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by

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I INTRODUCTION

Dynamic changes in information technology (IT) have created a unique interdependence among nations, whether they are capitalist or communist, developed or developing. With the end of the Cold War and the collapse of the former Soviet Union, the impact of value added information such as facsimile, satellite -generated broadcasting of radio and television programs and interchange of data by computers is being appreciated to a greater extent than before. The countries of eastern Europe are struggling to establish relevant infrastructures for state -of- the- art IT in their countries . They are seeking foreign direct investment (FDI) to generate the capital required to fulfil their goals. On the other hand the developing countries of South East Asia are well on their way to becoming integrated with world markets and making an impact on the trade and investment of the region.

This paper will attempt to analyse the contribution of information both as a commodity and a resource for economic growth and the accumulation of capital. It will examine the nature of the technology that facilitates information flows across national boundaries and between continents. It will explore the contribution of infrastructure in IT in the NIES of Asia and the NEAR NIES of the ASEAN region to their economic prosperity. In dealing with this aspect of the paper, the sectoral responses to telecommunications policies of these various governments will be dealt with in order to show the wide variety in regulatory, legal and socio economic conditions in these countries. It will also examine the international frame work within which these

developments are currently taking place. The conclusion will deal with the future trends in the region for investment and growth of the IT sector.

II THE ECONOMICS OF INFORMATION AND ITS CONTRIBUTION TO GROWTH.

Information has been identified as one of the prime movers for the economic activities of production and exchange. The growing impact of information has enabled the determination of a knowledge economy and its impact on development. In 1974 Jacob Marschak described the modern economy as a process of inquiring, communicating, and decision making. Stocks and flows of information are determinants of organizational change.. However, conventional economic theory has rarely viewed information as a commodity because it does not fit in with neoclassical economic analysis which bases its assumptions on the availability of perfect knowledge. The pricing of information has enabled theorists to devise models to study the market behavior of economic agents within a market framework. Further studies have brought about a new dimension to the relationship between information and economic development (Lamberton, 1984) While the technology for transmitting and distributing information is changing rapidly, it is the content of information that flows through these conduits that adds value to the technology and imparts productivity to various sectors of the economy. In 1974 Spence affirmed that recent interest in computers and telecommunications overshadows the pervasive influence of information in markets and the information sectors on the rest of the economy. Arrow(1974) introduced the importance of organizational change as a determinant of overcoming uncertainty since the economics of information enables us to do just that.

But the concept of information needs to be viewed in a broader context than the analysis of market signals. Torr(1980) raised the issue of whether information can be treated as another commodity for which demand and supply curves can be derived. However, since information is intangible, and cannot be quantified, it defies inclusion in

functional relationships (Jussawalla and Braunstein, 1992). The very existence of commercial and consumer information services shows the importance of information both to the market and to the production sectors of the economy. Therefore, informational efficiency becomes an important policy objective and information as a valuable resource has to be managed in an optimal fashion. Arrow (1962) claimed that such optimal allocation requires government financing of research and invention. Demsetz argued that government institutions replacing the market may not bring about an efficient solution. Measurement of the information sector's contribution to GNP was pioneered by Fritz Machlup (1962) in his work on the U.S. economy. Porat also measured the primary and secondary information sectors of the American economy in 1976. A similar study was done by the East West Center in measuring the primary information sectors of ten countries in the Asia Pacific region. In all these cases it was found that the impact of information intensive activities is growing appreciably and making a significant contribution to the overall national income.

Information is recognized both as a commodity and as a resource. It is a catalytic resource which acts as a powerful agent of change. The production, storage and exchange of information are valuable inputs into the process of production of commodities and services. In fact information has been viewed as a factor of production much like capital and labor. The major advantage of using IT is that the collocation of labor and capital are no longer necessary in the production process. Information is traded for its own sake as information services in banking, insurance, consultancy and legal services. It is also a concomitant to trade and provides the information needed to make international trade possible. The problem of considering information as a resource is that it might create a misunderstanding of its nature and value. It is difficult to differentiate between the conduit and content of information and though we recognize the

telecommunications transformation as sweeping across continents we are not sure if the information society we live in makes a significant contribution to economic development and whether distributive justice is attained through it.

A new conceptual framework within which structural shifts can be made and development objectives realigned to suit the endowments of productive resources, as well as ecological and technological task environments, may be useful in evaluating the role of IT in development. Since structural shifts are the concern of both the rich and poor countries they must be viewed in their totality. In other words we cannot accept the thesis that there is a planetary zero- sum game in which if the rich countries accumulate growth the developing ones will lose out. Indeed IT is so pervasive in its impact on all sectors of the economy that it will help the developing world to move from 'triage' to prosperity.

