit
     TV T/R
     TVRO

Engineering
  and Test

Sets
  B&W
  Color

Cable TV:
 Head End
 Trunking
 Downlinks

VCR's

2. <u>% Share of broadcast equipment market by vendor.</u>

Vendor	Production	Transmission	Eng.	Sets	VCR

E. <u>Important Means of Financing</u>

1. joint ventures
2. donation and aid
3. term financing
4. mixed credits
5. govt/private co-ventures
6. govt funds

IV. SATELLITE TELECOMMUNICATIONS

A. Satellite Telecommunications Systems

Description of Satellite
Services used:

1. Intelsat

2. Domestic

3. Regional

4. Satellite(s) owned
   sat. name
   coverage

5. Transponders leased
   sat. name
   coverage
   lease terms

6. Tracking and Telemetry

Satellite Service Description:

7. Telephone
   Sats. used, allocation, time
   % phone traffic carried
   via satellite
      domestic
      ASEAN
      International (non-Asean)
   Type of service
      SCPC/DAMA
      FDMA
      TDMA
      other

8. Broadcasting
   Sats. used, allocation, time
      Radio
      Television
         program import/export
         news import/export
         educational - domestic
      Military

9. Info Systems T-com (datacom)
   Sats. used, allocation, time
     Gov't/public (telex/fax/etc)
       domestic
       Asean
       International
     Private Organizations and Companies
       data transfer
       communication
     Military
       communication
       surveillance

10. # of Earth Stations, Type (Std A to Vsats and micro antenna)
    location

    Telephone system

    Broadcast systems
      Radio
      TV
      T/R
      TVRO

    IS T-com (datacom)
      Gov't/public
      Private
      Military

B. Investment in Satellite Telecommunications

1. Launch Activities $US

2. Satellites:

3. Geo-stationary
   - Owned - $US
     - Gov't/public
     - Private
     - Military
   - Leased (transponders) $US
     - Gov't/Public
     - Private
     - Military

4. Other Satellites: (non-geo-stationary)
   - Weather
   - Surveillance

5. Earth Stations - Total $US
   - Gov't/Public
     - Std A
     - .
     - .
     - .
     - VSAT
   - Private
     - Std A
     - .
     - .
     - .
     - VSAT
   - Military
     - Std A
     - .
     - .
     - .
     - VSAT

6. Ground-Based Electronics

C. Government Policies and Regulations

1. participation in WARC and INTELSAT
2. domestic DBS
3. transborder Satellite info flow
   news, data, etc.

D. Principal Suppliers of Satellite Equipment and Services (By country and vendor)

1. % share of market for Satellite Equipment

Equipment	Domestic	USA	Japan	EC	ASEAN	Other
Sats.						
Geo-sta.						
Transp.						
Earth Stations						
Ground-based electronics						

2. Principal Vendors

by % share of market
and
by $US of sales/contracts

Vendor	Satellites	Earth Stations	Ground Based Elects.

E. <u>Important Means of Financing</u>

1. contribution to INTELSAT
2. mixed credits
3. grants and aid
4. lease agreements
5. co-ventures
6. supplier credits
7. domestic government investment

V. INFORMATION SYSTEMS TELECOMMUNICATIONS

A. IS Telecommunication Systems

1. Gov't/Public (incl. education)

LAN
WAN
Dedicated data lines
Modems
Codecs
Multiplexors
FAX
E-Mail

---

2. Private (banks, corporations, etc.)

LAN
WAN
Dedicated data lines
Modems
Codecs
Multiplexors
FAX
E-Mail

---

3. Military

LAN
WAN
Dedicated data lines
Modems
Codecs
Multiplexors
FAX
E-Mail

---

4. Videotex

5. On-line Databases

B. Investment in IS Telecommunications - $US

1. LAN
2. WAN
3. Dedicated data lines
4. Modems
5. Codecs
6. Multiplexors
7. Fax
8. E-Mail

C. Government Policies and Regulations

1. transborder data flow policies
2. ownership and control of IS networks
3. accessibility to public networks
4. "interconnect" policies

D. Principal Suppliers of IS T-Com Equipment and Services (By country and vendor)

1. % sales of equipment by country

equipment	Domestic	USA	Japan	EC	ASEAN	Other
________						
________						

2. % market by vendor

vendor	LAN	WAN	Modems	Codecs	m-plxrs	etc.
________						
________						

E. Important Means of Financing

1. supplier credits and other vendor schemes
2. World Bank and IMF loans
3. Asia Development Bank loans
4. domestic government investment

The draft data taxonomy scheme was critiqued on two separate occasions. First, the taxonomy scheme was a part of the discussions among researchers at the East-West Center in Honolulu, where the taxonomy was written as a part of a research project headed by Dr. Meheroo Jussawalla from 1988-1990. The taxonomy was created by Mark Hukill in a lead role in the project designated by Dr. Jussawalla.

As a listing of infrastructure and investment items, it was generally determined that if the taxonomy was to be utilized as data tables for the collection of information, then that information should be collected in a time-series fashion in as far as quantifiable items could be represented at different levels over time. Discussion focused principally on the availability and accessibility of the information that the taxonomy represents. While certainly some information was already available in other forms (indeed, inspiration for the taxonomy came from those sources, as was previously explained, and as is represented in a number of the tables in Appendix 3 which helped in part to create the description of the previous chapter), it was the consensus of the discussants that the taxonomy should in some way account for the practicality of collecting data. That is, concerns as to the viability of operationalizing the taxonomy needed to be addressed. This concern was addressed by the formulation of open-interviews in a survey of key policy makers and stakeholders in the ASEAN region which could in part address the operationalization questions.

Secondly, the draft data taxonomy scheme was subject to review in a workshop held in Singapore in May 1989, which focused on the information needs in determining impacts of telecommunications technologies on ASEAN economies. The taxonomy was again reviewed in a workshop organized by this author at the Pacific Telecommunications Conference (PTC'90) just prior to conducting the interviews in the selected countires. Participants to the workshop, organized by the East-West Center under the auspices of project leader Dr. Meheroo Jussawalla, and the Asian Mass Communication Research and Information Centre, AMIC, in Singapore are listed in Appendix 1 as well as participants to the workshop at PTC '90.

Participants to the workshops generally agreed to the notion of a need for comprehensive data organization and a collection tool across all areas that telematics represents and that such an effort would contribute significantly to not only the understanding of telematics in the ASEAN region, but as a useful tool for government, business and academics alike in terms of policy and planning. It can, for example, help academics in terms of conceptualizing research and assist in planning for training and educational programs.

It was generally acknowledged that the division of categories helped otherwise more "disciplinary" people understand the other categories not within their range of expertise and that the general focus of infrastructure and investment would be feasible as a comparative across diverse nations.

Critical comments on the scheme made at the workshops centered on three areas. The first was the viability of collecting data in the ASEAN region in a manner that the taxonomy represents, the second was the sensitivity of some information represented by the scheme, and the third concern was a for the definition of some of the items which would be needed to operationalize the taxonomy.

In terms of the viability of collecting the data, the general expression was that a fair amount of high level diplomacy would be needed to gain access to some information and where information was not available, to press for basic collection. As a result, efforts were enlisted to gain support from high ranking telecommunication officials in each country as well as enlisting support from several regional organizations as is discussed in the next section.

As to the second concern of the sensitivity of a number of items that the taxonomy calls for in terms of actual data collection, the workshop participants felt that some information might not be available at all for political and security reasons. While the intent of the draft taxonomy was to include a comprehensive listing of infrastructure and investment in all areas of telematics, it was not intended to be a set data collection instrument. Indeed, it is only suggestive of the items that might be included and deemed useful for policy and planning purposes. Items which may be sensitive need to be explained in terms of further efforts to operationalize the data taxonomy scheme. It was the consensus of the workshop participants that the taxonomy could be useful internally as well in each country, for policy and planning purposes, whether or not some particular information was made public.

The third major concern addressed at the workshop was the definition of the terms of some of the items. It was generally acknowledged that the items, as included, were self-explanatory at least to those familiar with the subject. However, there may be a need for further explanation in terms of the precise terms used especially in the case where the taxonomy might be used as a data collection instrument. It was not deemed necessary in the presentation of the taxonomy to add much more precision to the terms of the items at this point. However, to operationalize the taxonomy in terms of a data collection instrument, some added precision to the terms of the items might be required for clarity. This might be accomplished in subsequent efforts by producing forms, descriptions and explanations of data items, perhaps in a booklet form, which could be used as models for data gathering.

To understand these and other specific concerns, a survey of key policy makers and stakeholders in the ASEAN region was conducted in which the concerns raised could be explored.

5.3 Survey Results

A survey of key policy makers and stakeholders in telematics in three of the ASEAN countries, namely Malaysia, Indonesia and Singapore, was conducted as validity check of the taxonomy.

An open interview format was utilized as was discussed in Chapter III. A list of the people interviewed appear in Appendix 1. Some of the information provided by the participants to the open-interviews was presented as part of the previous chapter especially in terms of the descriptive information that the base-line data taxonomy calls for.

People who were to be interviewed were selected on the basis of their direct involvement in areas of telematics policy and planning in each country. The term stakeholder is used simply to indicate someone not directly involved in the actual setting of policy, but, who, through activities in telematics, plays a very influential role either in business or academe. A large number of people to interview were suggested by participants to the Singapore and PTC'90 workshops. From there, a network of people helped to make contacts and set interview dates in each country. An attempt to interview at least ten key people in each of three countries was made and indeed several more were interviewed in some countries. A range of telecommunication authorities, business and academic people were selected.

While no precise or formal procedure to select people for interviews was possible, due in part to the high level government contacts that had to be established, the reliability of the selected sample for generalization purposes is provided from the fact that these people play major roles, if not the leading role in the formulation of policy in each country. Several are the top officials responsible for the establishment of policy including the Minister of Energy, Telecommuncations and Posts in Malaysia and the Director General of Posts and Telecommunications in Indonesia. These two people in particular were instrumental in indicating other key people in their respective countries with the requisite expertise. In Singapore, representives of the Business Planning and Ventures section of Singapore Telecoms were suggested for interview as having the expertise in policy and planning matters. Since many of the people suggested for interview came from policy makers in the telecommunications authority in each country themselves, the group of people interviewed as a whole represents an expertise in telematics and is therefore representative of opinion on telematics in each country. A survey of this scope obviously must rely on tremendous goodwill of the people involved and the readiness and enthusiasm that these people showed demonstrates the importance that they attached to the subject matter. The interviews were conducted in February and March 1990.

It was originally planned to go item by item with each interviewee to discuss the utility in planning and the availability of data for that item. However, that process would have been too time consuming and cumbersome. Therefore, each participant received a copy of the data taxonomy in advance and was able to familiarize themselves with the content prior to the interview. Questions (listed in Appendix 2) in the open interview format then focused on the availability and desirability for planning of the data items suggested. Each person could then respond in specific to the items for which they had more expertise.

While responses to specific questions varied in context from country to country, numerous common denominators are ascertainable from the interviews.

In general, everyone interviewed found no quarrel with the specific items included in the data taxonomy. Indeed, there was the desire on the part of most respondents to add more detail to each item in the area where they had more specific expertise. However, with the exception of one major item, personnel, the respondents were satisfied with the comprehensiveness of the taxonomy. Most agreed however, that to operationalize the data taxonomy, each item could be explored more fully to structure the data that would be collected. To get to that stage, however, would require efforts on an official level between the governments of the ASEAN in a joint meeting of the interested parties who could execute such an endeavor. Respondents agreed that forums such as the Asia-Pacific Telecommunity based in Bangkok and the Committee on Transportation and Communication, COTAC, of the ASEAN Secretariate would be the appropriate forums in which to address the formal operationalization of the data taxonomy scheme.

In terms of personnel items that would need to be included in the data taxonomy, several respondents provided specific information that they would need for planning purposes and for comparisons across each ASEAN country.

These include personnel involved in (a) management, administration and planning, (b) engineering, design and research and development, (c) technical and operations staff, and (d) general labor and clerical. Most respondents favored the inclusion of these items especially in terms of projections for the future from which cooperative education and training could be planned. From the APT in Bangkok came the suggestion that to include such items in a comprehensive database, perhaps housed at the APT, would also help in their efforts to design and provide for education and training needs across each country, a task for which they are mandated.

Somewhat surprisingly, more descriptive information was sought by many respondents. In the area of telephony, telephone service costs and international call costs would be useful across each country. Indeed, officials at each of the telecommunications authorities expressed a desire to know some more financial information such as the net out-payments to other countries in terms of long-distance services. This specific request is tied to the more general question of tariffing which was suggested by many to be added, at least in a descriptive form, to the taxonomy due to its growing importance as a concern in regional policy.

Many other items which might be included in the taxonomy were suggested by the respondents. Where respondents in several countries were agreed to the utility of such items for comparison and planning purposes across the countries, the items were added to the taxonomy. These included in the telephony area: classes of digital switches, percent of revenues generated that are re-invested in telematics development, more detail in terms of urban and rural differences, infrastructure and investment figures for redundant systems, backups and spares.

In the area of broadcast systems, it was suggested that use of satellite systems for broadcast be fully described along the lines of ENG (electronic news gathering), SNG (satellite news gathering) and video and audio news exchanges which are being developed in the region often without much knowledge as to what the other ASEAN countries are doing in the same area. Also an importance is needed to be placed on home video systems such as VCRs and VCPs (video cassette recorders/players). These equipment are viewed as having a tremendous impact socially and culturally in each country and could be the subject of separate, more specific studies. In any case, the rapid advancement of electronics is outpacing means for accounting as UNESCO, for example, still gathers statistics on movie houses but has not made provision for much of the newer technology. In terms of the broadcast markets in each country, it was suggested that information regarding solar equipment, assembly of equipment and building component parts, as well as the attached labor involved, and taxation structures would be useful for comparison and planning across each country.

Perhaps the least developed area of the taxonomy and certainly the newest is that of information systems. Since telematics is the focus of attention here and in general, the electronic means of human communication, items which appear in the taxonomy of information systems were drawn short of the realm of counting computers and peripherals. Rather, information systems as described here are the electronic means by which information is exchanged including via the telephone networks, private or leased cables, fibre and satellite. The information exchange infrastructure and peripherals only are considered in the information systems section. It was suggested that full services descriptions in information systems also be added to the taxonomy beyond the couple of service items listed.

In general, respondents were very interested in more market information as is represented in item "D" of each category and could see the expansion of these items in operationalizing the taxonomy.

Questions regarding availability of data for the taxonomy varied considerably from country to country. Again it was assumed by many respondents that if through diplomatic channels on an official ASEAN level, a precise data collection scheme could be built from the data taxonomy. Then, the information, in full, from each country could be provided.

In many cases, information for items suggested by the draft data taxonomy scheme are available but not necessarily easily accessible. This is because it is published in forms other than suggested by the taxonomy and requires laborious efforts to re-convert and combine or is not otherwise generally released by the agencies involved. If an agreement could be reached across each country of the ASEAN on an official level, however, the vast majority of respondents replied that the information would be made available and means to gather and report the information in the comprehensive manner suggested by the base-line data taxonomy would be applied. Asked directly if doing so would be desirable, nearly all the respondents felt that the taxonomy represents a very useful way to organize and compare information for planning and evaluation purposes across the ASEAN and ought to be pursued. One respondant was rather pessimistic about the reality of such a pursuit given the complexity of the subject and the government channels it would have to go through. No one suggsted, however, that efforts in this regard should not be made.

Respondents were also asked what information would be useful for them for cooperative planning purposes across the countries of the ASEAN. Everyone agreed that the information, if it could be provided as the taxonomy suggests, would be useful in many ways and the desire to have access to all of the information represented on the data taxonomy scheme was expressed.

As to the question to test whether infrastructure and investment information was indeed the best way to conceptualize, organize and present data on telematics in the region, the response was unanimously in favor. The reasons varied from country to country and person to person. In Indonesia, such data is not widely available and would be useful across a broad range of internal needs as well as for comparison and planning in the region. In Malaysia, the more private business structure of telematics as it is evolving sees these as critical issues in planning corporate strategy and for marketing efforts. In Singapore, moves toward internationalization of Singapore Telecoms services means that such information across countries would provide a perspective for competitive as well as cooperative efforts.

Investment figures were without a doubt one of the more sensitive issues. From a range of reasons of internal security to a look to the future where more competitive business practices may evolve between the countries, it was acknowledged that investment figures, though desirable, may not necessarily be made available. In fact, everyone wanted to know the investment data as suggested by the taxonomy for the other countries, but, were reluctant to say that such data for their own country would be made available. In terms of the importance of the investment information that the data taxonomy represents for expanded regional planning in telematics, everyone was agreed. One Singaporean summed it up by stating that sooner or later, "if we are to cooperate more fully in areas such as these, this kind of information will have to be made available." Again, as was suggested by several respondents, this will take an official political will to act.

Another very sensitive area represented by the data taxonomy is information relating to military use of telematics. In each country, that information would likely remain unavailable for security reasons. One Indonesian was quick to point out that on a military cooperative level across the ASEAN, such a data taxonomy scheme for the representation of information in telematics would be very useful internally. He was much obliged for the idea! Most respondents suggested that at the level of public telematics systems, it would not be fruitful to pursue information on the data taxonomy regarding military uses if the scheme is to be operationalized for public purposes. Ironically, however, no one suggested it be removed from the taxonomy.

5.4 Refined Base-line Data Taxonomy

From the results of the interviews, it is possible to further refine the base-line data taxonomy. This includes adding the suggested items expressed by one or more people in each country and revising somewhat the format. This is not intended to be a final statement in terms of presenting the data taxonomy for telematics in the ASEAN. Rather, it is a next step in the overall scheme for telematics development in the region. It should be viewed as an ever modifiable taxonomy which could then be operationalized in various forms for more specific uses. However, the taxonomy represents indicators of telematics for comparison across the ASEAN countries which are considered useful to planners in each country. Thus, the refined data taxonomy represents a significant new tool for regional policy and planning.

