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Telecommunications  
and the Developing  
World

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## Restructuring of Telecommunications and the Developing World

### Introduction

The past decade has witnessed major changes in the telecommunications systems of industrialized countries. In the United States, the near-monopoly of the Bell system was abolished; the giant AT&T was dismembered into eight parts, and competition was introduced into equipment supply, long-distance and international services, and increasingly even local exchange telephony. Superficial analysis of these challenges to the time-honored notion of a "natural monopoly" in telephony are analyzed by many observers as yet another manifestation of the Reagan Administration's laissez-faire zealotry. This is partly true. But it does not explain why many of these deregulatory policies were already initiated under the previous and more liberal Carter administration; nor would it explain why other countries have embarked on a similar journey, first the United Kingdom, then Japan and the Netherlands; several other European countries, including Germany, are now taking a hard look at the monopoly structure of their telecommunications. These changes are

accomplished with significant internal disputes and the clashing of various interest groups.

This then raises the question whether a certain determinism is at work, which will sooner or later reach the developing countries, either as they become technically more mature, or as part of a global restructuring of telecommunications. At present, the telecommunications systems of developing countries are, with few exceptions, state-owned and monopolistic. They are considered part of essential public infrastructure and a responsibility of the state. The developing countries' telephone systems are typically operated by so-called PTTs (Post, Telephone, and Telegraph administrations), which will be termed in the following as "DPTTs". These have close relations with the PTTs of the industrialized world (termed here "IPTTs"), based on colonial history, training programs, and development aid.

As the changes described above indicate, the traditional IPTTs are at present engulfed, in their respective countries, in a defensive battle to conserve their monopoly status. They are similarly engaged in the international arena in disputes with the countries which have reformed their system, and with the organizations which have been spawned by these reforms. In these conflicts, the IPTTs have sought alliances with the DPTTs, and have presented themselves as the protectors of the latter's interests, and of the developing world in general. But this assertion, I believe, is incorrect. I will argue in this paper that the IPTTs are based on different considerations than those

of the DPTTs; that these systems are changing due to underlying structural changes in their own societies, which they cannot prevent; and that the interests of developing countries are not served by a backward-looking policy to create structures whose roots lie in 19th century technology and power relations.

### The Three Segments of Telecommunications

It is important, at the outset, to understand that a telephone system consists of equipment (terminals, switches, transmitters, cables, etc.), which provides services (telephony, telex, videotex, mobile radio, etc.) that are used in applications (personal calls, business transactions, on-line information, fire alarms, etc.). Each of these three stages is dominated in the industrialized world by very different actors. The equipment sector is naturally controlled by private business enterprises. These are typically among the large industrial firms in their countries -- Siemens and AEG in Germany, CEG and Thomson in France (temporarily nationalized), GEC and Plessey in the UK, BMT in Belgium, Italtel in Italy, Philips in the Netherlands, NEC and Fujitsu in Japan, Ericsson in Sweden, Northern Telecom in Canada, and AT&T and GTE in the United States. These firms are powerful entities in their countries, and play important roles in each country's high-technology developments.

The second sector of telecommunications are services. These

are provided by carriers, which in most countries are the PTTs. The PTTs, in setting up the networks, use enormous amounts of equipment. They are part of the government apparatus, and act in accordance with technical as well as political considerations. They have traditionally used the powers of the state to prevent competition to their monopoly, and have done so in Europe since the 16th Century, when they suppressed private messenger services which threatened to reduce the extraordinarily high profits to the state from the mail monopoly, and which the absolutist states needed as a source of revenue.

The third sector of telecommunications are applications. These are in the hands of end-users, sometimes with help of specialized firms which set up systems. In the richer countries, almost everyone is an end-user, although some users are much larger than most others. The end-users are residential households, businesses, and institutions. They are a diverse group, with many conflicting interests and views, particularly as between residential and business users, but they are united by the desire to pay as little as possible for as good a service as possible. In this desire, they are on the opposite side of the fence from the PTTs and the private equipment manufacturers, with the latter wishing to profit from the sale of equipment. Users tend to be fragmented; there are millions of small and hundreds of large ones; for most of them, the cost of telephones is a relatively small budget item; it has therefore been difficult to build user-coalitions with the same effectiveness of the

concentrated equipment industry. Furthermore, the PTTs were able to split users by having large users subsidize small and rural ones, thus bringing the latter to the PTT side.