Within such a conceptual framework, telecommunications becomes a leading variable, propelling industrialized countries towards such structural changes as would be of benefit in their application to the developing world. For example, the private sector of medical professionals in the Washington D.C. area and its suburbs put together the application of satellite technology to reach African countries in their quest for medical information. This is called the Satlife project launched just over a year ago and which shows that IT can generate the kind of assistance needed by the remote regions of the world. Such schemes help to integrate the labor and capital endowments of developing countries with available resources of IT.

In the past there used to be considerable resentment towards the operations of transnational corporations and their subsidiaries in LDCs but the increasing availability of telecommunications technologies at declining prices is changing the attitudes in host countries. Furthermore, telecommunications subsidiaries help capital and skills accumulation in host countries and do not add to their external debts. There is no way that governments can stop the flow of information from entering their countries

because of the wide prevalence of satellite technology. Asiasat is providing Star TV to masses of audiences throughout Asia and the fear of conspicuous consumption cannot be parleyed. Viewers have to make their own choices of the kinds of lifestyles they wish to emulate. The strong desire for free markets both in China and the former East Germany have been attributed to the programs beamed by CNN. In a global context the tide of technology cannot be stemmed and governments have to gear themselves to maximize the benefits for human welfare through education and be able to retain their cultural identity. The Olympic Games held in Mexico city in 1968, in Seoul Korea in 1988 and in Barcelona in 1992 have all brought in the latest forms of telecommunications and broadcasting technologies making a significant contribution to the infrastructures of these countries.

Access to telecommunications systems have been scarce in the developing world as seen from the chart depicting the penetration ratios for telephones in these countries. Despite advances made in their infrastructures, China, India and Indonesia still have penetration ratios of less than one percent. Most of the sophisticated technologies are centered in the metropolitan areas and the rural areas are mostly neglected. This has led to the wave of deregulation of the Post, Telephone and Telegraph (PTT) organizations in these countries. Developing countries find that while basic services should remain in the government sector the rapid changes in technologies compel them to provide value added services through private corporations. Liberalization policies have helped the developing countries in South East Asia to emulate the Japanese model of development based on the concept of the information society or *Johoka Shakai*. But universal service or universal access to the different technologies available have been responsible for different responses on the part of governments of these countries chiefly because of the differences in levels of economic development, traditions and customs as well as political systems. Conversion of manually operated telephone exchanges to electronic ones may not always be an advantage to labor surplus economies but they are a method of advancing

new industries to be located in regions where the telecommunications networks facilitate their operations. Without modern infrastructure these countries cannot attract foreign investment or loan capital from international lending institutions like the World Bank or the Asian Development Bank..

The International Telecommunications Union has recognized the needs of the LDCs and held several World Administrative Radio Conferences for equitable allocation of orbital spectrum resources as well as magnetic spectrum resources. In 1984 the ITU took the initiative in appointing an international commission to examine the needs of the developing world . It worked under the chairmanship of Sir Donald Maitland and highlighted the inequities in telecommunications distribution in the world. It emphasised the fact that there are more telephones in the city of Tokyo than there are in the entire continent of Africa. This report called the *Missing Link Report* was taken up by developing countries with the serious intent of reaching the goals laid out by the Commission. Their efforts were supported by the ITU through its Center for Development Communications. In the restructuring of the ITU in 1993 the new organization for developing countries is called the Bureau of Telecommunications Development.

III TECHNOLOGY TRANSFER AND ECONOMIC DEVELOPMENT

International telecommunications networks are largely a collective, cooperative and pragmatic process even though there is fierce competition in the provision of services and equipment. Transfer of telecommunications technology is ridden with certain contentious issues of standardization of equipment and protocols for interconnectivity, as well as problems of allocation of the spectrum, services trade and equitable access to information. All these have significant social and economic ramifications. Central to this process of technology transfer is the convergence of computer and telecommunications technologies. Investment in the infrastructure to create and maintain this convergent technology is a major determinant of macroeconomic

growth. As innovations increase in the industrialized countries these get transmitted to the developing ones through a process of change in the international division of labor. During the colonial era, developing countries were limited to the production of raw materials and the imports of finished commodities. In the post industrial society, a new international division of labor has emerged. These changes have transformed the investment structures from capital intensive to information intensive strategies. Developing countries concentrate on the production, exchange and storage of information in order to make access easier, so that flows of knowledge could generate new income and employment.