Figure 4

Refined Base-line Data Taxonomy

Telematics Infrastructure and Investments in the ASEAN Countries

The base-line data taxonomy is organized as follows:

I. TOTAL INVESTMENT IN TELEMATICS

II. TELEPHONE TELECOMMUNICATIONS

A. Telephone Telecommunications Systems Infrastructure
B. Investment in Telephone Telecommunications
C. Government Policies and Regulations
D. Principal Suppliers of Telephone Equipment and Services (By country and vendor)
E. Important Means of Financing

III. BROADCAST SYSTEMS (television, radio)

A. Broadcast Systems Infrastructure
B. Investment in Broadcast
C. Government Policies and Regulations
D. Principal Suppliers of Broadcast Equipment and Services (By country and vendor)
E. Important Means of Financing

IV. SATELLITE SYSTEMS

A. Satellite Systems Infrastructure
B. Investment in Satellite Systems
C. Government Policies and Regulations
D. Principal Suppliers of Satellite Equipment and Services (By country and vendor)
E. Important Means of Financing

V. INFORMATION SYSTEMS

A. Information Systems Infrastructure
B. Investment in Information Systems
C. Government Policies and Regulations
D. Principal Suppliers of IS T-Com Equipment and Services (By country and vendor)
E. Important Means of Financing

I. TOTAL INVESTMENT IN TELEMATICS

	1970	1975	1980	1985	1990	1995 (Projected)	2000 (Projected)
1. Total Investment in Telematics, $US -							
2. Total Investment in Telematics as % GDP -							
3. Total Investment in Telephony, $US -							
4. Total Investment in Telephony as % Total Telematics -							
5. Total Investment in Broadcast Systems, $US -							
6. Total Investment in Broadcast Systems as % Total Telematics -							
7. Total Investment in Satellite Telematics,$US -							
8. Total Investment in Satellite Systems as % Total Telematics -							
9. Total Investment in Information Systems , $US -							
10. Total Investment in Information Systems as % Total Telematics -							

II. TELEPHONE TELECOMMUNICATIONS

A. Telephone System Infrastructure

	1970	1975	1980	1985	1990	(Projected) (1995	2000)
1. # of telephone lines (voice circuits) **domestic.**							
# satellite circuits							
# undersea circuits							
# copper cable circuits							
# fibre optic circuits							
# over-land circuits (incl. cable,microwave,etc.)							
2. # of telephone main lines (voice circuits) to **other ASEAN countries.**							
# satellite circuits							
# undersea circuits							
# copper cable							
# fibre optic							
# over-land circuits (incl. cable,microwave,etc.)							
3. # of telephone lines (voice circuits) **international** other than to ASEAN countries.							
# satellite circuits							
# undersea circuits							
# copper cable							
# fibre optic							
# over-land circuits (incl. cable,microwave,etc.)							
4. Total # Telephone subscriber lines							
# government subscriber lines							
# civil							
# military							
# business subscriber lines							
# residence subscriber lines							

5. Wait List, Total # demand for
   subscriber line installations.
      waitlists by region, urban and rural.

6. Total # of single -line
   telephone handsets
   (subsets) in use.

   # in urban areas
   (pop. > 100,000)

   # business
   # government
     # civil
     # military
   # private (residence)

7. # of multi-line
   handsets (subsets) in use
   (2 or more circuits)

   # in urban areas
   (pop. > 100,000)
   # business
   # government
     # civil
     # military
   # private (residence)

8. Total # of analog
   switches in use

   # handling
     > 100,000 circuits

9. Total # of digital
   switches in use

   By Classes of Switches (5)

10. Total # of PBX's (PABX, PMBX)
    (Private [Automatic/Manual] Branch Exchanges)
    - # of PBX's in Business
      - # with <50 extensions
      - # with >100 extensions
    - # of PBX's in Government
      - # civil
      - # military

11. Total # of Cellular Mobile Systems
    - Cell sites
    - % penetration

12. Total # of cellular subsets
    - # civil
    - # military

13. Total # of Paging systems
    - # of pager units

14. Total # of Public Payphones
    - % public payphones in urban areas.
    - % public payphones in rural areas.

15. Redundant systems, back-ups and spares.

16. Personnel
    - Management and Administration
    - Engineering, Design, Research and Development
    - Technicians and operators
    - General Labor and Clerical

17. Services (Description of phone services offered)
    - # international calls
    - Services costs

B. Investment in Major Telephone Equipment, $US

	1970	1975	1980	1985	1990	(Projected) (1995	2000)
1. Telephone handsets (subsets) $US							
single-line $US							
multi-line $US							
2. Telephone Switching systems $US							
analog $US							
digital $US							
by classes (5)							
3. Total domestic voice circuits $US							
4. Total voice circuits to ASEAN countries $US							
5. Total international voice circuits $US							
6. Total Copper-cabling $US							
# of Kms							
# of kms over-land							
# of Kms under-sea							
Twisted-pair wiring $US							
# of kms							
7. Total Fibre Optic cabling $US							
# of kms							
# of kms over-land							
# under-sea							
8. Total Micro-wave equip $US							
# of stations							
# of kms covered							

9. Total Radio Freq. equip, $US
   # HF stations
   HF station $US
   # VHF stations
   VHF stations $US
   # UHF Stations
   UHF stations, $US

10. Total Long Distance Equipment, $US

11. Total PCM equipment, $US

12. Total Repeaters, $US

13. Total PBX's (incl. PABX and PMBX), $US

    PBX's business $US
      PBX's < 50 extensions, $US
      PBX's > 100 extensions, $US
    PBX's Government, $US
      PBX's civil, $US
      PBX's military, $US

14. Total Cellular Mobile Telephone systems, $US
      Mobile sets, $US
      Base Stations (cell sites)$US

15. Total Paging Systems, $US

16. Total Public Payphone, $US

17. Total Maintenance and Test equipment, $US

18. Redundant systems, back-ups and spares, $US.

19. ISDN TECHNOLOGY:

    [Total ISDN circuits] (Projections)
    Std 2xB + D Channel
    (2x64Kbs + 16kbs)

    -maintenance and test equip.
    -subsets (telepc's)

C. <u>Government Policies and Regulations</u>

1. regulations by government telecommunications authority.
2. trends in deregulation and liberalization of policies and markets
3. policies for competition and cooperation
4. tariffing policy (rate structures, net out-payments)

D. <u>Principal Suppliers of Telephony Telecommunication Equipment and Services</u>

1. Market Share of Equipment by Supplier Country (%)

	Supplier					
Equip.	Domestic	U.S.A.	Japan	E.C.	ASEAN	Other
Cabling (incl. connection equip)						
copper						
twisted-pair						
T-1						
trunking						
fibre-optic						
Switching						
Analog						
Digital						
Handsets (subsets)						
single-line						
multi-line						
PBX						
PABX						
PMBX						
RF equip						
HF						
VHF						
UHF						

Micro-wave

LD equip

PCM

Repeaters

Mobile
- stations
- interconnect
- subsets
  - mobile
  - portable

Payphone

Maintenance
and Test

2. Market Share in Equipment by Vendor (%)

Vendor	Cabling	Switching	Handsets	PBX	RF	MW	LD	PCM	other

E. Important Means of Financing

1. Considerations for purchasing equipment
   terms and other provisions, i.e. training.
2. joint-ventures
3. mixed credits
4. World Bank and IMF loans
5. joint operations and payback (revenue
   sharing) schemes
6. Government budget
7. Grants and aid

III. BROADCAST SYSTEMS (television, radio)

A. Broadcast Systems Infrastructure.

	1970	1975	1980	1985	1990	(Projected) (1995	2000)

RADIO:

1. # of radio stations
   AM
   FM
   HF (shortwave)

2. Military radio

3. Government Radio other than public transmission (i.e civil defense)

4. Radio Coverage
   % of country covered by a radio signal

   Area covered by each station, location

5. # of radio transmitters (and antennae), power, location
   AM
   FM
   HF

6. # of Radio repeaters (for each station)

7. # of Micro-wave stations used for radio (for each station)

8. Solar equipment

9. Description of Program Content
   hours, language, music, edu., etc.

10. Description of regional services.
    Program exchanges.
    ENG/SNG.

11. Personnel
    Management and Administration
    Programming
    Production: artistic, technical
    Engineering, Design
    Clerical and Labor

12. # of radio sets in use
    AM
    FM
    HF
    Combinations

13. Radio manufacturing and assembly
    labor

14. % pop. that owns a radio
    % urban
    % rural

15. ave. # radios per household

16. % households with at least one radio

17. % households in urban areas
    (pop. > 100,000) with radios
    households in rural areas with radios

TELEVISION:

18. # television stations
    # VHF, location, coverage
    # UHF, location, coverage

19. Color Standard (PAL, SECAM or NTSC)

20. # of transmission towers, power
    location and coverage

21. # of repeater stations
    (for each station)
    power, location, coverage

22. # of micro-wave stations
    (each tv station)
    coverage

23. Description of Long-line use
    for television

24. Description of Satellite use for
    television (will overlap with
    section below)
    # and types of sat. transmitters
    # and types of TVRO stations

25. Solar television equipment

26. Description of program content
    domestic production- type, hours, language
    imported programming - type, hours, language
      entertainment
      news

27. Personnel
      Management and Administration
      Programming
      Production: Artistic and Technical
      Engineering, Design, Maintenance
      Labor and Clerical

28. Television equipment manufacturing
      Assembly, components
      Labor

29. # of tv sets in operation
      # B&W; ave cost
      #Color; ave cost
      % total households with at least one tv
      % of total households with tv that are
        in urban areas; % rural
      % households in urban areas with a tv
      % households in rural areas with a tv

30 # public viewing sets
      by urban and rural areas

CABLE TELEVISION:

31. # of cable operators, organizations

32. # of cable stations
    location
    penetration

33. % households with cable
    % cable households in urban areas
    % cable households in rural areas

34. Description of cable programming

32. Personnel

VCRs and VCPs:

32. # VCRs and VCPs in use

33. % households with VCRs, VCPs
    % urban
    % rural

34. VCR and VCP manufacturing and assembly
    Labor

B. Investment in Broadcast Systems, $US

						(Projected)	
	1970	1975	1980	1985	1990	(1995	2000)

RADIO:

1. Total radio $US
   Broadcast
   Military
   Government (non-public broadcast)

2. Total radio Goverment owned $US

3. Total radio Privately cwned $US

4. Production facilities $US
   (by station type)

5. Transmission Equipment $US
   Broadcast towers
   Repeaters
   Micro-wave
   Long-lines
   satellite

TELEVISION:

6. Total television $US
   Gov. owned
   Privately owned

7. Production facilities
   by station $US

8. Transmission Equipment, $US
   by station
   broadcast towers
   repeaters
   micro-wave
   long-line
   satellite
   transmit
   transmit and receive
   tvro

9. Solar Television Equipment, $US

10. Television assembly and components manufacture, $US
    Labor costs

11. Television sets $US
    B&W
    Color
    taxes and user fees

---

12. Cable Television, $US
    - Head end
    - Cable Trunking
    - Downlinks
    - Engineering and test

---

13. VCRs and VCPs
    - cost (domestic) $US
    - projected market size
    - taxes

C. Government Policies and Regulations

1. ownership/control
2. operation
3. licensing of sets, taxes
4. regulations governing programming and
5. advertising, radio, tv, cable tv

D. Principal Suppliers of Broadcast Equipment and Services (By country and vendor)

1. Share broadcast equipment market by country (%)

Equipment	Domestic	USA	Japan	E.C.	ASEAN	Other
RADIO:						
production						
transmission						
towers						
repeaters						
micro-wave						
engineering and test						

Sets
- AM
- FM
- HF
- Combination

TELEVISION:

Production

Transmission
- Towers
- repeaters
- micro-wave
- satellite
  - TV Transmit
  - TV T/R
  - TVRO

Engineering and Test

Solar Equip.

Sets
- B&W
- Color

Cable TV:
- Head End
- Trunking
- Downlinks
- Test

VCRs and VCPs

---

2. Share of broadcast equipment market by vendor, (%).

Vendor	Production	Transmission	Eng.	Sets	VCR
______					
______					

E. <u>Important Means of Financing</u>

1. joint ventures
2. grants and aid
3. technical assistance programs
4. term financing
5. mixed credits
6. govt/private co-ventures
7. govt funds

IV. SATELLITE SYSTEMS

A. Satellite Systems Infrastructure.

Description of Satellite
Services used:

1. Intelsat

2. Domestic

3. Regional

4. Satellite(s) owned
   sat. name
   coverage
5. Transponders leased
   sat. name
   coverage
   lease terms

6. Tracking and Telemetry

Satellite Service Description:

7. Telephone
   Sats. used, allocation, time
   % phone traffic carried
   via satellite
      domestic
      ASEAN
      International (non-Asean)
   Type of service
      SCPC/DAMA
      FDMA
      TDMA
      other

8. Broadcasting
   Sats. used, allocation, time
      Radio
      Television
         program import/export
         news import/export
         educational - domestic
      Military

9. Info Systems (datacom)
   Sats. used, allocation, time
      Gov't/public (telex/fax/etc)
         domestic
         Asean
         International
      Private Organizations and Companies
         data transfer
         communication
      Military
         communication
         surveillance

10. # of Earth Stations, Type (Std A - Vsats -micro antenna) and location

   Telephone system

   Broadcast systems
      Radio
      TV
         T/R
         TVRO

   IS T-com (datacom)
      Gov't/public
      Private
      Military

B. Investment in Satellite Systems.

	1970	1975	1980	1985	1990	(Projected) (1995	2000)
1. Launch Activities $US							
2. Satellites, Total $US							

3. Geo-stationary
   Owned - $US
      Gov't/public
      Private
      Military

   Leased (transponders) $US
      Gov't/Public
      Private
      Military

4. Other Satellites: (non-geo-stationary)
      Weather
      Surveillance

5. Earth Stations - Total $US

	1970	1975	1980	1985	1990	(Projected) (1995	2000)
Gov't/Public							
Std A							
.							
.							
.							
VSAT							
Private							
Std A							
.							
.							
.							
VSAT							
Military							
Std A							
.							
.							
.							
VSAT							

6. Ground-Based Electronics
   Includes:
   - frequency translator and modulators
   - signal processors
   - frequency (spectrum) analyzers
   - SCPC/DAMA electronics
   - video identifier
   - modems
   - signal generators
   - power equip.
   - codecs
   - encoders/de-cryptors
   - portable/mobile up and down-links

C. Government Policies and Regulations

1. participation in WARC and INTELSAT
2. domestic DBS
3. transborder Satellite info flow news, data, etc.
4. Participation in regional systems, Palapa, Asiasat.
5. Ground stations, ownership, control

D. Principal Suppliers of Satellite Equipment and Services (By country and vendor)

1. Share of market for Satellite Equipment by Country (%).

Equipment	Domestic	USA	Japan	EC	ASEAN	Other
Sats.						
Geo-sta. Transp.						
Earth Stations						
Ground-based electronics						

2. <u>Share of market by vendors (%)</u>.

Vendor	Satellites	Earth Stations	Ground Based Elects.

E. <u>Important Means of Financing</u>

1. contribution to INTELSAT, INMARSAT
2. mixed credits
3. grants and aid
4. lease agreements
5. co-ventures
6. supplier credits
7. domestic government investment
8. revenue sharing

V. INFORMATION SYSTEMS

A. Information Systems Infrastructure.

Description of systems and services:

LAN (Local Area Networks)
WAN (Wide Area Networks)
Dedicated data lines, (T-1 equivalents)
Modems
Codecs
Multiplexors
FAX (facsimile)
E-Mail
Videotex
On-line data bases
Packet and Circuit Switched systems

	1970	1975	1980	1985	1990	(Projected) (1995	2000)
1. Gov't/Public (incl. education)							
2. Private (banks, corporations, etc.)							
3. Military							
4. Personnel network management							
5. Mobile Systems text, fax, data							

B. <u>Investment in Information Systems - $US</u>

	1970	1975	1980	1985	1990	(Projected) (1995	2000)
LAN (Local Area Networks)							
WAN (Wide Area Networks)							
Dedicated data lines, (T-1 equivalents)							
Modems							
Codecs							
Multiplexors							
FAX (facsimile)							
E-Mail							
Videotex							
On-line data bases							
Packet and Circuit Switched systems							

C. <u>Government Policies and Regulations</u>

1. transborder data flow policies
2. cwnership and control of IS networks
3. accessibility to public networks
4. "interconnect" policies
5. copyright, intellectual property rights
6. standards
7. Taxes and Tariffs
8. Import rules/ prohibitions

D. <u>Principal Suppliers of IS Equipment and Services</u> (By country and vendor)

1. <u>Share of Market by Country (%).</u>

equipment	Domestic	USA	Japan	EC	ASEAN	Other

-------						

2. Share of Market by Vendor (%).

vendor	LAN	WAN	Modems	Codecs	m-plxrs	etc.