### The Postal-Industrial Complex

In consequence, for about one hundred years, telecommunications were run by a coalition which can be termed the "postal-industrial complex." This included the PTT, the equipment industry, together with the small and rural users, and the trade unions of the industry. The system worked, in particular, to the benefit of the equipment industry. The PTTs, through their huge procurements, especially after World War II, provided large markets for the industry. Even better, these markets were almost totally protected from foreign competition by national procurement practices. Thus, the German Bundespost did not buy from France, the French DGT did not buy from the UK, etc. etc. Within most major IPTT countries, the domestic manufacturers collaborated with each other in formal or informal cartels, which at times set prices and allocated precise shares of the large PTT procurement contracts. This system did not lead to low-cost systems, but it was very profitable for the insiders, but its inefficiency was usually hidden behind the general reduction in the cost of electronic equipment which was part of a secular trend in information technology.

The PTTs could also set the standards for equipment in a way that would discourage or delay outsiders, and they collaborated with domestic firms in the joint development of new systems.

Subsequently, they provided the testing ground for the new equipment, and later helped promote it to other countries, particularly of the developing world, often financed by development aid which they helped to arrange. The system was opaque enough to permit much hidden profits. Sometimes, however, one could get glimpses of the underlying inefficiencies. An OECD report which found that only 15% of the world market for telecommunications equipment was free, observed that in the IPTT countries, switching equipment prices were twice as high as in countries with competitive procurement. [OECD. 1983. Telecommunications: Pressures and Policies for Change. Paris: OECD.]

Insulated from competition, secure in their profits, the traditional telecommunications firms were not particularly successful in technological terms. They all missed the development of computers, or were unsuccessful in it. The Japanese firms are the only exceptions; even an advanced firm such as Siemens required infusion of Japanese and American technology. This lack of success came despite major national efforts and subsidies for the development of computer and semiconductor components.

#### The Emergence of the "Second" Electronic Industry

The development of micro-chip components, provides an instructive illustration on how the traditional equipment manufacturers fell behind technologically; and how they permitted the emergence of a "second" electronic industry. Contrary to

popular belief, the American advantage in electronic component development did not result from European devastation in World War II. At the end of the war and in the early 1950s, the United States and Europe were at similar levels in terms of technology development. The war had provided a major impetus for innovation in countries such as Britain and Germany, and though many Germany production facilities were destroyed or dismantled, the technical know-how remained in place. European firms were as advanced in tube technology as their American counterparts, and were doing sophisticated research in solid state technology, such as the one which led to the development of semi-conductor diodes.

In late 1947, the transistor was invented at Bell Labs, and its superiority over traditional receiving equipment soon became apparent. The large, established tube manufacturers moved into transistor manufacturing, and although the Americans had something of a head start, European companies managed to keep up with the new developments. Philips (with its various European subsidiaries), Siemens, AEG-Telefunken, Plessey, Ferranti, GEC, and Lucas were all doing quite well, with many of them having close development links with American manufacturers or with each other [Malerba, Franc. 1985. The Semiconductor Business. Madison: University of Wisconsin Press.]

What was more significant than any American technological advantage in creating the later disparity in high tech was the fact that market structures evolved in different ways on the two sides of the Atlantic. In the United States, the demand for new



innovations, particularly the integrated circuit, came from the military and the emerging computer industry. These demands were met not so much by traditional tube manufacturers as by new firms that began to master the silicon-planar-integrated circuit technology, to which the traditional tube producers did not rapidly adapt. Furthermore, major American computer manufacturers themselves went into component production. In Europe, meanwhile, much of the development of the new integrated circuit technology was left to the traditional manufacturers, who were larger and slower to innovate than their American -- and later, Japanese -- counterparts. American producers thus gained an advantage that they were able to translate into larger market shares. This left European manufacturers to the development of less innovative discrete devices and linear integrated circuits for consumer and industrial markets.

A significant side effect of the role of the European manufacturers was that competition between new and existing technologies was frequently determined not by head-to-head rivalry, but by in-house bureaucratic rivalries. In America, rival technologies were mostly advanced by competing companies, and have thus been subject to rigorous competition.