It is in consequence of this new international division of labor that the NIEs of Asia and the ASEAN region have achieved 7 to 10 % growth rates over the last decade. They abandoned policies of import substitution and attracted FDI from multinationals which located their subsidiaries in these countries. The main engine of growth became the export sector and the electronics industry which assisted the accumulation of hard currency reserves. (Jussawalla, 1992). A driving force in this evolution of division of labor is the fact that specialization has moved from the U.S. to Japan and then on to the Asian NIEs. The conventional pattern of exploiting low income countries for wage differentials is no longer necessary because IT makes it possible to tap skills wherever they are located through telecommunications networks.. For example, software producers in Poona, India are networking with industrialists in Boston, for the provision of customized software via computer and satellite links. As a result labor pools are being reorganized with the distribution processes across geographic points to avail of specialization in IT.

Convergence of technologies has ushered in a new era of information transmission in 'real time'. In concrete terms the output of multinationals has outstripped the growth of world output by a factor of two. Over the last decade international telephone traffic has grown by 20% a year. This concept of convergence was first

introduced in 1978 by the Nora Minc Report in France which forecast the impact of "telematique " on the world economy. In today's multivendor framework, the user is able to interlink computing with telecommunications through the success of Open Systems Integration (OSI) which makes it possible for skills located geographically apart to contribute to the same product. The spread of digital switching along with Integrated Services Digital Networks (ISDN) in Singapore, Malaysia, and Taiwan are boosting investments which will accelerate the growth of services industries like banking, finance, and insurance. As a result comparative advantage in international trade is emerging from accessibility to information and the ability to add value to it will sharpen the competitive edge of developing nations.

As the life span of new technologies gets shorter under the impact of dynamic innovations, developing countries in the Asia Pacific region are rapidly accumulating their comparative advantage through technology transfer. Hence Indonesia researched and built its own solar powered satellite dishes, China built its own satellite launch rocket called Long March, Singapore and Malaysia devised their own videotext systems called Teleview and Teleta respectively. Hong Kong and Singapore have automated their stock exchanges in order to link their financial markets with Wall Street, London and Tokyo. Likewise the infrastructures to use electronic funds transfers and automated financial services are no longer concentrated in the industrialized countries. Malaysia no longer supplies semiconductor parts for companies located in the West. It is the world's second largest exporter of semiconductors manufactured in the country and not by sweat shops as in the past. The goal of the Malaysian government is to increase the productivity of its own people to compete in quality of product with the Japanese . The politicians of developing countries in the region have become travelling salesmen for their countries, offering tax incentives, free trade zones, profit sharing and joint ventures to induce the technologically advanced countries to locate their joint ventures in host countries.

Another technology that is going to add value to the development of the ASEAN region is teleports. This is an infrastructure strongly advocated by the Japanese in their negotiations at APEC (Asia Pacific Economic Cooperation) meetings. It is the same concept as that of an airport where diverse carriers share runways and other facilities. In a teleport multiple common carriers share satellite earth stations, nodes for fibre and microwave distribution systems, relay stations and equipment in a central location that is protected from electronic interference. There are such facilities available in Atlanta, New York and Los Angeles. The proposal now is to construct one on Batam Island to serve the growth triangle of Indonesia, Malaysia and Singapore . The prospects for the growth of the telecommunications market in the ASEAN region are so promising that this investment is expected to bring in a high rate of return not only on investment but also in terms of overall regional economic development.

The technologies that have added value to the overall GDP of the South East Asian countries have been optical fibre cable, facsimile, cellular telephones and satellite earth receiving equipment. Undersea fibre optic cable now links Singapore with Malaysia , Indonesia and moves all the way to the Mediterranean port of Marseilles. Likewise there are fibreoptic submarine cables across the Pacific linking the region through Guam and the Philippines to Hawaii and the West Coast of the United States. These transmission systems enable the flow of large quantities of data ,voice and facsimile between the ASEAN region, Japan and North America. Such facilities add value to the international and inter regional trade that takes place and link more closely the developing and the developed worlds. Likewise satellite technology is proliferating in the Pacific region and making it possible for China to get assimilated into the market economies of the world through its fax machines and its cellular telephones. Some of these advantages are now enjoyed only by the metropolitan areas of the developing countries but as mobile communications become cheaper, rural China, Mongolia and Vietnam will join the ambit of global communications and markets. Already Ulan Bator has received a

satellite earth station built by Overseas Telecommunications Corporation of Australia (OTC) giving that country access to Intelsat signals. Hanoi city has been similarly equipped. Hitachi and Motorola have obtained contracts for cellular telephones in Thailand, Malaysia and China and are rapidly spreading mobile communications to the other developing countries. Inmarsat is a ship to shore communications system using satellites for ocean going vessels and port towns. It provides considerable assistance to the fishing industry in the Philippines and the islands of the South Pacific.