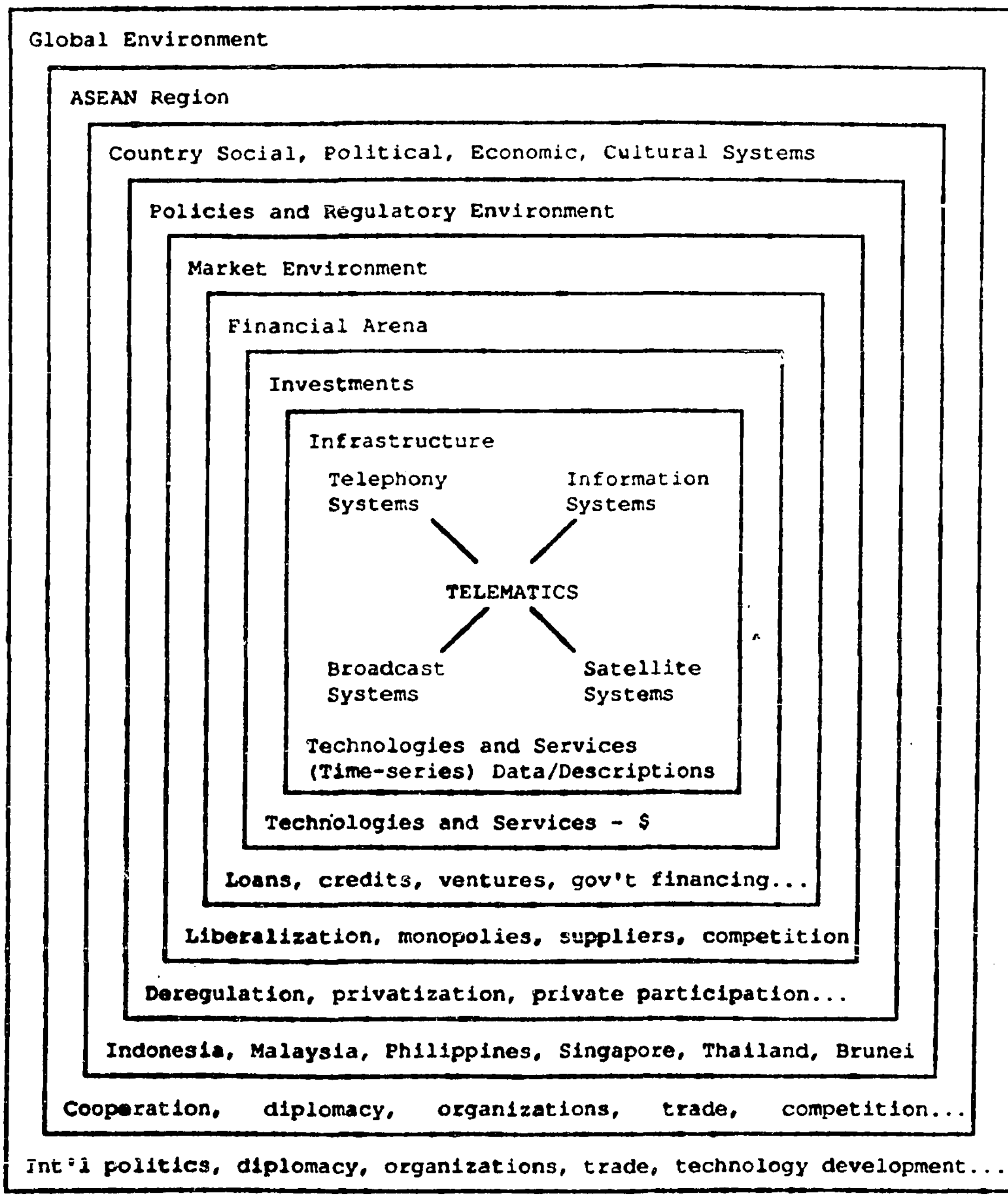
E. Important Means of Financing

1. supplier credits
2. World Bank and IMF loans
4. Asia Development Bank loans
5. domestic government investment
6. joint ventures, revenue sharing
7. grants and aid, assistance projects

5.5 Summary Base-line Data Taxonomy Framework

Figure 5

Framework for a Base-line Telematics Data Taxonomy of Infrastructure and Investment in the ASEAN Region



5.6 Feedback

In an attempt to verify the utility of the base-line data taxonomy for policy makers and planners in the ASEAN region and to begin to operationalize the taxonomy for the collection of data, the telecommunication authorities in each country were asked to provide the information as is suggested by the base-line data taxonomy. Each were allowed to operationalize the taxonomy and define the terms in their own manner for this purpose.

It is not within the scope of this study to formally operationalize the taxonomy and structure specific data collection items in terms of definitions and modes of data collection. Indeed, that will require efforts far beyond the means here. However, if preliminary information could be collected and made available from the official telecommunications authorities as they saw fit themselves in each country, then a demonstration of the need and utility of the data taxonomy would be made.

To date, two countries, namely Malaysia and the Philippines have responded directly to the request to begin to fill in the data suggested. In fact, from Malaysia, data was provided directly on the data taxonomy sheets themselves. From Malaysia, the response was made by the head of corporate planning at STM through a request from the

Minister of Energy, Telecommunications and Posts. From the Philippines, the First Vice-President of PLDT provided the feedback response. Parties in Indonesia, Thailand and Singapore have promised responses but these have not yet been received. The replies received are reproduced in Appendix 4. The data itself has already begun to be used in the East-West Center project on the Impact of Telecommunication Technologies on ASEAN Economies, headed by Dr. Meheroo Jussawalla.

The feedback from the telecommunication authorities in terms of actual preliminary implementation of the data taxonomy scheme provides evidence that the scheme is a viable and useful new tool as an indicator of telematics development for policy and planning in the region.

Perhaps the next step in this effort would be to begin to formally operationalize the base-line data taxonomy and to begin the process of gaining acceptance for its use on an official level across the ASEAN. In terms of the operationalization of the taxonomy, data already collected might be analyzed for completeness and for differences of interpretation across each country. A study of the definition of each item and the required information which might be standardized across each country could be conducted.

CHAPTER VI

SUMMARY AND RECOMMENDATIONS

In the ASEAN region, countries are characterized by their different governments, social and cultural milieus, and economic policies and strategies. The priorities in development are different and so it is no surprise that the development of the telematics sectors are also quite different in each country. However, it must be acknowledged that the growth in economies and perhaps the success of the ASEAN region as a whole, requires a concomitant growth in the telematics sector.

Despite political, social and cultural differences in each of the ASEAN countries, several commonalties emerge in terms of telematics development across the region as a whole. The natural monopoly for telematics development can no longer be justified in each country except perhaps for thin-route and remote/rural areas where a heavy government component is necessary to meet the high costs of infrastructure development which provide little revenue return in the initial stages.

Whether telematics in any country can become a leading sector for development such as in Singapore or suffer from neglect and inefficiencies as is evident in some of the systems in Thailand is largely a policy question. With high capitalization costs and the pressure to build higher capacity and better quality infrastructure, governments are reconsidering the policies for state-owned and controlled monopoly operating entities. The need to liberalize telematics markets, especially in terms of non-basic services and the look toward the privatization of telematics authorities and/or the increase in private participation in the government controlled enterprise is confronting each nation.

Faced with high costs and the need to provide better service, financing from outside the government for telematics development is required. This is perhaps the single most important factor driving the trend toward liberalization of markets in the lesser-developed countries of the ASEAN. In the more developed Singapore and to a similar extent in Malaysia, the need to respond to international pressures as they move well beyond domestic basic service provision into the world market for telematics services, requires them to substantially re-evaluate their position vis-a-vis privatization and/or monopoly control of services.

The economies of scope of the telecommunications authorities in particular are being reduced by innovative technology developed in the private sector. This is in fact eroding economies of scale in the delivery of services to a mass market on an affordable level compelling a shift to more liberalized policies. While the relative degree to which policy is shifting is quite different in each country, each ASEAN country is moving toward a greater liberalization of telematics markets, increasing private participation particularly in terms of private investment in telematics development, moving toward various forms of privatization of the telecommunication authorities (except in the Philippines which is already private) and beginning moves toward the deregulation of all areas of telematics.

In each of the ASEAN countries, the political will to act toward changing policies of telematics development is seen. Even in Thailand which has enormous political barriers to the reorganization of the telecommunications authorities, privatization and deregulation are now a part of the development agenda. Technology development push and market push factors are creating ever increasing demand for telematics services. The resultant increase in private telematics vendors and service providers to meet that demand at affordable costs is forcing each government to reconsider its policies toward telematics development in order to meet demand which the government authorities simply cannot provide either financially or in terms of the multiplicity of innovative services demanded.

In terms of social and economic development, each ASEAN country recognizes the need to more fully develop its telematics capabilities. The priorities of such development vary in each country and the relative level of that development is also different. However, it is recognized that while an increase in telematics development is not a direct cause for economic and social growth, the two go hand-in-hand in terms of improving overall social and economic conditions. Even in the relatively high cost/benefit area of rural and remote telematics development, the social development derived from the electronic connectivity of people is recognized even if only for primarily emergency reporting purposes in the beginning. Thus, with the high social benefit outweighing the economic cost/benefit of infrastructure development, governments are compelled to find new ways of financing telematics development beyond the treasury of their own country and are turning to an ever-increasing degree to the private sector.

In essence, the inefficiency of the telematics authorities, the inability to meet demand and to clear backlogs, the heavy capital investment requirements and the constrained revenue-generating capacity of the government organizations is compelling a serious look at the complete privatization of the telecommunication authorities in particular in each ASEAN country. While Malaysia is making the strongest move toward full privatization and the Philippines will remain largely private, Singapore is moving to privatize in the next year with Thailand to follow in three to five years. In Indonesia, where very heavy government control persists, the shift to private sector development of non-basic services and the increase in private participation in basic services is in evidence.

In terms of ASEAN regional telematics development, commonalties exists in terms of the need for cooperation in satellite telematics in particular and in terms of education and training in all areas of telematics. Cooperative efforts are increasing in terms of broadcast services and exchanges in the region and information systems development is increasing in regional scope due to the need for standardization and interconnectivity of systems to meet regional database and interchange needs.

Differences remain across the region in terms of the relative level of infrastructure development and investment in each area of telematics. However, those differences are relatively unknown in the absence of a region-wide accounting system for telematics infrastructure and investment which policy makers in the region see as necessary in the development of regional policy. With regional differences in terms of views toward tariffing for example and the need for greater cooperation in terms of understanding the implications of the shifts toward privatization and liberalization of markets in the region, each to a different degree or form, policy makers are at a loss for comprehensive information about the region as a whole. The base-line data taxonomy developed in this study and discussed subsequently provides a mechanism to begin to fill in the missing information on a regional level.

From an interdisciplinary and systems view, procedures have been adopted in this study for the creation of a base-line data taxonomy scheme of telematics infrastructure and investment in the ASEAN countries. These procedures are based largely on communication planning methods as described by Middleton and Wedemeyer (1985). It is important to stress that it is the interdisciplinary view however, which enabled the development of a comprehensive data taxonomy for the ASEAN region in telematics. The taxonomy includes both quantitative and qualitative indicators of the broad range of telecommunication and information infrastructure and investments developed from a systems view, as well as government policies, market information and financing schemes viewed as important for both internal country purposes as well as external, regional cooperation and competition.

The process of the development of the base-line data taxonomy is one that is not easily represented in a hierarchical fashion. Rather, it is a procedure or set of activities which help build each component part. Feedback on results of each activity helps to build parts of other on-going activities.

The process began with a description of the telematics environment in each of the ASEAN countries using the case study method and collecting data from primary and secondary literature sources as well as from the people involved in policy concerns in telematics in each country studied. In part as a result of the country descriptions and as a matter of course for developing the description itself, several key development indicators for planning evolve which are comparable across each of the ASEAN countries despite individual country social, economic, political and cultural differences. These are primarily infrastructure and investment indicators in each of four areas of telematics, namely, telephony, broadcast, satellite and information systems. From this and other sources which present data taxonomies for various separate components of the telematics environment, a base-line data taxonomy encompassing telematics in a comprehensive manner was drafted. This taxonomy was drafted with a view that the items listed would be useful, when operationalized and data was gathered, for planning purposes in each country and across the ASEAN region.

In order to verify the taxonomy as indicative of a useful planning tool, a survey of selected key policy makers and telematics stakeholders was conducted. The open interview format allowed for a broad ranging discussion on the data taxonomy as well as for collecting and verifying information that would be a part of the country descriptions.

Feedback in terms of the utility of the base-line data taxonomy as a planning tool for the region was sought. Two of the ASEAN countries, Malaysia and the Philippines have begun to operationalize and actually collect data under the scheme.

It is a temptation at this point to begin to generalize from this process. However, caution is applied as the procedure was specific to meeting the objectives of a study based in the ASEAN region. For this reason, similar procedures used elsewhere may not be entirely applicable. Nonetheless, the procedure described here can provide an interdisciplinary model, albeit one that might be modified, for similar efforts in other regions. It also provides a means by which the results of the study in terms of both country descriptions and the base-line data taxonomy can be verified.

Both the ASEAN country telematics description and the base-line data taxonomy present significant contributions.

The work provides a process for policy research in telematics in the ASEAN which is heretofore unavailable. The differences in development of each of the ASEAN countries is a result, in part, of the pursuit of relatively independent goals, and the result simply of countries at different stages of development. Yet, there is a simultaneous need to act in concert in the region for telematics development and in such forums as the GATT international trade discussions which are linked with each other. Thus cooperative efforts in the region in telematics development can benefit from comparative descriptions and the data taxonomy as tools in regional policy and planning activities.

The information presented in the country descriptions represents a first attempt to organize and present the broad ranging telematics sector in the ASEAN region. It combines infrastructure and investment descriptors in order to situate each country within its political, social, economic and cultural milieu and to be able to compare countries across the ASEAN. The summary of policy trends of each country (end of Chapter 4) provides a significant and unique view of the telematics policies of the ASEAN region for not only understanding of each country but for comparison across countries as well.

Data gathered as a result of the operationalization of the base-line data scheme can be used as input to many other research endeavors and may be applied to many methods of communication planning. For example, scenarios on possible future developments of telematics in the ASEAN could be created. Delphi and nominal grouping methods could be developed for use based on the information of the descriptive narrative and data gathered from the implementation of the taxonomy for future forecasting methods. Trend and extrapolation techniques could be used from data gathered over-time. Primarily, however, the country descriptions and data taxonomy provide a means by which to communicate and learn about telematics in the ASEAN region and could be used as such in the region.

Furthermore, it may be possible to move toward a more formal adoption of a structured data gathering effort for regional planning. The data taxonomy could be used as a model for the Committee on Transportation and Telecommunication, COTAT, of the ASEAN Secretariate for implementing new means of cooperative data gathering for planning purposes. This represents a contribution on the diplomatic level in the ASEAN heretofore unavailable. While procedures to begin the formal adoption of the data taxonomy as a model for data gathering efforts in the region are beyond the scope here, a number of phases of implementation might be sketched. The first phase might include the formation of a regional task force on the recommendation of the ministers to formulate procedures and scope. The task force or working groups of leaders and policy makers would then form a consensus and make recommendations back to the relevant permanent committees of ASEAN with recommendations for action. In the next phase, discussion could then ensue and also take into account other regional and international concerns. Organizations such as the International Telecommunications Union, ITU and CCITT working groups; UNESCO; the Asia-Pacific Telecommunity, APT; the Asia-Pacific Broadcasting Union, ABU; and the Pacific Telecommunications Council, PTC, could be consulted and also use the data taxonomy as a model for implementing further data gathering efforts in the region which look at telematics on a comprehensive level for planning purposes. In a final phase, formal adoption procedures might then be formulated at the ASEAN secretariate level and the adaptation of the taxonomy in each country would follow.

While cooperative efforts are made for technical training in the region as well as regional efforts for cooperation in marketing of telematics equipment, so too efforts for regional education in telematics policy development and planning could emerge. White papers on these subjects could be developed to help guide policy makers and planners in the region and to help guide political action.

In terms of enhancing educational efforts in telematics, this research contributes to academics in terms of helping to conceptualize the broad range of telematics technologies and policy and could be used as input for program planning in the field of communication and information sciences as well as help shape specific training programs.

As a next step or set of activities, the taxonomy could be operationalized and data gathered organized in a database for telematics in the ASEAN region. As outlined in the adoption procedures sketched above, perhaps such a database effort could be housed at the Asia-Pacific Telecommunity in Bangkok. This would go a long way toward remedying the need for databases in this sector similar to efforts which have created enormous database resources in such sectors as tourism and transportation elsewhere.

A case for further study is often recommended at the end of nearly all academic endeavors. The recommendation for the need for further study is presented here in view of the process that the interdisciplinary study of telematics in the ASEAN region requires. The description of telematics in the region will require updating as new trends develop and new policy replaces old. The educational process of understanding telematics in the region is on-going. Also, the base-line data taxonomy is but the latest version of a taxonomy useful as a tool for regional policy and planning. It too can be continually developed over time. As new technologies and services emerge, the taxonomy can be a modified. Indeed the taxonomy is but a beginning to the operationalization and use of data gathered under its rubrics for policy and planning.

APPENDIX 1

WORKSHOP PARTICIPANTS, INTERVIEW RESPONDENTS AND PROJECT COLLABORATORS

1. Participants to the Workshop, "Impact of Telecommunications Technologies on ASEAN Economies." May 1990, Singapore.

2. Participants to a workshop (working group) on ASEAN telecommunication policy held at the PTC '90 (Pacific Telecommunications Council) conference, January 16, 1990.