An important factor in the acceleration of high technology development in the United States was the switch from the earlier germanium-alloy and mesa-discrete devices, to the newer silicon-planar integrated circuits, which were developed by Fairchild and Texas Instruments in 1960. The new technology was based on

silicon instead of germanium, and on planar fabrication, which made mass production easier. And it made possible substantial component integration within one chip, which eliminated the need for the construction of discrete components. Firms that switched to the new technology were either young companies who were wedded neither intellectually nor financially to the older ways. Firms that were able to move rapidly into the new, superior technology left the older, vertically integrated telecommunications manufacturers behind. Traditional European firms also often made the wrong choices in choosing traditionalist firms among American partners for technology transfers, such as RCA and GE, which soon dropped out of computer manufacturing for lack of success.

The integrated circuit period lasted until the introduction of large scale integration (LSI) in 1971 and the invention of the microprocessor; this period was in turn followed by the stage of very large-scale integration (VLSI) in the early 1980s. At the beginning of the LSI period, European public policy had focused on micro-electronics, and encouraged finished goods producers such as telecommunications and consumer electronics firms to integrate vertically into micro-electronic component manufacture. Government development projects began to provide investment funds, mostly for the giant traditionalist firms. On the whole, however, none of these efforts succeeded in significantly challenging the American and Japanese lead.

An important question to be considered in analyzing the

problems of Europe's electronic industry is whether it was an absence of R&D funds that was the explanatory factor. Surveys by industry analysts estimate that 1982 R&D expenditures by the European computer industry were about \$3.7 billion. This compares to about \$1.7 billion by Japanese and \$4-5 billion by U.S. firms. [Kraus, Jim. 1984. "EEC Computer Manufacturers Tie R&D to Compete with U.S., Japan." Electronic News (September 10): Section 11, 11.]. Thus, European computer R&D spending was twice as large as that of Japan and not much smaller than that of the United States.

#### The Shift Towards a Service Economy and a Second Electronic Industry

In industrialized countries, the restlessness of users has been growing, and with it their willingness to go around the system. Their gratitude to the PTTs for being connected to the network is short-lived. On the residential side, it is a manifestation of greater consumer-assertiveness. On the business side, it has been a far more fundamental change, part of the shift towards a service-based economy. The large users of telecommunications are banks, insurance firms, airlines, health delivery organizations, consulting companies, engineering firms, law offices, media organizations -- all parts of what is described as the "service economy" or the "information economy." Developed countries, with the US in the forefront, have been moving from an economy based on industry to one based on services. Partly this is due to the loss of competitiveness of

the traditional mass-production sector vis-a-vis newly industrializing countries. Partly it is due to their great pool of highly-educated people skilled in the handling of information. Advanced information and advanced services are emerging as the prime comparative advantage for developed countries. In New York City, in districts where for a century light industry flourished and then stagnated, there are now advertising agencies, law firms, publishing companies, brokerage houses, investment banks, corporate headquarters, and engineering consultants, many of them involved in international business. The changes which they brought do not only transform the cityscape. They also lead to a restructuring of the telecommunications landscape. These firms have an enormous use for telecommunications, in particular since these have been merging with computer applications, generating a large number of applications and equipment options.

The development of a computer and component industry, the "second" electronic industry, is another major change in industrialized countries, as was described above. While in many instances the newcomers are part of the traditional telecommunications industry, in many instances they are not -- IBM in the US, Nixdorf in Germany, Olivetti in Italy, and office equipment makers everywhere. They are used to direct relations with the users, without centralized the mediation of the PTTs. They are often not integrated into the traditional club, nor do they wish to play by its rules.

The Services-Information Coalition

The traditional coalition of PTTs and insider industry has been unable to meet many of the user needs and expectations at reasonable prices. This has led to a new coalition, which is challenging the postal-industrial complex: it is the alliance of large service sector users with the "second" electronic industrial sector -- a "services-information coalition." In the United States, classic members of this grouping would be American Express, IBM, Time, TWA, Citibank etc. Opposed to it, among private firms, was primarily AT&T --not enough to stem the tide. Hence, the victory of the services-information coalition over the traditional forces was inevitable. In Britain, the new coalition was slower to gather, and the defense of the traditional industrial sector was more tenacious and ideological. However, when the government withdrew its support from the traditional arrangement and blessed London as the services capital for all of Europe, the postal-industrial complex had to compromise. A similar story can be told for the Netherlands. In Japan, where the "first" telecommunications industry has transformed itself better than anywhere else into the "new" information industry, the changes were smoothest, since the industry did not stand to lose much. In other IPTT countries, the old coalition is still powerful relative to the newer one, and it has often tried to integrate the "new" electronic industry by new types of equipment procurement.