III TELECOMMUNICATIONS INVESTMENT IN SOUTH EAST ASIA.

A major advantage of the telecommunications revolution is that developing countries and their administrations have before them the opportunity to buy and sell in global markets and to upgrade their infrastructures with new and innovative technologies. In order to do this they are gradually deregulating the monopoly structures in the government sector or at least liberalizing the control over the services in the telecommunications sector.. Not all these countries have introduced competition but they are liberalizing the ownership of value added services because the PTTs(Post Telephone and Telegraph administrations) are unable to provide these services with their outmoded infrastructures. in the telecommunications industries. As the services sector grows more rapidly, these countries need to make their systems compatible with global markets. Examples drawn from various countries will show how they are meeting the challenges of changing technologies and profiting from such changes.

Indonesia has the lowest density of telephones per hundred population at 0.8 in 1991. Twenty five percent of these are located in the city of Jakarta alone and many islands of the 13,700 that make up the archipelago have none. The country's current account deficit is \$5 billion and the debt servicing ratio is 40%. It has two state owned monopolies that operate the telecommunications services: Perumtel and PT Indosat which is now called Telekom Indonesia. The latter handles primarily international services

while the former provides domestic services. There is not much prospect of Indonesia deregulating these monopolies in the near future although it has privatized two of its satellite systems. The Palapa system which leased its transponders to Singapore, Malaysia, Thailand, the Philippines and Papua New Guinea has been privatized and an older satellite in the B series has been moved in orbit and is commercialized as the Palapa Pacific Nusantara. It has leased transponders to CNN, ESPN and HBO. Currently the Palapa B4 launched in May 1992 supplies television and some telecommunications to the island chain and is used for distance learning programs. The country has also contracted with AT&T as well as NEC to add about 700,000 new telephone lines in the country and it aims to add 2 million new lines by 1995. So we find that there is a mixture of government ownership, private and joint venture investment in the country all with the goals of enhancing value added services to the users.

Providing for basic telephones in Thailand is still critical. There are two statutory bodies: The Telephone Organization of Thailand (TOT) and The Communications Authority of Thailand (CAT). Demand from the business sector for improved telecommunications facilities is growing in Thailand even as Japan continues to pour its FDI into that country and to build its off shore factories there. Pressures to privatize have emerged mostly from the U.S. but have not met with a favorable response from the Thai government. It receives soft loans from Japan and Europe as well as supplier credits for its telecommunications value added networks. In July 1992, Thailand decided to contract for additional one million telephones in the rural areas. This gave rise to a new consortium led by Loxley called Thai Telephone and Telecommunications to bid for the contract. Another group known as Shinwatra has been given permission to operate Thaisat which will lease a transponder from Asiasat for linking Thailand with the region. Hitachi supplies cellular phones in Bangkok and Motorola supplies them in other areas of the country. As such Thailand is equipped with modern technology in enhanced services which add to the rapid growth of the country, currently running at 10 % per annum.

The chief weakness of a public sector monopoly is that it does not operate at optimal efficiency levels by exercising cost restraints, nor does it allow the market to determine prices. Hence Malaysia undertook to privatize its PTT in 1987. The shares of Telekom Malaysia were sold on the stock exchange in Kuala Lumpur in 1991. Malaysia retains a regulatory body and new service suppliers are from the private sector such as Celcom and Atur 800 which compete for the cellular market along with the former PTT. Currently Celcom has the largest share at 53% of the market. While Telekom Malaysia provides both basic and international services, it plans to spend US \$ 4.8 billion in the next five years for equipment procurement. It will also be bidding for \$800 million worth of new digital telephone lines. Even though foreign suppliers can bid for these contracts, new companies are being formed in the country itself like Sapura and Federal Cables which are well positioned to bid for such contracts. This goes to show how investment in telecommunications is generating new avenues of enterprise and employment for local suppliers. The Malaysian telephone industry is expected to grow by 12 % a year over the next five years and the country is planning to install integrated services digital networks (ISDN) so that voices, video and data can be transmitted over the same pair of twisted wires either copper or optical fibre. Malaysia has digitalized its network so that it already has 78% of its switches on digital equipment. Malaysia will also have its own satellite system for domestic communications to reach its remote areas and the system will be called Measat.