3. Interview Respondents: Open-Interview Survey.

4. Project Collaborators.

* *

1. Participants to the Workshop, "Impact of Telecommunications Technologies on ASEAN Economies."

This workshop was sponsored by the East-West Center, Honolulu, Hawaii and the the Asian Mass Communication Research and Information Centre, Singapore, May 15-16, 1989. At this workshop, under the leadership of Dr. Meheroo Jusswalla, both a preliminary draft of the description of telematics in the ASEAN region and the draft base-line data taxonomy were presented and critiqued. Participating in the workshop were:

Mr. Jonathan Parapak
President, PT INDOSAT
Jakarta, Indonesia

Dr. Vincent Lowe
Dean, School of Graduate Studies
University Sains Malaysia
Penang, Malaysia

Mr. Sankaran Ramanathan
Senior Lecturer
School of Mass Communication, Institute Technology Mara
Shah Alam, Selangor
Kuala Lumpur, Malaysia

Dr. Alexander Flor
Professor of Development Communications
University of the Philippines at Los Banos
Laguna, Philippines

Mr. Er Sung Kheng
Administrative Officer, Business Strategy,
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Singapore Telecoms
Singapore

Mr. Wong Seng Hon
Director, Planning
National Computer Board, NCB
Singapore

Mr. Loh Chee Meng
Assisant Director, Information Economy and Society
National Computer Board, NCB
Singapore

Mr. Vijay Menon
Secretary General
Asian Mass Communication Research
and Information Center, AMIC
Singapore

Dr. Benjamin V. Lozare
Joint Deputy Secretary General
Asian Mass Communication Research
and Information Center, AMIC
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Dr. Anura Goonesekera
Senior Program Specialist (Research)
Asian Mass Communication Research
and Information Center, AMIC
Singapore

Dr. Eddie C.Y. Kuo
Professor, Department of Sociology
National University of Singapore, NUS
Singapore

Dr. Boonlert Suphadhiloke
Director, Office of National Communication Policy Board
Bangkok, Thailand

Mr. Chao Thongma
Executive Director
Asia-Pacific Telecommunity, APT
Bangkok, Thailand

Dr. Hajime Oniki
Professor
Institute of Social and Economic Research,
Osaka University
Ibaraki, Osaka, Japan

Dr. Meheroo Jussawalla
Research Associate, Economist
East-West Center
Honolulu, Hawaii

Mr. G. Russell Pipe
Project Director
Telecommunications Services Trade Project & Publisher
Transborder Data Report
Springfield, Virginia

Mr. Mark A. Hukill
Research Intern
East-West Center
Honolulu, Hawaii

2. Participants to a workshop (working group) on ASEAN telecommunication policy held at the PTC '90 (Pacific Telecommunications Council) conference, January 16, 1990, organized by Mark Hukill.

While approximately 15 people were a part of this working group, the following are those most directly concerned with telematics policy in the ASEAN. Other participants included buisness people from various companies in the United States who were sitting in for information.

Mr. Soekarno Abdulrachman
Director General of Posts and Telecommunications
Department of Tourism, Posts and Telecommunications
Jakarta, Indonesia

Mr. Shanmugam Manickam
Head, Corporate Planning Division
Syrikat Telekoms Malaysia Berhad, STM
Kuala, Lumpur, Malaysia

Mr. Dietrich Westendoerpf
Executive Director,
Center for Telecommunications Development
International Telecommunications Union, ITU
Geneva, Switzerland

Ms. Jane Hurd
Assistant Director
National Telecommunications and Information Agency, NTIA
Washington, D.C.

Mr. Ceasar Castro
President and Chief Operating Officer
Cable and Wireless, Inc.
Manila, Philippines

3. Interview Respondents: Open Interview Survey.

The following people were the respondents in the open interview survey described in Chapter V.

Malaysia:

Dato' Seri S. Samy Vellu
Minister of Energy, Telecommunications and Posts
Kuala Lumpur, Malaysia

Mr. Abdul Hassan
Deputy Director for Telecommunications
Ministry of Energy, Telecommunications and Posts
Kuala Lumpur, Malaysia

Dr. Syed Hussein bin Mohamed
Executive Director
Syrikat Telekoms Malaysia Berhad, STM
Kuala, Lumpur, Malaysia

Mr. Shanmugam Manickam
Head, Corporate Planning Division
Syrikat Telekoms Malaysia Berhad, STM
Kuala, Lumpur, Malaysia

Dr. Mohammad Othman
Head, Research and Development
Syrikat Telekoms Malaysia Berhad, STM
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Mr. Aris Bernawi
Deputy Director
Jabatan Telekom Malaysia, JTM
Kuala Lumpur, Malaysia

Mr. Halim B. Shafie
Director, Information Technology Division
Malaysian Administrative Modernization and Management Planning Unit, MAMPU
Kuala Lumpur, Malaysia

Dato' Abdullah Mohamad
Director
Asia-Pacific Institute for Broadcasting Development, AIBD.
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Mr. A.M.M. A'abad
Director, ABU Technical Centre
Asia-Pacific Broadcasting Union, ABU
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Mr. Arthur Wyndham
Director of Progamming Services
Asia-Pacific Broadcasting Union, ABU
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Dr. Ismail Bukory
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Malaysia

Dr. Vincent Lowe
Dean, Graduate Studies
University Sains Malaysia, USM
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Dr. Huan Chiang Chan
Research Fellow, Communication Policy Studies
University Sains Malaysia, USM
Penang, Malaysia

Group Interview: Faculty of Electrical Engineering,
(Information Systems)
University Technology Malaysia, UTM
Kuala Lumpur, Malaysia

Dr. Marzuki Khalid
Head, Department of Control Engineering

Dr. Zainal Ahmad
Associate Professor of Information Technology

Mr. Kamaruzzaman Seman
Head, Telematics Research Group

Dr. M. Ghazie Ismail
Country Manager, Hewlett Packard (M) Sdn.Bhd
Kuala Lumpur, Malaysia

Dr. Ismail is also:
Treasurer
Association of the Computer Industry
Malaysia, PIKOM
Kuala Lumpur, Malaysia

Mr. Shaharom Md. Shariff
General Manager
Pernas, NEC Corporation
Kuala Lumpur, Malaysia

Indonesia:

Mr. Soekarno Abdulrachman
Director General of Posts and Telecommunications
Department of Tourism, Posts and Telecommunications
Jakarta, Indonesia

Mr. Arnold Ph. Djiwatampu
Deputy Director General, Posts and Telecommunications
Department of Tourism, Posts and Telecommunications
Jakarta, Indonesia

Dr. F. Rachmadi
Head, Office of Information Research and Development
Department of Information
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Mr. Jonathan Parapak
President, PT INDOSAT
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Mr. Sumitro Roestam
Director of Operations
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Jakarta, Indonesia

Ir. Safwan Natanagara
General Manager, Marketing
PT INDOSAT
Jakarta, Indonesia

Mr. Ir. Saleh Effendi
Chief Engineer, Planning
PERUMTEL
Jakarta, Indonesia

Group Interview: Perum POS dan GIRO
Development Planning Division
Bandung, Indonesia

Mr. Ngurah Martanegara
Chief, Development Planning Division

Mr. Kahadji Kalake
Head, Planning Centre

Dr. Soepardjiman
Projects Coordinator

Mr. Cacik Sudarijanto
Director
Perum Telekomunikasi, PERUMTEL
Telecommunications Centre
Bandung, Indonesia

Singapore:

Dr. Chin Choon-Wei
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Singapore Telecoms
Singapore

Ms. Lian Bee Leng
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Mr. Er Sung Kheng
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Corporate Planning
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Singapore

Dr. Paul Seow
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Ministry of Information
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Dr. Eddie C.Y. Kuo
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4. Project Collaborators

A network of people throughout Southeast Asia were instrumental in assisting with providing information for this project and/or were instrumental in the logistics of the interviews, extending a warm hospitality which is deeply appreciated.

Malaysia:

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Philippines Long-Distance Telephone Company, PLDT
Manila, Philippines

Dr. Alexander Flor
Professor of Development Communications
University of the Philippines at Los Banos
Laguna, Philippines

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Mr. Vijay Menon
Secretary General
Asian Mass Communication Reserch
and Information Centre, AMIC
Singapore

Mr. Chin Saik Yoon
Senior Program Officer
Communications Division
International Development Research Centre, IDRC
Singapore

Thailand:

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Executive Director
Asia-Pacific Telecommunity
Bangkok, Thailand

Dr. Chamnong Vibulsri
Associate Professor
Faculty of Communication Arts
Chalangkorn University
Bangkok, Thailand

APPENDIX 2

OPEN-INTERVIEW SURVEY QUESTIONNAIRE

The following questions were posed during the course of each interview. The order here is not necessarily the order in which the questions were posed. The interviews were a discussion of a broad range of concerns of telematics. The questionnaire helped shape that discussion and keep it focused. Numerous follow-up questions were posed for clarification of the responses given and/or for clarification of the questions. In some cases, the interviewees provide printed information as follow-up to questions or to add more detail which could not be discussed during the course of the interview. The term regional is used to denote the ASEAN.

1. What is your overall impression of the data taxonomy? Is this an effort that is worth pursuing in terms of developing information for regional comparison and planning? Is there a need for such a taxonomy?

2. Is the attempt to combine telephony, broadcast, satellite and information systems together as telematics a useful concept for understanding in the region? (Given the current somewhat separate administrative structure of each in each country of the region.)

3. Can it be assumed that infrastructure and investment data that the taxonomy represents is what is needed by policy makers for comparison and regional planning purposes?

4. What other types or categories of information would you need or want for regional planning purposes?

5. For the sections of the taxonomy within your area(s) of knowledge and/or expertise, which items would you consider important and/or useful for regional policy and planning purposes? Which are not as important or not useful?

6. What is the likelihood of gathering the data that an operationalization of the taxonomy implies? Can this data be gathered?

7. What items represent data that is available now or that is at least accessible? To whom is it accessible or available? Can or should it be made available to policy makers on a regional basis?

8. Should data be gathered and made available on a regional basis of the items for which currently no data is available?

9. How should the data be made available across the region? What organizations/people would need to be involved?

10. What would be the likely sources of the data which the taxonomy represents?

11. Of the data items which you feel information could not be gathered, could not be made available, or is not accessible, why not? (Sensitivity or security concerns.)

12. How are you involved in national (regional, local) policy making and planning? (Business planning, academic planning?)

13. Regional cooperation in telematics has been focused largely on submarine cable systems between the countries and the use of the Palapa satellite system. This has included regional cooperation in traffic and routing plans as well as some cooperation in services provisions especially in the realm of broadcast programming and technical training in all areas of telematics. What other regional policy and planning concerns are of issue?

14. What other areas would you see developing into cooperative arrangements across the region? Into competitive situations?

15. In policy making and planning on a regional level, what exactly do you need to know? What information is useful to you? What information could you see as useful for others with similar concerns?

16. What items would you add (or delete) from the data taxonomy?

17. Who else should I be talking to with regards to telematics policy and planning on a regional level?

18. Policy areas to discuss about each country and the region as a whole:

    Privatization of telecommunications authorities.
    Private participation.
    Deregulation.
    Liberalization of markets.
    Financing schemes.
    Priorities for development.

APPENDIX 3

ASEAN TELECOMMUNICATIONS AND ECONOMICS DATA TABLES

As part of the effort to provide statistical information for the description of telematics in the ASEAN region presented in Chapter IV and as part of the analysis process of the "Impacts of Telecommunication Technologies on ASEAN Economies," project at the East-West Center, Honolulu, Hawaii, under the direction of Dr. Meheroo Jussawalla, the following tables were compiled from available sources as indicated in each table. These tables represent the extend of current available data for primarily telephony telecommunications in the ASEAN region. The base-line data taxonomy includes rubrics for these data which are considered of value for planning purposes in the region. They, however, are by no means complete as the data taxonomy calls for much more information for regional planning purposes beyond what is currently provided by the sources cited.

Telecommunications Infrastructure and Investment in the ASEAN Region

Tables 3.1 - 3.15

Compiled from the Yearbook of Common Carrier Telecommunication Statistics (1978- 1987)

International Telecommunications Union, ITU, Geneva, Switzerland, 1989.

(All figures have been rounded)

3.1 Telephone Stations (sets) of All Kinds Connected to the Public Network (000's)

1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
13.8	15.7	18	21.9	na	na	na	32.9	35.6	39.5
392.6	442.1	512.9	584.2	669.3	717.7	788.4	796.3	804.3	890.1
434	na	598	716.8	836.6	967.5	1150.9	1278.8	1380.9	1500.5
600	628	702	730.5	775.6	787.6	811.8	820.3	na	na
540.2	625.1	702.2	774.6	852	992.6	1002.6	1074	1115.7	1163.8
409	451	497	529.1	502.4	623.4	733.4	754.6	999.7	na

Telecommunications Infrastructure and Investment in the ASEAN Region

Tables 3.1 - 3.15

Compiled from the Yearbook of Common Carrier Telecommunication Statistics (1978- 1987)

International Telecommunications Union, ITU, Geneva, Switzerland, 1989.

(All figures have been rounded)

3.1 Telephone Stations (sets) of All Kinds Connected to the Public Network (000's)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Brunei	13.8	15.7	18	21.9	na	na	na	32.9	35.6	39.5
Indonesia	392.6	442.1	512.9	584.2	669.3	717.7	788.4	796.3	804.3	890.1
Malaysia	434	na	598	716.8	836.6	967.5	1150.9	1278.8	1380.9	1500.5
Philippines	600	628	702	730.5	775.6	787.6	811.8	820.3	na	na
Singapore	540.2	625.1	702.2	774.6	852	992.6	1002.6	1074	1115.7	1163.8
Thailand	409	451	497	529.1	502.4	623.4	733.4	754.6	999.7	na

3.2 Main Telephone Lines (000's)

1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
8.2	9.5	11.1	14	na	na	na	20.8	22.3	24.6
275.1	317.9	369.8	427.2	475.5	503.3	536.1	602.4	677.3	759.1
271	325	396	488.7	585.4	700.1	849.1	958.6	1042.8	1131.7
371	389	420	442.8	480.7	437.5	480.9	478	na	na
396.9	464.8	523.4	575.5	630.4	679.8	743	796.8	830.5	875.7
296	332	366	382.2	434.3	463.2	519.5	626.5	878.3	901.6

3.2 Main Telephone Lines (000's)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Brunei	8.2	9.5	11.1	14	na	na	na	20.8	22.3	24.6
Indonesia	275.1	317.9	369.8	427.2	475.5	503.3	536.1	602.4	677.3	759.1
Malaysia	271	325	396	488.7	585.4	700.1	849.1	958.6	1042.8	1131.7
Philippines	371	389	420	442.8	480.7	437.5	480.9	478	na	na
Singapore	396.9	464.8	523.4	575.5	630.4	679.8	743	796.8	830.5	875.7
Thailand	296	332	366	382.2	434.3	463.2	519.5	626.5	878.3	901.6

3.3 Percentage of Main Lines Equiped for International Direct Dial (%)

1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
0	0	75	78	na	na	na	81	85	85
na	na	0.37	0.59	na	0.77	1.3	1.37	1.79	3.34
na	0.1	0.18	0.21	0.3	0.4	0.9	2.2	3.9	6.7
na	na	na	0.21	0.7	3.76	3.3	5.8	na	na
na	na	na	na	na	4.73	5.97	7.87	10.9	7.6
na	na	na	na	na	na	na	27	54	60

3.3 Percentage of Main Lines Equiped for International Direct Dial (%)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Brunei	0	0	75	78	na	na	na	81	85	85
Indonesia	na	na	0.37	0.59	na	0.77	1.3	1.37	1.79	3.34
Malaysia	na	0.1	0.18	0.21	0.3	0.4	0.9	2.2	3.9	6.7
Philippines	na	na	na	0.21	0.7	3.76	3.3	5.8	na	na
Singapore	na	na	na	na	na	4.73	5.97	7.87	10.9	7.6
Thailand	na	na	na	na	na	na	na	27	54	60

3.5 New Applications for Main Lines (000's)

1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
1.5	1.2	1.8	(not reported after 1980.)						
76.8	86.7	58.8	48.6	46.2	36.1	31.3	48	64	61.7
87	113	144	176.9	200.7	227.6	193.9	248.3	240.5	242.2
54.4	60.9	49.8	na	62.3	61.1	68.5	56.5	na	na
85.3	86.7	89.4	87.2	90.1	99.1	115	123.1	111.8	92.7
69	139	85	93.4	101.5	138.5	121.9	168.8	102.4	145.9

3.5 <u>New Applications for Main Lines</u> (000's)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Brunei	1.5	1.2	1.8	(not reported after 1980.)						
Indonesia	76.8	86.7	58.8	48.6	46.2	36.1	31.3	48	64	61.7
Malaysia	87	113	144	176.9	200.7	227.6	193.9	248.3	240.5	242.2
Philippines	54.4	60.9	49.8	na	62.3	61.1	68.5	56.5	na	na
Singapore	85.3	86.7	89.4	87.2	90.1	99.1	115	123.1	111.8	92.7
Thailand	69	139	85	93.4	101.5	138.5	121.9	168.8	102.4	145.9

3.6 Total Demand for Main Lines (including tran

	1978	1979	1980	1981	1982	1983	1984
Brunei	1.7	1.4	2.0	na	(not reported after 198		
Indonesia	125.5	129.6	103.5	178.1	228.7	287.8	357.8
Malaysia	355	431	529	638.6	786.1	899.9	1039.7
Philippines	na	na	na	na	83.7	215.5	210.8
Singapore	112.9	113.4	121.3	117.5	123.8	136.7	176.7
Thailand	na	na	na	na	na	na	671.1

ain Lines (including transfers) (000's)

1982	1983	1984	1985	1986	1987
(not reported after 1981)					
228.7	287.8	357.8	428.9	447.5	478.1
786.1	899.9	1039.7	1141.2	1170.7	1216.4
83.7	215.5	210.8	195.2	na	na
123.8	136.7	176.7	192.3	171.2	140.4
na	na	671.1	na	1448	177.5

3.7 Waiting List for Main Lines (000'

	1978	1979	1980	1981	1982	1983	1984
Brunei	4.8	5.4	6.3	6.6	na	na	na
Indonesia	48.7	42.9	44.7	129.5	182.5	251.7	326.4
Malaysia	84.2	105.7	133	149.9	189.8	199.6	190.5
Philippines	81.9	122.3	154.3	198.2	132	199.4	186.8
Singapore	3.1	3.6	4	3	1.4	0.7	0.2
Thailand	83	194	264	337.1	386.8	437.4	347.9

.ting List for Main Lines (000's)

31	1982	1983	1984	1985	1986	1987
5.6	na	na	na	9.7	12	12.1
9.5	182.5	251.7	326.4	380.9	413.6	416.3
9.9	189.8	199.6	190.5	182.6	127.9	84.6
3.2	132	199.4	186.8	173	na	na
3	1.4	0.7	0.2	0.1	0.1	0.1
7.1	386.8	437.4	347.9	359.9	287.3	289

3.8 Telex Service

a - Subscriber lines (000's)
b - National traffic (000 minutes)
c - Outgoing international traffic (OOO minutes)

		1978	1979	1980	1981	1982	1983	1984
Brunei	a	0.1	0.1	0.2	0.2	0.3	0.4	0.
	b	na						
	c	155.8	184.4	300	419.3	610	659.3	784.
Indonesia	a	2.9	3.6	4.7	6.2	7.4	8.6	9.
pulses -	b	35.9	63.1	87.7	142.1	440.7	533.4	595.
	c	4.5	5.5	6.9	8.8	10.1	11	12.
Malaysia	a	2	2.9	3.7	4.1	5.9	8	9.
pulses -	b	33.7	38.3	47.9	na			
	c	2867	3745	4637	5273	5972.8	6961	7214.
Philippines	a	4.9	5.7	6.4	6.9	8.6	10.5	12.
	b	2851	3198	2885	4116.2	5185.7	5211.2	3462.
	c	4690	6101	7372	8306.8	7743	9339.3	8319
Singapore	a	4.5	5.9	8	10	12.3	14.3	16
	b	2186	3341	5647	9680.9	14912.7	19968.3	25813.
	c	10259	14146	19194	20667	25292.6	30143	32926
Thailand	a	1.2	1.6	2	2.5	3	3.9	4.
	b	1283	1383	na	1723	2314	3242.5	4056.
	c	2324	2987	na	4443	5110.5	6151.5	7490.