#### Implications for Developing Countries

It was necessary to analyse these IPTT changes at length,

because of their implications for the DPTT countries. The previous sections argued that the IPTT system existed to a large extent to support the interests of the equipment industry rather than of end users. This system reflects power coalitions dating back to the 19th century. In developing countries (and I will concentrate on those with private industry) the underlying economic structure is different. The telecommunications industry is small, and often consists of subsidiaries of large international firms which add a bit of local assembly to equipment produced elsewhere to comply with local political obligations. Of course, some of the larger and more advanced developing countries already have a greater stake in electronic equipment. Their experience should not be generalized to smaller and poorer LDCs. Hence, many of the developing countries would be able to pursue telecommunications policies which are primarily aimed to benefit the stages of services, i.e., of networks and applications rather than of equipment. This has not always been obvious to some countries, as they have pursued the IPTT route and aimed at establishing local telecommunications and computer industries. Most people would agree that it would be sub-optimal for a developing country to slow its road-building and construction activities until it had established its own bulldozer production; or that it should establish independence in drug manufacture before embarking on public health projects. But for telecommunications and information technologies -- informatics-- the analogous attitude is more prevalent, partly in

deference to the myth of intelligent machines. An international body, the Intergovernmental Bureau for Informatics (IBI) in Rome, which had been set up with the aim to develop Third World understanding on the issues, concluded its 1978 international conference in Spain with the ringing declaration that "any nation that wishes to remain sovereign must achieve independence in Informatics." Subsequently, the policies of Brazil have been particularly applauded, and have been adopted by several others. Brazil, under a military dictatorship which tried to curry favor with the country's technocracy, established rules which make the importation of information equipment, including computers, costly and difficult. Similar policies restrict the importation of data services and information processing. As justification, Brazil chief information officer (in both senses) argued that it would benefit the development of Brazil's informatics industry. That it did, but at a cost. Computer equipment in Brazil is far costlier than on the world market, and its performance lags years behind. This is not a criticism of Brazilian talents; most West European countries also lag behind the US and Japan, and Eastern Europe is doing even worse. The question is therefore, whether (a) it makes sense for any country with limited technical resources to try to keep up in a race which most industrial countries cannot manage, and (b) whether it makes sense to impose the indirect costs of this attempt onto the operators of the networks and the users of applications and services, in the form of higher prices and lower performance. Several Brazilian

manufacturers may be benefitting, but in the meantime hundreds or thousands of users are served less well than otherwise, or not at all. The "infant industry" argument is one that presumes that the infant grows up to compete with adults. It presupposes an analogy to humans, namely that growth ceases after a certain point. However, it is questionable whether maturity will be reached in the foreseeable future in the computer, information, and telecommunications fields. More likely, the LDC "infants" could find themselves, after years of protection, still lagging behind, and in need of further protection, in particular since much government money and prestige has been invested in them already.

#### Priorities for Telecommunications Development

This is not an argument against modernization, or in favor of keeping developing countries backward in traditional fields of production. Instead, it is an argument that the pursuit of modernization in equipment development production should take a secondary role to modernization in applications, and in an expansion of the networks to reach every village. Let Japan and Silicon Valley battle each other for ever-cheaper hardware. This benefits the users, and they are global. And while of course the most advanced societies have the greatest need for communications and information systems, there are vast uses for them everywhere else. Examples are crop and production planning, ordering of spare parts, export and shipping transactions, government administration, remote health care, industrial engineering,



repair and maintenance procedures, commodity trading, taxation, financial transactions (important in high-inflation situations), electronic mail in lieu of some physical delivery, job banks, electronic mail-order systems, access to library resources, medical documentations, transportation planning and control, animal breeding coordination -- to name but a few obvious ones. Estimates of the cost-benefit ratios of expansion in telecommunications have shown high multiples. [Leff, Nathaniel H. Externalities, Information Costs, and Social Benefit-Cost Analysis for Economic Development: An Example From Telecommunications. 1983, Working paper #3, Columbia University, Center for Telecommunications and Information Studies] With information as a resource of production, the cheap, speedy and easy access to it needs to be facilitated. It is one of the properties of information that once produced, its marginal cost is merely that of distribution. Thus, with the technical cost of telecommunication transmission steadily falling, the access to vast information resources is within the reach of the smallest village with telephone access. But this major development in human civilization is greeted by many as a threat rather than an opportunity. They feel that it provides excessive power over information to a few multinational companies and countries. They fear that it undercuts national sovereignty and the privacy of the citizens of less developed countries. All these fears are based on real possibilities, but not on probabilities. Private companies could monopolize information globally only if they