Singapore is at the forefront of the latest technologies in telecommunications so much so that it is known as the "intelligent city". Singapore has so far not privatized its telecommunications services but plans to do so in the near future. However, that has not deterred the statutory body from providing the most sophisticated services to its business users as well as its households. It provides data fax and paging services along with cellular and has launched its own videotex system called Teleview. Its latest plan is called IT2000 under which it will even provide a virtual reality park to

its citizens. By far its networks have attracted the most multinational investment in banks, insurance and shipping services and its National Computer Board facilitates foreign direct investment for the benefit of its citizens.

SATELLITES IN THE PACIFIC AND DEVELOPMENT

Satellites have played a crucial role in the development of the region by bringing cost effective communications to the dwellers of island chains and remote areas. When Intelsat launched its first Pacific Ocean region satellite the Lani Bird in 1965 expectations for its success were not great. But the demand outstripped supply and soon there was competition for orbital space and frequency spectrum to transmit broadcasts over this developing area. As shown before the Palapa system was the first to raise the consciousness of policy makers to the benefits of satellite communications and with the proliferation of computers they grew in demand. Now most countries in the region are either leasing or having their own satellites for domestic communications and use Intelsat for international services. Most of the satellites are used for television viewing and demand for them is growing. For example, Korea has placed an order with Hughes Communications for its own bird even as Malaysia has and Thailand is leasing a transponder for its Thaisat.

With the launch of Asiasat in 1990, the entire picture of television broadcasts have been transformed. A whole new industry for VSATS (very small aperture terminals) has mushroomed in India, Pakistan and across Southeast Asia. Since the system provides access to unrestricted programming like BBC World Service viewers are defying government control over satellite antennae and paying high prices for their installation. Not only was its launch the outcome of a novel international division of labor but it marks a new collaboration between service providers. In this case the owners are Hutchison of Hong Kong, Cable and Wireless of the U.K. and CITIC (China International Trade and Investment Corporation). This new venture cost \$397 million and fills a vacuum for high powered unregulated TV in the developing countries. The

footprint of Asiasat is so widespread that countries from Basra to Hokaido are able to receive its signals. This has induced even Myanmar to lease a channel for providing telephone connections to its remote areas. What this implies for development is that disaster warnings and relief will be expedited, farmers will be in linkage with markets and need not succumb to the wiles of moneylenders, that governments will be better able to reach their peripheries and education programs can be implemented with speed across distances. Such development will bring about national integration and put the viewers in closer touch with the new information age.

The Pacific Island countries with their fragile economies are also using such services through the PEACESAT system operated by the University of Hawaii to bring information to the dwellers of those islands. The Overseas Telecommunications Corporation of Australia has provided satellite links for the Cook Islands and Fiji runs the University of the South Pacific linking 14 campuses through audiosatellite broadcasting. Papua New Guinea is leasing a transponder on the Palapa for its domestic telephones but will soon have its own equipment being installed by Scientific Atlanta. Panamsat is also planning to launch a satellite in the Pacific and Alpha Lyracom is proposing the Orbx system for wider coverage. Mobile communications through Low Earth Orbiting Satellites (LEOS) will help cellular telephones to become cheaper and provide connections to remote areas.. These are now being planned by Motorola's Iridium system which will place 66 small satellites in polar orbit whereas Inmarsat's Project 14 will also provide LEOS for mobile communications world wide. Obviously such developments in technology will be major advances that will bridge the barriers in access between developed and developing countries.. As greater investment is made in newer forms of technology and as this generates greater flows of development assistance from Japan and the U.S., the developing countries of the Pacific region will join the ranks of the community of nations.

CONCLUSION

It has been amply demonstrated throughout this paper that with changing telecommunications technologies, developing countries want to join the global trading system and are not willing to watch from the sidelines as they did during the Industrial Revolution. They want to participate in the global society and take advantage of the transition to it, as shown by their investment policies and liberalization of telecommunications services. These developing countries are now far more self-reliant, having taken advantage of technology transfer and FDI to give their economies sustainable development. It is possible that as the global trading system becomes freer without regional trade blocs, these countries will be better able to integrate with world markets. Even if the trend for trade blocs becomes steadier, they will still be able to meet the challenges of the world trading system with greater confidence with their prowess in telecommunications infrastructures and products. It is to be hoped that GATT's Uruguay Round will conclude a services charter that ensures equitable access to markets with transparency and reciprocity in trade and with the spread and use of global standards for equipment interoperability.

Development today is intrinsically tied to investments in information technology and willingness on the part of nations to participate in its progress will help them leapfrog into the 21st century.

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