3.8 Telex Service

s)
ic (000 minutes)

31	1982	1983	1984	1985	1986	1987
).2	0.3	0.4	0.4	0.5	0.5	0.5
).3	610	659.3	784.6	814.2	811.4	742.7
5.2	7.4	8.6	9.5	10.4	11.7	13.5
2.1	440.7	533.4	595.8	684.2	725.9	780.4
3.8	10.1	11	12.4	12.6	12.7	11.2
4.1	5.9	8	9.8	10.9	11.4	11.2
na						
3	5972.8	6961	7214.8	9931.9	9638.8	6118.6
5.9	8.6	10.5	12.9	8.8	na	na
5.2	5185.7	5211.2	3462.9	na	na	na
5.8	7743	9339.3	8319	7434.7	na	na
)	12.3	14.3	16	16.8	17.6	17.9
).9	14912.7	19968.3	25813.9	29420.3	32566	31835
7	25292.6	30143	32926	31306.6	30182.7	30133.7
2.5	3	3.9	4.9	5.4	5.8	6.2
3	2314	3242.5	4056.9	4817.4	4898.8	4842.3
3	5110.5	6151.5	7490.5	8026	7465.2	7814.7

3.9 Equivalent Full-Time Telecommunicatio

a - Operating Staff
b - Technical Staff
c - Other Staff
d - Total Staff

		1978	1979	1980	1981	1982	1983	1984
Brunei	a	96	110	110	110	na	na	na
	b	212	334	339	339	na	na	na
	c	100	114	137	165	na	na	na
	d	408	560	590	614	na	na	na
Indonesia	a	6600	6378	6590	6222	6240	6778	7467
	b	11882	11424	11237	11260	12443	12880	15748
	c	8024	8863	9181	9143	9803	10315	13347
	d	26506	26665	27008	26625	28486	29973	36562
Malaysia	a	3400	3900	3900	4390	4900	9604	na
	b	8800	9900	11100	18810	20350	20707	16064
	c	6100	6800	7200	3770	4560	na	14180
	d	18300	20600	22200	26970	29810	30311	30244
Philippines	a	na	na	na	na	19738	20263	18939
	b	na	na	na	na	12693	4119	3363
	c	na	na	na	na	5927	3673	3744
	d	16920	23790	27220	28545	29358	28055	26046
Singapore	a	1968	2038	2100	2282	3730	3848	3869
	b	5235	5459	5732	5785	6209	6490	6086
	c	2245	2345	2452	2470	2667	2698	2904
	d	9448	9842	10284	10537	12606	13036	12859
Thailand	a	na	na	na	na	5142	6239	8215
	b	na	na	na	na	5625	5036	7272
	c	na	na	na	na	4515	5272	2957
	d	na	na	na	na	15282	16547	18753

t Full-Time Telecommunication Staff

1982	1983	1984	1985	1986	1987
na	na	na	106	110	105
na	na	na	340	340	322
na	na	na	215	202	166
na	na	na	661	652	593
6240	6778	7467	7404	7718	8051
12443	12880	15748	16310	17855	18778
9803	10315	13347	13697	14771	15499
28486	29973	36562	37411	40344	42328
4900	9604	na	9368	9198	9900
20350	20707	16064	10626	10667	15500
4560	na	14180	9404	9019	2915
29810	30311	30244	29398	28059	28315
19738	20263	18939	9525*	na	na
12693	4119	3363	1675	na	na
5927	3673	3744	2362	na	na
29358	28055	26046	13563*	na	na
3730	3848	3869	3889	3671	3669
6209	6490	6086	5993	5879	5678
2667	2698	2904	2846	2871	2642
12606	13036	12859	12728	12421	11989
5142	6239	8215	9022	5415	6315
5625	5036	7272	7896	2513	7919
4515	5272	2957	3092	9626	3512
15282	16547	18753	20010	17554	22125

3.10 Total Income and Expenditures of All Teleco

	1981		1983		198
	National Currency	$US*	National Currency	$US	National Currency
Brunei (M $B)					
income	20.2	9.6	na	na	39.4
expenditures	15.6	7.4	na	na	30.5
net (i-e)	4.6	2.2	na	na	8.9
Indonesia (M rupiah)					
income	275,100	420	519,300	520.3	718,579
expenditures	252,771	385.9	470,706	471.7	617,771
net (i-e)	22,329	34.1	48,594	48.6	100,808
Malaysia (M ringgit)					
income	633.2	285.2	960.8	410.6	1430.7
expenditures	396.1	178.4	799.4	341.6	1082.5
net (i-e)	237.1	106.8	161.4	69	348.2
Philippines (M pesos)					
income	2002.6	246.3	6043.3	431.7	6109.6
expenditures	2427.4	298.6	3077.3	219.8	4644.1
net (i-e)	(424.8)	(52.3)	2966	211.9	1299**
Singapore (M $S)					
income	554.9	270.7	803.1	377	867.9
expenditures	337	164.4	505.2	237.2	622.8
net (i-e)	217.9	106.3	297.9	139.8	245.1

xpenditures of All Telecommunication Services

983	1985		1987	
$US	National Currency	$US	National Currency	$US
na	39.4	18.3	47.5	22.8
na	30.5	14.2	26.9	12.9
na	8.9	4.1	20.6	9.9
520.3	718,579	635.9	970,807	586.6
471.7	617,771	546.7	899,522	543.5
48.6	100,808	89.2	71,285	43.1
410.6	1430.7	593.7	1561.7	627.2
341.6	1082.5	449.2	1441.9	579.1
69	348.2	144.5	119.8	48.1
431.7	6109.6	324.1	na	na
219.8	4644.1	246.4	na	na
211.9	1299**	68.9	na	na
377	867.9	411.3	1088.4***	536.2
237.2	622.8	295.2	2742.4	1350.9
139.8	245.1	116.1	346	170.4

(3.10 Continued) <u>Total Income and Expenditures of All Telecommu</u>

	1981		1983		1985	
	National Currency	$US*	National Currency	$US	National Currency	$U
Thailand (M baht)						
income	2947.7****	128.7	6309.5	273.7	9165.5	3
expenditures	2279.3	99.5	3731.8	161.9	5676.2	2
net (i-e)	668.4	29.2	587.9**	25.5	3489.3****	1

* $US figure based on exchange rate of that year.
** as reported
*** capital gains income not included
**** author's calculation
sources: ITU Yearbook of Common Carrier Statistics 1978-1987.

and Expenditures of All Telecommunication Services (CONTINUED)

1983		1985		1987	
nal ency	$US	National Currency	$US	National Currency	$US
09.5	273.7	9165.5	340.6	13839.9	532.3
31.8	161.9	5676.2	210.9	9213.9	354.4
87.9**	25.5	3489.3****	129.7	4626	177.9

hat year.

istics 1978-1987.

3.11 Annual Gross Investments in Telephone Switc

	1978	1979	1980	1981	1982	1983	1984
Brunei							
M $B	0.8	13.6	6.7	2.1	(not reported after 19		
M $US*	0.38	6.48	3.2	1.0			
Indonesia							
M rupiah	39125	10991	60922	15	16332	21892	13560
M $US	61.9	17.45	96.4	0.23	23.43	21.94	12.
Malaysia							
M ringgit	564.5	681.4	852.7	111.9	117.1	191.2	181
M $US	256.6	311.1	384.1	50.0	50.7	81.7	74
Philippines							
M pesos	1171	1361	1579	2667.4	4267.8	4572.5	7736
M $US	158.9	183.7	208	328.1	439.5	326.6	389
Singapore							
M $S	32.8	14.9	55.6	47.6	26.4	37.6	5
M $US	14.1	6.9	25.6	23.2	12	17.7	2
Thailand							
M baht	353.8	317.8	1250.3	370.5	na	na	[illegible]
M $US	17.3	15.6	60.6	16.2	na	na	[illegible]

* All $US calculated on that year's exchange rate.

Investments in Telephone Switching Equipment

31	1982	1983	1984	1985	1986	1987
2.1	(not reported after 1981)					
1.0						
15	16332	21892	13560	22747	53863	62377
0.23	23.43	21.94	12.61	20.13	32.66	37.69
11.9	117.1	191.2	181	388.2	1001.2	1018.3
50.0	50.7	81.7	74.5	161.1	386.6	409
57.4	4267.8	4572.5	7736.1	655.2	na	na
28.1	439.5	326.6	389.7	34.8	na	na
47.6	26.4	37.6	52.8	17.4	48.3	65.7
23.2	12	17.7	24.3	8.2	22	32.4
370.5	na	na	na	2883.7	1929.9	744.8
16.2	na	na	na	107.2	74.2	28.6

te.

3.12 Annual Gross Investments for Telephon

	1978	1979	1980	1981	1982	1983	1984
Brunei							
M $B	4.2	39.4	30	16	(not reported after 19		
M $US*	2	18.8	14.2	7.4			
Indonesia							
M rupiah	14536	65765	95143	47590	103128	70347	97566
M $US	23	104.4	150.5	72.7	148	70.5	90
Malaysia							
M ringgit	1476	1806.3	2302.5	511.3	545.3	618.7	451.
M $US	670.9	824.8	1037.2	228.3	236.1	264.4	185.
Philippines							
M pesos	3532	4326	5052	9246	11529.5	20104.9	30136.
M $US	479.2	583.8	665.6	1137.3	1187.4	1436	1518.
Singapore							
M $S	116	84.6	121	130.5	149.9	142.7	171
M $US	50	39	55.8	63.7	68.1	67	78.
Thailand							
M baht	544.1	1272.2	1886.3	690.1	152	**34.5	499
M $US	26.7	62.4	91.4	30.1	6.6	1.5	21.1

* All $US calculated on that year's exchange rate.
** International circuits

ross Investments for Telephone Services

31	1982	1983	1984	1985	1986	1987
5	(not reported after 1981)					
'.4						
0	103128	70347	97566	86691	132625	390659
'2.7	148	70.5	90.8	76.7	80.4	236
..3	545.3	618.7	451.6	1583.3	1270.1	4088
.3	236.1	264.4	185.8	657	490.4	1641.8
5	11529.5	20104.9	30136.3	1298.6	na	na
'.3	1187.4	1436	1518.2	68.9	na	na
0.5	149.9	142.7	171	271.9	162.1	130
3.7	68.1	67	78.8	128.9	73.7	64
0.1	152	**34.5	499	5129	6752	4607.2
0.1	6.6	1.5	21.1	190.6	259.7	177.2

te.

3.13 Total Annual Gross Investment in Telecom
(Not Including Land and Buildings)

	1978	1979	1980	1981	1982	1983	1984
Brunei							
M $B	4.4	42.4	31.2	20.6	(not reported after 198		
M $US*	2.1	20.2	14.8	9.6			
Indonesia							
M rupiah	60046	66496	100963	57044	111285	71967	106521
M $US	95	105.5	159.8	87.1	159.7	72.1	99.
Malaysia							
M ringgit	1593.4	1871.4	2384.7	623.1	622.3	809.9	632.5
M $US	724.3	854.5	1074.2	278.2	269.4	346.1	260.3
Philippines							
M pesos	3019	4808	6275	9708.4	12107.5	21395.6	30348.7
M $US	409.6	648.9	826.7	1194.1	1246.9	1528.3	1528.9
Singapore							
M $S	146.7	140.7	194.4	203.2	273.1	253.7	295.7
M $US	63.2	64.8	89.6	99.1	124.1	119.1	136.3
Thailand							
M baht	na	na	na	778.8	868.7	896.3	881
M $US	na	na	na	34	37.7	38.9	37.3

* All $US calculated on that year's exchange rate.

. Gross Investment in Telecommunications
ncluding Land and Buildings)

	1982	1983	1984	1985	1986	1987
6	(not reported after 1981)					
6						
	111285	71967	106521	103205	149678	460617
.1	159.7	72.1	99.1	91.3	90.8	278.3
1	622.3	809.9	632.5	1628.3	1290.4	4132.6
2	269.4	346.1	260.3	675.6	498.2	1659.7
4	12107.5	21395.6	30348.7	1700	na	na
.1	1246.9	1528.3	1528.9	90.2	na	na
2	273.1	253.7	295.7	295.7	253.6	188.5
1	124.1	119.1	136.3	140.1	115.3	92.9
3	868.7	896.3	881	na	na	na
	37.7	38.9	37.3	na	na	na

rate.

3.14 Telecommunications Investments as a Sha

	1978	1979	1980	1981	1982	1983	1984
Brunei	0.18	1.17	0.79	0.74	(not	reported	after 1
Indonesia	0.29	0.21	0.25	0.11	0.2	0.10	0.1
Malaysia	4.65	4.62	5.04	1.25	1.24	1.54	1.0
Philippines	2.61	2.58	2.79	3.77	4.21	6.27	7.4
Singapore	1.08	0.88	0.95	0.83	0.83	0.89	0.9
Thailand	na	na	na	0.11	0.11	0.09	0.0

unications Investments as a Share of GDP (%)

1981	1982	1983	1984	1985	1986	1987
0.74	(not reported after 1981)					
0.11	0.2	0.10	0.13	0.15	0.22	na
1.25	1.24	1.54	1.07	2.32	2.03	8.47
3.77	4.21	6.27	7.42	na	na	na
0.83	0.83	0.89	0.91	1.11	0.8	0.51
0.11	0.11	0.09	0.09	na	na	na

3.15 Telephone Main Lines per 100 Inhabit

	1978	1979	1980	1981	1982	1983	1984
Brunei	4.08	4.46	4.93	7.29	na	na	na
Indonesia	0.19	0.22	0.25	0.28	0.31	0.32	0.33
Malaysia	2.03	2.40	2.95	3.64	4.27	4.76	5.55
Philippines	0.81	0.83	0.87	0.90	0.96	0.85	0.90
Singapore	16.86	19.50	21.68	23.55	25.34	27.02	29.20
Thailand	0.65	0.72	0.79	0.80	0.89	0.94	1.03

ephone Main Lines per 100 Inhabitants

981	1982	1983	1984	1985	1986	1987
7.29	na	na	na	9.27	9.70	10.45
).28	0.31	0.32	0.33	0.37	0.40	0.44
3.64	4.27	4.76	5.55	6.11	6.44	6.85
).90	0.96	0.85	0.90	0.88	0.88	0.88
3.55	25.34	27.02	29.20	30.96	31.94	33.29
).80	0.89	0.94	1.03	1.21	1.66	1.67

3.16 Density of Telephone Sets per 100 In

	1970	1975	1978	1979	1980	1981	1982	1983	1984	1985	19
Brunei	na	na	6.87	7.37	8.00	11.42	na	na	na	14.65	15.
Indonesia	0.10	0.16	0.28	0.31	0.35	0.39	0.43	0.45	0.49	0.49	0.
Malaysia	na	3	3.26	na	4.45	5.33	6.10	6.64	7.52	8.14	8.
Philippines	na	1.2	1.31	1.34	1.46	1.49	1.54	1.53	1.52	1.51	r
Singapore	7.7	14.3	22.95	26.23	29.09	31.70	34.24	36.67	39.41	41.73	42.
Thailand	na	0.8	0.90	0.98	1.07	1.11	1.03	1.26	1.45	1.46	1.

* projected in plans

Sources: Various Annual Reports of Singapore Telecoms, JTM/STM - Malaysia, TOT - Thailand, Perumtel- Indonesia, and PLDT-Philippines.
TDRI Quarterly, vol. 4, no. 2, 6/89
ITU Yearbook of Common Carrier Statistics, 1978-1987.

ɔf Telephone Sets per 100 Inhabitants

	1982	1983	1984	1985	1986	1987	1988	1989	1990*
	na	na	na	14.65	15.49	16.79			
	0.43	0.45	0.49	0.49	0.48	0.52	0.54	0.54	0.80
	6.10	6.64	7.52	8.14	8.53	9.08	9.5	9.7	10.0
	1.54	1.53	1.52	1.51	na	na	na	1.3	1.61
	34.24	36.67	39.41	41.73	42.91	44.24	45.30	46.45	50
	1.03	1.26	1.45	1.46	1.89	1.95	1.99	2.04	3

:coms, JTM/STM - Malaysia,
. PLDT-

:s, 1978-1987.