could do so within their own countries. In the US, the opposite is happening: the number of traditional publishers has been going up steadily every year; the number of providers of electronic data services is growing; similarly growing is the number of software houses, television networks, satellite transponders, scientific journals, cable channels, communications carriers, etc. This could not be expected otherwise; the advent of an information-based economy leads to richness and diversity of information sources rather than to their concentration.

This still leaves the question whether Western information and communications enterprises, as diverse as they may be, may dominate the communications structure of the world, to the detriment of non-Western societies. This ties in with the efforts towards a "New Information Order." The answer to the question is a somewhat regretful "yes." Western information and communications providers, whether data, computer, or media firms, are likely to be dominant, because they reflect the comparative advantage of the emerging structure of Western economies -- information and services. Information products and services are what these societies are good at producing and distributing, just as Hong Kong is good, at this stage, at mass-producing textiles, and efforts to reduce their presence are like efforts to reduce the imports of textiles from Hong-Kong: they are achievable, but only at a cost to oneself.

Moreover, the Western dominance in the information sector lies in information that is globally useful, such as data-bases

on chemical compounds, etc. There are vast areas of the information sector which are national and local in nature, and where there is much room for domestic production. For example, the existence of a huge American-based legal reference system does not affect the need for similar systems in Brazil or Indonesia.

#### The Divergent Interest of Developing countries

Internationally, the dispute over the flow of electronic information is part of the global fight between the traditional "postal-industrial" complex and the "services-information" coalition. Another of these struggles is on the question of alternative satellite services. Here, the IPTTs have resisted the emergence of private competition to Intelsat, which they control. They have argued that Intelsat provides subsidies to LDCs, and therefore deserves their protection. It is true that the low-traffic routes are charged less than their share by Intelsat. However, this is only a minor part of the cost of international communications. National PTTs add a vast surcharge to the actual users, often ten times as much as the Intelsat charge. For the end user, the difference in the Intelsat charges would be a mere drop in the bucket. What is much more at stake, however, is the PTTs' ability to add the huge surcharge over cost. From the perspective of an end-user in a developing country, such competition should be welcomed as a reduction in their communications costs. It is of course argued that the PTT profits in international service are used to subsidize domestic

service. This is true, but one need no monopoly to do so. A government could simply levy a tax on all international calls, whether they use Intelsat or a rival, and use the revenue for subsidies.

These examples illustrate how developing countries are used as pawns in the struggle accompanying the restructuring of telecommunications in the industrialized world. They are used by the historically losing side, the traditional telephone industry, which has benefitted most from the monopoly system. But for most developing countries, it makes little sense to enter and defend a system based on past technology and power relations. Their primary interest is not in the equipment and hardware part of telecommunications and computers, -- though there are opportunities to serve market niches here -- but in domestic applications, and in low cost of network services. Therefore, they ought not defend the PTT system as a mark of progressive politics. This is in no way to suggest that there should be no government involvement in telecommunications infrastructure. There is a large need for a governmental role in spreading the networks and achieving universal service. Nor is it an advocacy of privatization. The question of ownership is secondary to the one of market structure. A publicly owned basic system, and subsidies to weaker groups and regions makes perfect sense for most countries. What is unnecessary is the near-religious stress on monopoly in every aspect of telecommunications, when a simple tax on telephone service and its redistribution as a subsidy

would do just as well in terms of social policy. One need not be a telecommunications engineer to notice, in many countries, how bad and expensive telephones are, in a service that could easily support itself financially, and be even profitable. Thus, most countries have not fared all that well with their traditional system: they can afford a bit of experimentation. Once they realize that they are following outdated European concepts, rooted in financial needs and state aspirations of the age of absolutism, and serving nineteenth century European industrial interests, and that their own interests are those of users of applications, not of manufacturers of hardware, they may show more inventiveness. The structure of telecommunications reflects the underlying structure of the economy, and only a view adhering to old industrialism will advocate old telecommunications structures.