3.17 Exports of ALL Communications Equipment to A
(US$000)

by\to	Philippines 87	Philippines 86	Philippines 85	Thailand 87	Thailand 86	Thailand 85	Singapore 87	Singapore 86	Singapore 85
Austria	14	75	128	236	446	231	9142	7919	4883
Belg/Lux	2	15	12	4462	3758	1038	8384	6441	4279
Canada	1132	447	430	636	1501	3659	3304	2602	3513
Denmark	36	1268	27	520	289	283			
Finland	na	na	na	4460	0	1			
France	788	129	116	1234	3246	1634	9132	5803	4587
FRG	6700	11009	7537	17876	13552	3958	13404	13388	9506
HongKong							12032	17954	16410
Italy	114	14	102	770	4759	1826			
Japan	32318	19922	18701	56016	96025	79764	203235	313789	223866
S.Korea							24610	13697	3882
Malaysia							104042	68115	47311
Neth.	408	101	61	na	3638	3062			
Norway	112	35	958	192	125	39			
Sweden	666	183	690	4940	35036	12120			
Switz.	56	135	985	460	317	232			
Taiwan							64808	49045	37399
UK	714	2500	412	5616	6484	5444	12152	8602	14069
USA	30508	30415	34235	40122	23892	27427	59354	74130	73729

Includes telecommunications (telephony), broadcast, satellite, consumer audio/
* Figures for '87 are extrpolated from Jan-June '87 figures.

Source: Asian Communications, Jan-June 1989.
and Project Collaborators

L Communications Equipment to ASEAN Countries
(US$000)

	Singapore			Malaysia			Indonesia		
35	87	86	85	87	86	85	87	86	85
231	9142	7919	4883						
038	8384	6441	4279		Figures for Malaysia and				
659	3304	2602	3513		Indonesia are not available.				
283									
1									
634	9132	5803	4587						
958	13404	13388	9506						
	12032	17954	16410						
826									
764	203235	313789	223866						
	24610	13697	3882						
	104042	68115	47311						
062									
39									
120									
232									
	64808	49045	37399						
444	12152	8602	14069						
427	59354	74130	73729						

ast, satellite, consumer audio/video, etc.
'87 figures.

3.18 Exports of Radio and TV Broadcasting Equipment

(US$000)

	Philippines			Thailand			Singapore		
by\to	87	86	85	87	86	85	87	86	85
Australia							180	111	201
Belgium				-	-	348			
Canada							230	151	251
Denmark	na	1261	1	412	231	10			
Finland				2784	-	-			
France				156	1396	192	438	318	191
FRG	28	468	50	7228	3752	497			
HongKong							416	649	306
Italy				142	1103	141			
Japan	3838	2569	860	4568	4432	17107	17246	17692	13471
S.Korea							756	4	189
Sweden				800	428	974	202	1263	21
Taiwan							528	169	24
UK	36	2124	38	4164	4445	1942	498	1418	694
USA	1246	823	268	8226	7782	10533	3924	7047	5875
USSR							1261	-	-

Source: Asian Communications, Jan-June 1989.
and Project Collaborators

o and TV Broadcasting Equipment to ASEAN Countries
(US$000)

	Singapore			Malaysia			Indonesia		
85	87	86	85	87	86	85	87	86	85
	180	111	201						
348									
	230	151	251						
10									
-									
192	438	318	191						
497									
	416	649	306						
141									
17107	17246	17692	13471						
	756	4	189						
974	202	1263	21						
	528	169	24						
1942	498	1418	694						
10533	3924	7047	5875						
	1261	-	-						

Figures for Malaysia and Indonesia are not available.

3.19 Exports of All Accessories for Communication

(US$000)

by\to	Philippines 87	Philippines 86	Philippines 85	Thailand 87	Thailand 86	Thailand 85	Singapore 87	Singapore 86	Singapore 85
Australia							7940	6596	7566
Austria	14	24	20	28	26	13			
Belgium	2	10	10	4460	3473	680	7061	4103	1363
Canada	982	232	328	632	1204	2964	1916	1728	1232
Denmark				-	13	15			
Finland				334	-	1			
France	56	56	37	760	864	289			
FRG	3892	2738	3595	4844	2481	1493	9050	8100	4756
HongKong							6596	13067	4967
Italy	114	14	92	1342	2350	1498			
Japan	17114	9989	5648	28756	43787	40945	264642	188554	124788
Malaysia							88914	58913	39849
Neth.	216	79	1						
Norway	112	29	103	12	12	6			
S.Korea							17992	10468	2616
Sweden	236	43	188	3660	18570	4392	2378	949	1494
Switz.	56	134	972	32	45	22			
Taiwan							48092	36314	29905
UK	552	203	285	912	1127	917	4530	2865	4423
USA	17574	20277	12727	17140	4949	1715	31688	47629	46414

Source: Asian Communications, Jan-June 1989.
and Project Collaborators

essories for Communications to ASEAN Countries
(US$000)

	Singapore			Malaysia			Indonesia		
5	87	86	85	87	86	85	87	86	85
	7940	6596	7566						
13									
30	7061	4103	1363						
54	1916	1728	1232						
15									
1									
39									
93	9050	8100	4756						
	6596	13067	4967						
98									
45	264642	188554	124788						
	88914	58913	39849						
6									
	17992	10468	2616						
92	2378	949	1494						
22									
	48092	36314	29905						
17	4530	2865	4423						
15	31688	47629	46414						

Figures for Malaysia and Indonesia are not available.

3.20 Key Economic Indicators - ASEAN, Japa
As of August 1989

	Pop. (M)	GNP/ Capita ($US)	GDP Growth (%)	Exports 12 mos. ($US, B)	Surplus/Defi current A/ ($US, B)
Brunei	0.2	17000	4.5	2.3	na
Indonesia	178.0	520	5.7	16.6	- 2.150
Malaysia	17.5	1820	7.3	20.1	1.870
Philippines	60.5	650	6.6	7.1	- 0.743
Singapore	2.7	9455	11.0	33.0	1.640
Thailand	56.0	995	10.6	16.0	- 1.762
Japan	123.8	23358	5.1	275	17.698
U.S.A.	249.1	19750	2.7	300	- 125

Source: Asiaweek, Sept. 22, 1989.

onomic Indicators - ASEAN, Japan, USA
As of August 1989

Exports 12 mos. ($US,B)	Surplus/Deficit current A/c ($US,B)	Foreign Debt ($US,B)	Inflation CPI (%)
2.3	na	net creditor	2.3
16.6	- 2.150	50	7.4
20.1	1.870	17.3	2.7
7.1	- 0.743	28.5	8.1
33.0	1.640	net creditor	3.6
16.0	- 1.762	15.5	4.0
275	17.698	net creditor	2.1
300	- 125	533	4.2

3.21 Gross National Product, GNP - AS

	1970		1975		1980		
	Country Currency	**$US (B)**	Country Currency	**$US (B)**	Country Currency	**$US (B)**	Count Curre
Indonesia (Ruppiah, B)	3,290	**1.85**	12,087	**6.779**	43,435	**24.40**	80,9
Malaysia (Ringgit, B)	11.80	**4.37**	21.96	**8.135**	49.63	**18.38**	72.3
Philippines (Peso, B)	41.75	**2.04**	114.44	**5.582**	264.53	**12.90**	607.4
Singapore (S$, B)	6.81	**3.40**	13.35	**6.67**	23.31	**11.65**	39.1
Thailand (Baht, B)	136.44	**5.69**	298.60	**12.44**	672.44	**28.01**	1010.4

Sources: International Financial Statistics, International Monetary Fund (IMF)
Asiaweek, Sept 22, 1989.
Telecommunication and Economic Development, World Bank, 1983.

ss National Product, GNP - ASEAN

	1980		1985		1990(est.)	
	Country Currency	**$US (B)**	Country Currency	**$US (B)**	Country Currency	**$US (B)**
9	43,435	**24.40**	80,924	**45.46**	164,756	**92.56**
5	49.63	**18.38**	72.31	**26.78**	86	**31.85**
2	264.53	**12.90**	607.43	**29.63**	806.27	**39.33**
	23.31	**11.65**	39.15	**18.57**	51.06	**25.53**
	672.44	**28.01**	1010.48	**42.10**	1,337.30	**55.72**

rnational Monetary Fund (IMF) Yearbook, 1986.

nt, World Bank, 1983.

3.22 POPULATION - ASEAN
(Millions, Mid-year estimates)

	1970	1975	1980	1985	est. 1990	P 1995
Indonesia	119.47	135.67	146.36	163.39	178.0	192
Malaysia	10.39	11.90	13.44	15.6	17.5	19
Philippines	36.85	42.07	48.32	54.38	60.5	66
Singapore	2.11	2.26	2.41	2.56	2.7	2
Thailand	36.37	41.87	46.50	51.30	56.0	61

Source: U.N. World Population Prospects: Estimates and Prospects as in 1982, N
"Population Indicators" (Appendix Table 1, p113) Asia-Pacific Report,

3.22 POPULATION - ASEAN
lions, Mid-year estimates)

	est.	Projected*	
1985	1990	1995	2010
163.39	178.0	192	229
15.6	17.5	19	23.5
54.38	60.5	66	86.6
2.56	2.7	2.8	3.1
51.30	56.0	61	75.6

:es and Prospects as in 1982, NY:1985.
1, pi13) Asia-Pacific Report, EWC, 1989.

3.23 ASEAN/US Exchange Rates
(1978-1990)

(1 $US = listed currencies average fo

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Brunei (Brunei $)	2.1	2.1	2.11	2.15	2.1	2.1	2.1	2.15	2.1	2.08
Indonesia (Rupiah)	632	630	632	655	697	998	1075	1130	1649	1655
Malaysia (Ringitt or Malaysian $)	2.2	2.19	2.22	2.24	2.31	2.34	2.43	2.41	2.59	2.49
Philippines (Peso)	7.37	7.41	7.59	8.13	9.71	14	19.85	18.85		
Singapore (Singapore $)	2.32	2.17	2.17	2.05	2.20	2.13	2.17	2.11	2.20	2.03
Thailand (Baht)	20.4	20.38	20.63	22.9	23.05	23.05	23.61	26.91	26	26

sources: ITU Yearbook of Common Carrier Statistics and author's calculation
1989 rate based on actual country bank buy rates as of 5/89.
1990 rate based on actual country bank buy rates as of 3/90.

ASEAN/US Exchange Rates
(1978-1990)

ed currencies average for year)

	1984	1985	1986	1987	1988	1989	1990
	2.1	2.15	2.1	2.085	2	1.95	1.9
	1075	1130	1649	1655	1705	1780	1809
	2.43	2.41	2.59	2.49	2.5	2.6	2.7
	19.85	18.85					
	2.17	2.11	2.20	2.03	2	1.95	1.9
	23.61	26.91	26	26	26	25.4	25

and author's calculations.
rates as of 5/89.
rates as of 3/90.

APPENDIX 4

MALAYSIA AND PHILIPPINES DATA TABLES

Using the data taxonomy as an outline for gathering data, STM and PLDT, in Malaysia and the Philippines respectively, have provided the following information. While the data itself is being used for the "Impacts of Telecommunications Technologies on ASEAN Economies" project at the East-West Center, under project leader Dr. Meheroo Jussawalla, the use of the data taxonomy by authorities in the ASEAN demostrates its viability.

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Surat Tuan:

Surat Kami:

Mr. Mark Hukill
Department of Communication
University of Hawaii - Manoa
2560 Campus Road
Honolulu, Hawaii 96822
UNITED STATES OF AMERICA.

Dear Mark

Although I received your May 21st letter early last month, I was tied up writing a few papers i.e.

a) Joint paper with Dr. Bukhory Hj. Ismail for the IAMCR Conference in Bled entitled "Role of the Mass Media in Malaysias General Elections", and

b) "Proposal to enhance Malaysias participation in UNESCO", presented last month at National Workshop organised by the UNESCO National Commission for Malaysia.

Finally, STM has sent the data sheets, which I'm forwarding with this letter. I hope the figures are still useful. With this, I believe that we have obtained whatever data that is available.

Kiran and I are still working on the article, which we hope to complete by next month. Do keep in touch. With best wishes.

Yours sincerely

SANKARAN RAMANATHAN
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Project: **IMPACT OF TELECOMMUNICATION TECHNOLOGIES ON ASEAN ECONOMIES**

Project Leader: Meheroo Jussawalla, Ph.D.
Project Research Intern: Mark A. Hukill, M.A.

Data Collection Outline for MALAYSIA

This packet contains an outline format for the type of data that this project is seeking. It is intended as a suggested guide for finding both quantitative and qualitative information on the telecommunication infrastructures and services in each ASEAN country. It is not expected that data will necessarily be available for all categories nor for all time periods. Also, it is not expected that the data provided is specifically in the format presented here. For instance, a document which lists numbers of available telephone access lines can be provided whether or not the specific information is in the form the following data tables suggest. In addition, monetary figures do not necessarily need to be in $U.S. Figures in the currency of each country is certainly acceptable.

We hope to gather as complete a set of information as is currently available in whatever form that information may appear. Your cooperation in aiding our efforts will be sincerely appreciated

CONTENTS: page

I. TOTAL INVESTMENT IN TELECOMMUNICATIONS

	* 1970	1975	1976 1980	1981 1985	1986 (1990	1991 (Projected) 1995	2000)
Total Investment in (M$ Million) Telecom. $US -			2,390	4,000	4,500	6,550	
Total Investment in Telecom as % GDP -							
Total Investment in (M$ Million) Telephone Telecom. $US -					3,908		
Total Investment in Telephone Telecom as % Total Telecom -					86.8%		
Total Investment in Broadcast Telecom. $US -				1989 41.1	1990 44.7		
Total Investment in Broadcast Telecom as % Total Telecom -							
Total Investment in US $ Million Satellite Telecom. $US -	3.7	3.8	7.0	5.9	17.5	18.7	15.5
Total Investment in Satellite Telecom as % Total Telecom -							
Total Investment in Info Sys Telecom. $US -							
Total Investment in Info Sys Telecom as % Total Telecom-							

* (specific dates to be used dependent on available data)

II. TELEPHONE TELECOMMUNICATIONS

A. Telephone System

	1970	1975	1980	1985	(Projected) (1990	1995	2000)
# of telephone lines (voice circuits) domestic.				212,760	255,120	410,190	
# satellite circuits							
# undersea circuits							
# copper cable circuits							
# fibre optic circuits							
# over-land circuits (incl. cable, microwave, etc.)							

# of telephone lines (voice circuits) to other ASEAN countries.	1980	1985
# satellite circuits	11	24
# undersea circuits	4	50
# copper cable		
# fibre optic	-	-
# over-land circuits (incl. cable, microwave, etc.)	25	29
# of telephone lines (voice circuits) international other than to ASEAN countries.		
# satellite circuits	82	350
# undersea circuits	57	94
# copper cable		
# fibre optic		
# over-land circuits (incl. cable microwave, etc.)	40	-

Total # Telephone subscriber lines

- # government subscriber lines
  - # civil
  - # military
- # business subscriber lines
- # residence subscriber lines

Wait List, Total # demand for subscriber line installations.

	1970	1975	1980	1985	1990	1995
Total Telephone Subscriber	103,763	169,539	395,640	958,598	1,561,472	2,567,153
Business Subscriber	61,488	93,427	167,469	309,051	454,686	741,864
Residential Subscriber	42,275	76,112	228,171	649,547	1,106,786	1,825,289
Total Demand For Subscriber Line Installations	117,467	217,845	529,246	1,141,239	1,616,594	2,588,465
Waiting List	13,704	48,306	133,606	182,641	55,122	21,312

	1985	1989
Total # of single-line telephone handsets (subsets) in use.		
# in urban areas (pop. > 100,000)		
# business		
# government		
# civil		
# military		
# private (residence)		
# of multi-line handsets (subsets) in use (2 or more circuits)		
# in urban areas (pop. > 100,000)		
# business		
# government		
# civil		
# military		
# private (residence)		
Total # of analog switches in use	290	247
# handling > 100,000 circuits		
Total # of digital switches in use	217	299
# handling > 100,000 circuits		
Types of digital switches in use by vendor and installation site.		
Total # of PBX's (PABX, PMBX) (Private [Automatic/Manual] Branch Exchanges)		
# of PBX's in Business		
# with <50 extensions		
# with >100 extensions		
# of PBX's in Government		
# civil		
# military		

	(AMPS 450) 1970	1975	1980	1985	1990	1995
Total # of Cellular Mobile Systems				1	2	
Total # of cellular subsets						
# civil				4,630	52,000	88,900
# military						
Total # of Paging systems						
# of pager units						
Total # of Public Payphones			3,560	11,252	25,604	42,439
% public payphones in urban areas (pop. > 100,000)						

B. Investment in Major Telephone Equipment, $US

(Projected)
1970 1975 1980 1985 (1990 1995 2000)

Telephone handsets
(subsets) $US

single-line $US
multi-line $US

Telephone Switching systems $US — 1985 — 1988

analog $US
digital $US — $M 1,081 M — $ 295M

Total domestic
voice circuits $US

Total voice circuits
to ASEAN countries $US

Total international voice
circuits $US

1990

Total Copper-cabling $US — $ US 14.3 million of 860 km.
# of Kms
# of kms over-land — $ US 0.3 million of 0.6 km.
# of Kms under-sea — $ US 14 million of 860 KM.

Twisted-pair wiring $US
# of kms

	1985	1990	1995	2000
Total Fibre Optic cabling $US (million)	0.7	14.4	21.4	33.0
# of kms				
# of kms over-land	44.7	685.5	1,167.9	1,744.4
# under-sea				

	1985	1990	1995
Total Micro-wave equip $US $M(000)	159	240	449
# of stations	315	412	707
# of kms covered	6,980	8,900	14,390

Total Radio Freq. equip, $US
HF stations
HF station $US
VHF stations
VHF stations $US
UHF Stations
UHF stations, $US

Total Long Distance Equipment, $US

$ (US Million)	1980	1985	1990	1995	2000
Total PCM equipment, $US	2.5	60.0	135.0	174.0	250.0
Equivalent channel Ends	5,190	146,010	432,190	632,190	900,000
Total Repeaters, $US					

Total PBX's (incl.
PABX and PMBX), $US

PBX's business $US
PBX's < 50 extensions, $US
PBX's > 100 extensions, $US
PBX's Government, $US
PBX's civil, $US
PBX's military, $US

	1985	1990
Total Cellular Mobile Telephone systems, $US	US$ 19.3M	US$ 34.4M

Mobile sets, $US

Total Paging Systems, $US

Total Public Payphone, $US

Total Maintenance and
Test equipment, $US

ISDN TECHNOLOGY:

[Total ISDN circuits] (Projections)
Std 2xB + D Channel
(2x64Kbs + 16kbs)

-maintenance and test equip.
-subsets (telepc's)

C. Government Policies and Regulations

-regulation by government telecommunications authority.
-trends in de-regulation and liberalization of markets
-policies for competition

D. Principal Suppliers of Telecommunication Equipment and Services
(% of Total by country)

Equip.	Domestic	U.S.A.	Japan	E.C.	ASEAN	Other
Cabling (incl. connection equip)						
copper twisted-pair						
T-1 trunking						
fibre-optic			91.3 %	8.7%		
Switching						
Analog			✓	✓		
Digital			✓	✓		
Handsets (subsets)						
single-line						
multi-line						
PBX						
PABX						
PMBX						

	DOMESTIC	USA	JAPAN	EC	ASEAN	OTHER
RF equip						
HF						
VHF						
UHF						
Micro-wave				100%		
LD equip						
PCM	3%			97%		
Repeaters						
Mobile						
stations						100%
interconnect						100%
subsets						
mobile						
portable						
Payphone	✓					✓
Maintenance and Test			✓	✓		

Market Share in Equipment by Vendor (%)

Vendor	Cabling	Switching	Handsets	PBX	RF	MW	LD	PCM	other

E. Important Means of Financing

- -Considerations for purchasing equipment terms and other provisions, i.e training.
- -joint-ventures
- -mixed credits
- -World Bank and IMF loans

III. BROADCAST TELECOMMUNICATIONS (television, radio)

A. Broadcast Telecommunications Systems

	1970	1975	1980	1985	(Projected) (1990	1995	2000)
RADIO:							
# of radio stations							
AM							
FM							
HF (shortwave)					13		
Military radio							
Government Radio other than public transmission (i.e civil defense)							
Radio Coverage							
% of country covered by a radio signal							
Area covered by each station							
# of radio transmitters (and antennae)							
AM							
FM							
HF							
# of Radio repeaters (for each station)							
# of Micro-wave stations used for radio (for each station)							
Description of Program Content hours, language, music, edu., etc.					See Appendix		

	1989	1990
# of radio sets in use		
AM		
FM	341,628	342,580
HF		
Combination		

	1989	1990
% pop. that owns a radio	2.5%	3%
ave. # radios per household	1	1.5
% households with at least one radio	2.5%	3%
% households in urban areas (pop. > 100,000) with radios	90%	95%

TELEVISION:

	1970	1975	1980	1985	1990	1995	2000
# television stations							
# VHF, location, coverage							
# UHF, location, coverage							
Color Standard (PAL, SECAM or NTSC) PAL							
# of transmission towers, power location and coverage							
# of repeater stations (for each station) power, location, coverage							
# of micro-wave stations (each tv station) coverage							
Description of Long-line use for television							
Description of Satellite use for television (will overlap with section below)							
# and types of sat. transmitters A	0	0	0	1	2	4	4
# and types of sat. transmitters B	1	1	1	1	1.5	1.5	1.5
# and types of TVRO stations 4.5m	0	0	0	2	3	3	3
# and types of TVRO stations 3.0m	0	0	0	0	15	200	300

note:
A = Palapa Transponder
B = Intelsat Transponder

Description of program content
domestic production- type, hours, language
imported programming - type, hours, language
entertainment
news

– See Appendix

	1989	1990
# of tv sets in operation		
# B&W; ave cost	US $ 185	US $ 185
#Color; ave cost	US $ 370	US $ 370
% total households with at least one tv	2.5%	3.0%
% of total households with tv that are in urban areas (pop. >100,000)	60%	85%
% households in urban areas with a tv (pop. > 100,000)	70%	75%
% households in rural areas with a tv (pop. < 100,000)		

III. Broadcast Telecommunications (Television & Radio)

RADIO - Description of Program Content;

FM Radio 1 (Rangkaian Nasional) - Monday to Sunday - 24 hrs/day Music & Education. Language - Malay.

FM Radio 2 (FM Stereo) - Monday to Friday (0900 to 1400, 1800 to 2400 hrs) - ie. 11 hrs/day.
Saturday to Sunday (0900 to 2400 hrs) - ie. 15 hrs/day.
Music. Language - Malay.

FM Radio 3 (Local) - Monday to Sunday(0600 - 0900 hrs) and (1300 to 1900 hrs) - 9 hrs/day
Music. Language - Malay.

FM Radio 4 (Blue Channel) - Monday to Thursday - (0600- 2400 hrs)ie.18 hrs/day. Friday:(0600 to 0900 hrs), (1300 to 1400hrs) and (1700 to 2400 hrs) ie. 11 hrs/day.

Music & Education. Language - English.

FM Radio 5 (Green Channel) - Monday to Thursday, Saturday and Sunday (0500 to 2400 hrs) - 19 hrs/day
Friday: (0500 to 0900 hrs), (1100 to 1400 hrs) and (1600 to 2400 hrs) ie. 15 hrs/day.
Music & Education. Language - Chinese.

FM Radio 6 (Red Channel) - Same time.
Music & Education - Language - Tamil.

TELEVISION - Description of Program Content;

RTM Network 1 -
(a) Monday, Tuesday and Wednesday from 1550 hrs to 0030hrs. i.e. 8 hrs 40 min per day
(b) Thursday from 1150 hrs to 0030 hrs ie. 12 hrs 40 min per day
(c) Friday, Saturday and Sunday from 0750 hrs to 0030 hrs ie. 16 hrs 40 min per day.

RTM Network 2 -
(a) Monday, Tuesday, Wednesday and Thursday from 1650 hrs to 0030 hrs ie 7 hrs 40 min per day.
(b) Friday, Saturday and Sunday from 1350 hrs to 0030 hrs ie 10hrs 40 min per day.

Language: Bahasa Malaysia, English, Mandarin, Cantonese & Tamil

RTM 2 (TV Pendidikan) - Monday to Thursday - 0730 to 1630 hrs ie 9hrs/day.

						PROJECTED		
	1970	1975	1980	1985	1988	1990	1995	2000
Total # of single-line tel. handsets (subsets) in use:								
- Business	ND	ND	ND	ND	167,580	Mar. 1989		
- Residential	ND	ND	ND	ND	201,043			
# of multiline handsets (subsets) in use (2 or more circuits)	ND	ND	ND	ND	3,000			
Total # of analog switches in use	ND	ND	ND	109	116			
- # handling >100,000 ckts.	ND	ND	ND	-	-			
Total # of digital switches in use	ND	ND	ND	1	2			
- # handling >100,000 ckts.	ND	ND	ND	-	-			
Types of digital switches in use by vendor & installation site	ND	ND	ND	Pasig-SPCD NEAX (by NEC)	Pasig SPCD-NEAX Malate EWS4-(EWSD) - by Siemens			

\# public viewing sets

CABLE TELEVISION:

- \# of cabie operators
- \# of cable stations
- location
- penetration
  - % households with cable
  - % cable households in urban areas (pop. > 100,000)
- description of cable programming

VCR's:

- \# VCR's in use
- % households with VCR's

B. Investment in Broadcast Telecommunications $US

	1970	1975	1980	1985	(Projected) (1990	1995	2000)
				1989	1990		
RADIO:							
Total radio $US				US$ 21.1M	$ 22.7M		
Broadcast							
Military							
Government (non-public broadcast)							
Total radio Gov. owned $US				US$ 21.1M	$ 22.7M		
Total radio Privately owned $US							

Production facilities $US
(by station type)

Transmission Equipment $US
- Broadcast towers
- Repeaters
- Micro-wave

	1970	1975	1980	1985	1990	1995	2000
TELEVISION:							
Total television $US							
Gov. owned							
Privately owned							
Production facilities by station $US							
Transmission Equipment $US by station							
broadcast towers							
repeaters							
micro-wave							
long-line							
satellite							
) transmit							
($us Million) transmit and receive	0	3.7		4.0	1.0	3.0	5.0
($us Million) tvro	0	0		0.2	0.05	0.3	0.4
Television sets $US							
B&W							
Color							

Cable Television
Head end $US
Cable Trunking $US
Downlinks
Engineering and test

VCR's
cost (domestic) $US
projected market size

C. Government Policies and Regulations

- ownership/control — Government Owned (RTM)
  — Licensing & Regulatory (JTM)
- operation — STM
- licensing of sets, taxes — Information Ministry
- regulations governing programming and advertising, radio, tv, cable tv — Information Ministry

D. Principal Suppliers of Broadcast Equipment and Services (By country and vendor)

- Japan - Toshiba
- Italy - Itilia
- U.S -

% Share broadcast equipment market by country

Equipment	Domestic	USA	Japan	E.C.	ASEAN	Other
RADIO:						
production						
transmission towers repeaters micro-wave						
engineering and test		10%	40%	50%		
Sets AM FM HF Combination			100%			
TELEVISION:						
Production						
Transmission Towers repeaters micro-wave			60%	7%	33%	
satellite TV Transmit TV T/R TVRO			100%			
Engineering and Test		16%	74%	12%		

Sets
B&W
Color

Cable TV:
Head End
Trunking
Downlinks

VCR's

% Share of broadcast equipment market by vendor

Vendor	Production	Transmission	Eng.	Sets	VCR
JAPAN		40%	40%	100%	-
US		10%	10%	-	-
ITALY		50%	50%	-	-

E. Important Means of Financing

- -joint ventures
- -donation and aid
- -term financing
- -mixed credits
- -govt/private co-ventures

Types of financing by country and vendor for each type of broadcast telecommunications equipment.

Types of financing by vendor is through bank loans and leasing.

A. Satellite Telecommunications Systems

Description of Satellite Services used:

	1970	1975	1980	1985	(Projected) 1990	1995	2000
Intelsat	✓	✓	✓	✓	✓	✓	✓
Domestic (via Intelsat/Palapa)		✓	✓	✓	✓	✓	✓
Regional - Palapa	–	–	–	–	–	–	–
Satellite(s) owned							
sat. name							
coverage							
Transponders leased							
sat. name							
coverage							
lease terms							
Tracking and Telemetry							
Satellite Service Description:							
* Telephone Network							
Sats. used. allocation. time							
% phone traffic carried via satellite							
domestic							
ASEAN			5.0%	4.4%	5.0%	5.0%	5.0%
International (non-Asean)			37.4%	61.0%	61.0%	61.0%	61.0%
Type of service							
SCPC/DAMA	–	–	–	✓	✓	✓	✓
FDMA	✓	✓	✓	✓	✓	✓	✓
TDMA	–	–	–	–	✓	✓	✓
other (IDR)	–	–	–	–	✓	✓	✓
(IBS)	–	–	–	–	✓	✓	✓
Broadcasting							
Sats. used, allocation, time							
Radio							
Television							
program import/export							
news import/export							
educational - domestic							
Military							

Info Systems T-com (datacom)
- Sats. used, allocation, time
  - Gov't/public (telex/fax/etc)
    - domestic
    - Asean
    - International
  - Private Orgs and Co.s
    - data transfer
    - communication
  - Military
    - communication
    - surveillance

# of Earth Stations, Type (Std A to Vsats and micro antenna) and location

		1970	1975	1980	1985	1990	1995	2000
Telephone system	Std A	1	–	1	–	1	1	1
	Std B	–	2	–	2	–	2	2
	4.5m	–	–	–	4	6	2	–
Broadcast systems								
Radio								
TV								
T/R	Std A	1	–	1	–	1	1	1
	Std B	–	2	–	2	–	2	2
	4.5m	–	–	–	–	1	1	3
TVRO	4.5m	–	–	–	2	3	3	3
	3.0m	–	–	–	–	15	200	~~300~~
IS T-com (datacom)								
Gov't/public								
Private								
Military								

B. Investment in Satellite Telecommunications

	1970	1975	1980	1985	(1990	1995	2000)
					(Projected)		
Launch Activities $US		—	—	NIL	—	—	
Satellites:		—	—	NIL	—	—	
Geo-stationary							
Owned - $US		—	—	NIL	—	—	
Gov't/public							
Private							
Military							
Leased (transponders) $US							
US $ Million Gov't/Public	1.0	0.9	0.8	1.6	2.8	4.4	4.4
Private	—	—	—	NIL	—	—	
Military	—	—	—	NIL	—	—	

Other Satellites: (non-geo-stationary)
Weather
Surveillance

Earth Stations - Total $US

	1970	1975	1980	1985	(Projected) (1990	1995	2000)
Gov't/Public $US Million							
Std A	3.7	-	7.0	-	14.8	4.0	4.0
Std B	-	3.8	-	3.7	-	3.8	3.8
4.5m	-	-	-	2.2	2.5	1.5	1.5
3.0m	-	-	-	-	0.2	1.4	2.2
VSAT	-	-	-	-	-	3.0	2.0
INMARSAT STN	-	-	-	-	-	5.0	2.0
Private							
Std A							
.							
.							
.							
VSAT (INTELNET)	-	-	-	-	0.03	0.04	0.1
Military							
Std A							
.							
.							
.							
VSAT							

* Ground-Based Electronics

C. Government Policies and Regulations

- participation in WARC and INTELSAT
- domestic DBS
- transborder Satellite info flow
  news, data, etc.

D. Principal Suppliers of Satellite Equipment and Services (By country and vendor)

% share of market for Satellite Equipment

Equipment	Domestic	USA	Japan	EC	ASEAN	Other
Sats.						
Geo-sta. Transp.						
Earth Stations	0%	10%	89%	1%	0%	0%
Ground-based electronics						

Principal Vendors

by % share of market
by $US of sales/contracts

Vendor	Satellites	Earth Stations	Ground Based Elects.
Ford / USA	-	10%	-
Thomson, Europe	-	1%	-
Mitsubishi	-	50%	-
NEC	-	29%	-
JRC, Japan	-	10%	-

* Ground Based Electronics includes:
- frequency translator and modulators
- signal processors
- frequency (spectrum) analyzers
- SCPC/DAMA electronics
- video identifier
- modems
- signal generators
- power equip.
- codecs
- encoders/de-cryptors
- portable/mobile up and down-links

E. Important Means of Financing

- contribution to INTELSAT —
- mixed credits —
  grants and aid –
- lease agreements -
- co-ventures –
- supplier credits -
- domestic government investment – 100%

V. INFORMATION SYSTEMS TELECOMMUNICATIONS

A. IS Telecommunication Systems

Gov't/Public (incl. education)

	1970	1975	1980	1985 1987	(Projected) (1990	1995	2000)
LAN (Local Area Networks)							
WAN (Wide Area Networks)				530	1,353	5,179	20,000
Dedicated data lines				6,724	11,269	20,757	33,500
Modems (For dedicated datalines. Customer own)							
Codecs							
Multiplexors (Customer own)							
FAX				4,674	38,142	103,961	150,000
E-Mail				0	480	3,600	14,000
Videotex				0	1,000	6,033	25,000

Private (banks, corps, etc.)

	1970	1975	1980	1985	(Projected) (1990	1995	2000)
LAN							
WAN							
Dedicated data lines							
Modems							
Codecs							
Multiplexors							
FAX							
E-Mail							

Military

	1970	1975	1980	1985	(Projected) (1990	1995	2000)
LAN							
WAN							
Dedicated data lines							
Modems							
Codecs							
Multiplexors							
FAX							
E-Mail							

Videotex

On-line Databases

B. Investment in IS Telecommunications - $US

	1970	1975	1980	1985	(Projected) (1990	1995	2000)
LAN							
WAN							
Dedicated data lines							
Modems							
Codecs							
Multiplexors							
Fax							
E-Mail							

C. Government Policies and Regulations

- transborder data flow policies
- ownership and control of IS networks
- accessibility to public networks
- "interconnect" policies

D. Principal Suppliers of IS T-Com Equipment and Services (By country and vendor)

equipment	Domestic	USA	Japan	EC	ASEAN	Other
MAYBAC (85PDN)		✓				
TELEMAIL (EMAIL)		✓				
TELITA (VIDEOTEX)				✓		✓
MAYCIS (ISPAN)						✓

PHILIPPINE LONG DISTANCE TELEPHONE COMPANY
INCORPORATED

GENERAL OFFICES
P. O. Box No. 952 Cable Address FONES
MAKATI, METRO MANILA, PHILIPPINES

AIR MAIL

Date: June 28, 1989
Ref.: FVPDP&TS-L-9-89

Dr. Meheroo Jussawalla, Ph. D.
Project Leader
Institute of Culture & Communication
East-West Center
1777 East-West Rd.
Honolulu, Hawaii 96848
U. S. A.

Dear Sir:

As requested, attached are filled up questionnaire on Impact of Telecommunication Technologies on ASEAN Economies. Questions answered are those applicable to PLDT and with available data. Except for number of telephone lines in terms of circuits which includes data for other operators, all the other data refer to PLDT only.

Very truly yours,

f NESTOR A. VIRATA
First Vice President

IMPACT OF TELECOMMUNICATION TECHNOLOGIES ON ASEAN ECONOMIES

Data Collection Outline for the Philippines

PLDT data only except for number of telephone lines - voice ckts. (Domestic, ASEAN, other international countries) which includes data for all operators.

	1970	1975	1980	1985	1988	PROJECTED 1990	1995	2000
I. TOTAL INVESTMENT IN TELECOMMUNICATIONS								
Total investment in tel. telecom. ₱(000)	1,100,768	1,904,317	4,883,888	26,309,093	33,838,575			
II. TEL. TELECOMMUNICATIONS								
A. Telephone System								
# of tel. lines (voice circuits) Domestic								
- # satellite circuits	ND	ND	ND	ND	64	Mar. 1989		
- # overland circuits	ND	ND	ND	ND	3,764	Mar. 1989		
plus leased lines	ND	ND	ND	ND	346	Mar. 1989		
# of tel. lines (voice circuits) to other ASEAN countries								
- # satellite circuits	ND	ND	13	15	70	84	17*	19
- # undersea circuits	ND	ND	18	58	93	100	272	394

*Singapore satellite circuits will be terminated in 1991.

						PROJECTED		
	1970	1975	1980	1985	1988	1990	1995	2000
# of tel. lines (voice circuits) international other than to ASEAN countries								
- # satellite circuits	ND	ND	218	528	727	977	1,103	1,784
- # oversea circuits	ND	ND	177	370	551	776	1,817	3,152
Total # telephone subscriber lines (Installed Lines)	ND	ND	ND	545,794	588,779	718,841		
Wait List, Total # demand for subscriber line installations								
- wait list (R.A.)	ND	ND	149,331	195,235	340,897			
- existing (main stns.)[1]	ND	ND	329,769	473,893	529,076			
- total # demand[2]	ND	ND	479,100	669,128	869,973	821,889[3]	1,102,814[3]	1,493,685[3]

Note: 1 - main stations = working telephones (connector terminals); includes all tel. except extension and locals.

2 - total # demand = existing + pending requests (R.A.)

3 - cancellation effect were considered on the projection

	1970	1975	1980	1985	1988	PROJECTED 1990	1995	2000
# of tel. lines (voice circuits) international other than to ASEAN countries								
- # satellite circuits	ND	ND	218	528	727	977	1,103	1,784
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Note: 1 - main stations = working telephones (connector terminals); includes all tel. except extension and locals.

2 - total # demand = existing + pending requests (R.A.)

3 - cancellation effect were considered on the projection

	1970	1975	1980	1985	1988	PROJECTED 1990	1995	2000
Total # of PBXs (PABX, PMBX) (Priv. /Automatic/Manual/ Branch Exchanges)								
- # of PBXs in business								
o # with < 50 extensions	ND	ND	ND	ND	1,956 Aug. 1988			
o # with > 100 extensions	ND	ND	ND	ND	77			
						(Nationwide Demand Projection)		
Total # of Cellular Mobile Systems	ND	ND	ND	ND	610 (Jun. 1989)	10,975	23,382	35,767
Total # of Public Pay-phones (Paystations)	ND	1,857	2,387	3,935	4,725			
B. Investment in Major Tel. Equipment								
Telephone handsets (subsets) (₱000)	39,097	82,011	100,551	668,454	545,533			
Telephone switching systems (₱000)	329,901	651,850	1,232,589	15,472,788	19,944,685			

						PROJECTED		
	1970	1975	1980	1985	1988	1990	1995	2000
Total PBXs (incl. PABX & PMBX (₱000)	43,587	152,422	272,587	926,343	735,014			
Total Cellular Mobile Telephone Systems ($000)					3,033	Feb. 1986		
-- Mobile sets ($000)					928			

C. <u>Government Policies & Regulations</u>

See Attachment

	DOMESTIC	USA	JAPAN	EUROPEAN COUNTRIES	ASEAN	OTHERS
D. Principal Suppliers of Telecommunication Eqpt. & Services						
Cabling (including connection eqpt.)	American Wire; Phelps Dodge; Columbia Wire; Associated Wire; Philips Wire	AT&T Int'l.	Furukawa	Siemens-Germany		
- Fiber Optic				SEL-Germany		
Switching						
- Analog	Spark Radio; Avesco Mktg.; Medina Sales	Electro Installation				
- Digital		Electro Installation		Siemens		
Handsets (Subsets)	Medina Sales; KST Industrial Supply			LM Ericsson-Sweden; Siemens		Goldstar-Korea
PBX				Siemens		Northern Telecom Ltd. - Hongkong

	DOMESTIC	USA	JAPAN	EUROPEAN COUNTRIES	ASEAN	OTHERS
Microwave			Anritsu			
PCM	Fomar; LM Precision			Siemens		
Repeaters	SEAC; LM Precision			Siemens		
Mobile (Subsets)			Marubeni Inc.; Nissho-Iwai; NEC			
Payphone			Toyo Menka Kaisha Ltd.	Plessey - U.K.		Philip Radio Comm. System - Australia
Maintenance & Test			OKI Electric Ind. Co., Ltd.			

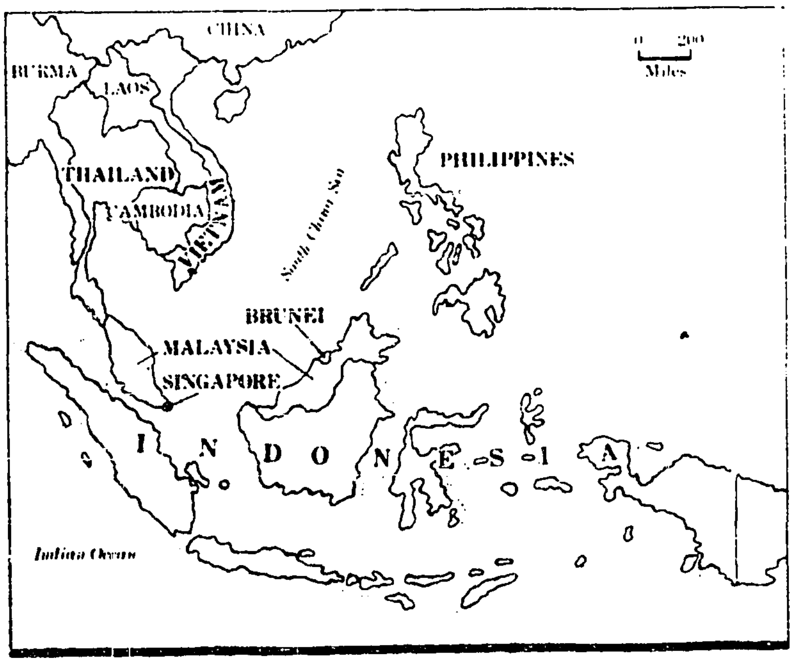
Note: We have included latest data as of December 1988 unless otherwise specified.

APPENDIX 5

ASEAN GENERAL STRUCTURE AND COTAT

There are many excellent references which detail the history and organization of the Association of South East Asian Nations, ASEAN. Some of these references, which have been used in providing information here, are listed at the end of this appendix section.

The following map shows the area of the globe comprising of the countries of the ASEAN, namely, Brunei, Indonesia, Malaysia, the Philippines, Singapore and Thailand.



Source: Wall Street Journal/Dow Jones & Co., 1987.

The ASEAN organization came into being officially on August 8, 1967. The "Bangkok Declaration" signed on that date sets forth the broad structure and objectives of the ASEAN. This declaration, is reproduced below.

1. THE ASEAN DECLARATION (BANGKOK DECLARATION)
BANGKOK, 8 AUGUST 1967

The Presidium Minister for Political Affairs/ Minister for Foreign Affairs of Indonesia, the Deputy Prime Minister of Malaysia, the Secretary of Foreign Affairs of the Philippines, the Minister for Foreign Affairs of Singapore and the Minister of Foreign Affairs of Thailand:

MINDFUL of the existence of mutual interests and common problems among countries of South East Asia and convinced of the need to strengthen further the existing bonds of regional solidarity and cooperation;

DESIRING to establish a firm foundation for common action to promote regional cooperation in South East Asia in the spirit of equality and partnership and thereby contribute towards peace, progress and prosperity in the region;

CONSCIOUS that in an increasingly interdependent world, the cherished ideals of peace, freedom, social justice and economic well-being are best attained by fostering good understanding, good neighbourliness and meaningful cooperation among the countries of the region already bound together by ties of history and culture;

CONSIDERING that the countries of South-East Asia share a primary responsibility for strengthening the economic and social stability of the region and ensuring their peaceful and progressive national development, and that they are determined to ensure their stability and security from external interference in any form or manifestation in order to preserve their national identities in accordance with the ideals and aspirations of their peoples;

AFFIRMING that all foreign bases are temporary and remain only with the expressed concurrence of the countries concerned and are not intended to be used directly or indirectly to subvert the national independence and freedom of States in the area or prejudice the orderly processes of their national development;

DO HEREBY DECLARE:

FIRST, the establishment of an Association for Regional Cooperation among the countries of South-East Asia to be known as the Association of South-East Asian Nations (ASEAN).

SECOND, that the aims and purposes of the Association shall be:

1. To accelerate the economic growth, social progress and cultural development in the region through joint endeavours in the spirit of equality and partnership in order to strengthen the foundation for a prosperous and peaceful community of South-East Asian Nations;
2. To promote regional peace and stability through abiding respect for justice and the rule of law in the relationship among countries of the region and adherence to the principles of the United Nations Charter;
3. To promote active collaboration and mutual assistance on matters of common interest in the economic, social, cultural, technical, scientific and administrative fields;
4. To provide assistance to each other in the form of training and research facilities in the educational, professional, technical and administrative spheres;
5. To collaborate more effectively for the greater utilization of their agriculture and industries, the expansion of their trade, including the study of the problems of international commodity trade, the improvement of their transportation and communications facilities and the raising of the living standards of their peoples;
6. To promote South-East Asian studies;
7. To maintain close and beneficial cooperation with existing international and regional organizations with similar aims and purposes, and explore all avenues for even closer cooperation among themselves.

THIRD, that to carry out these aims and purposes, the following machinery shall be established:

(a) Annual Meeting of Foreign Ministers, which shall be by rotation and referred to as ASEAN Ministerial Meeting. Special Meetings of Foreign Ministers may be convened as required.

(b) A Standing Committee, under the chairmanship of the Foreign Minister of the host country or his representative and having as its members the accredited Ambassadors of the other member countries, to carry on the work of the Association in between Meetings of Foreign Ministers.

(c) Ad-Hoc Committees and Permanent Committees of specialists and officials on specific subjects.

(d) A National Secretariat in each member country to carry out the work of the Association on behalf of that country and to service the Annual or Special Meetings of Foreign Ministers, the Standing Committee and such other committees as may hereafter be established.

FOURTH, that the Association is open for participation to all States in the South-East Asian Region subscribing to the aforementioned aims, principles and purposes.

FIFTH, that the Association represents the collective will of the nations of South-East Asia to bind themselves together in friendship and co-operation and, through joint efforts and sacrifices, secure for their peoples and for posterity the blessings of peace, freedom and prosperity.

DONE in Bangkok on the Eighth Day of August in the Year One Thousand Nine Hundred and Sixty-Seven.

For the Republic of Indonesia:

ADAM MALIK
Presidium Minister for Political Affairs/ Minister for Foreign Affairs

For Malaysia:

TUN ABDUL RAZAK
Deputy Prime Minister, Minister of Defence and Minister of National Development

For the Republic of the Philippines:

NARCISO RAMOS
Secretary of Foreign Affairs

For the Republic of Singapore:

S. RAJARATNAM
Minister of Foreign Affairs

For the Kingdom of Thailand:

THANAT KHOMAN
Minister of Foreign Affairs

Source: ASEAN Document Series, 3rd edition, 1988.

By 1972, the ASEAN had reorganized some of its permanent committees to operate more effectively without the sole direction of the foreign ministers of each country. The Permanent Committees which stand today are:

Permanent Committee on

(a) Food and Agriculture,
(b) Shipping
(c) Civil Air Transportation
(d) Communication/Air Traffic Services/Meteorology
(e) Finance
(f) Commerce and Industry
(g) Land Transportation and Telecommunication
(h) Tourism
(i) Science and Technology
(j) Socio-Cultural Activities
(k) Mass Media

Source: Palmer and Reckford, 1987.

The committees on Transportation and Telecommunication, Communication/Air Traffic Services/Meteorology, Mass Media and to some extent Science and Technology combined have jurisdiction on telematics matters. It is the Committee on Land Transportation and Telecommunication, COTAT, which is primarily responsible for cooperative matters on the majority of telematics related interests. The objectives of the COTAT committee are:

1. To establish new land transportation and telecommunication facilities in the ASEAN region to accelerate economic growth, social progress, and cultural development.

2. To improve facilities for the same purpose.

3. To achieve efficient use of existing land transportation and telecommunications facilities.

The Terms of Reference for the COTAT committee are:

1. Identify, evaluate and study high priority land transportation and telecommunications projects and programs in the ASEAN region.

2. Recommend the implementation of above projects and programs.

3. Recommend the improvement of existing land transportation and telecommunication facilities and systems.

4. Coordinate plans and activities with other ASEAN committees.

5. Initiate exchange of information, methods, procedures and technical matters relating to land transportation and telecommunications in the ASEAN region.

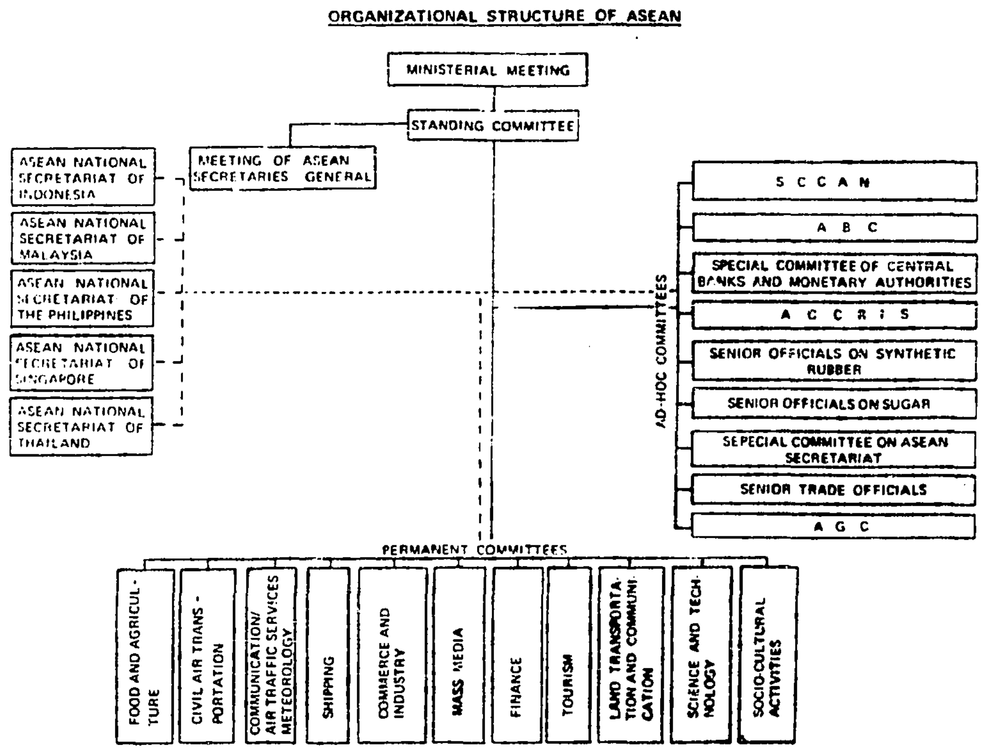
6. Advise ASEAN bodies on all matters pertaining to land transportation and telecommunications.

7. Liaise with other regional and international transportation and telecommunication agencies on activities affecting the ASEAN region.

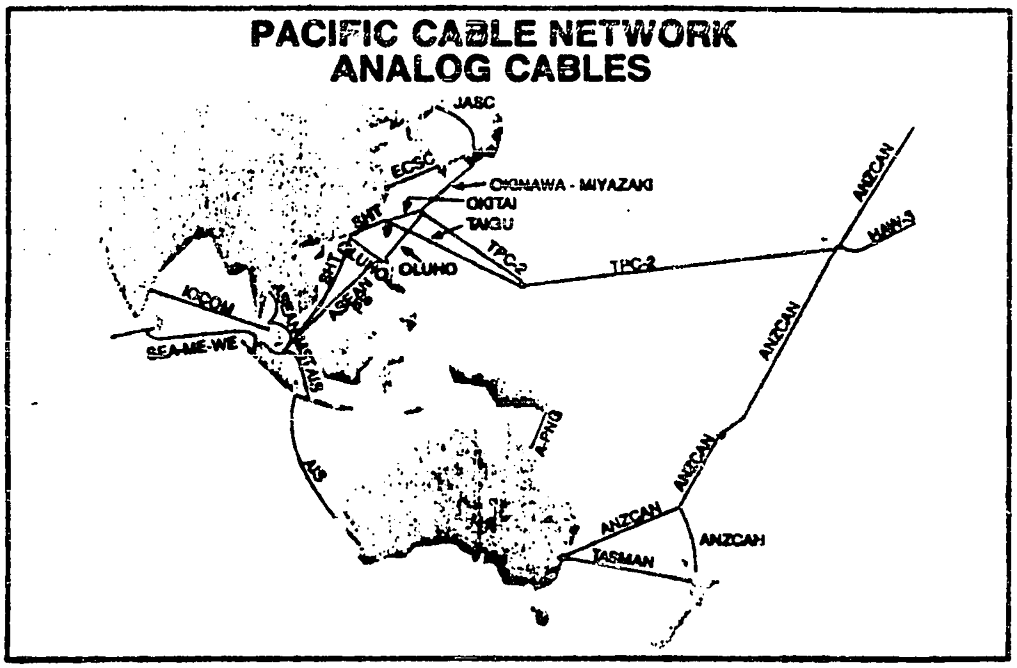
Source: ASEAN, Jakarta: Association of South East Asian Nations, 1975, pp. 33-34.

The undersea cable systems in the ASEAN have been built largely due to the organizing efforts of the COTAT committee. The following map shows the cable links in the ASEAN region as well as across the Pacific.

The ASEAN structural organization is presented in the following chart:



Source: Association of Southeast Asian Nations, 1975.



Source: Fick and James, 1990.

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