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The Promise Of Tomorrow's Telecommunications For The Global Economy

By

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I Introduction

Modern society is living in the most exciting period of its history. Each day unfolds a new and spectacular achievement that telecommunications technology brings to radically alter the ways by which nations and people talk to each other. As the interface of satellites with computers grows and as telematics becomes more widespread, countries find their economic health and viability determined by their investments in innovative communication technology. The welfare effects of this revolution should be as carefully assessed as when modernization was considered the best growth strategy for developing nations. It is difficult to predict the future outcome of these catalytic changes. Whether they will widen the gulf between rich and poor countries or create a global "republic of technology" (Boorstein 1978) remains to be researched. The fact is that equitable access to information will become a significant dimension for policymakers even as equitable distribution of income now is.

With the acceleration of global integration, there emerges a series of controversies over the uses of telecommunications technology. These center around the allocation of outer space, the free flow of information, the domination of computerized networks by transnational corporations and the growing barriers to transborder data flows (TBDF). Are the resources used by futuristic technology the common heritage of mankind or are they the property of the few high technology nations which invest extensively in research and development? The ultimate objectives of these arguments, pro and con, are to install an economic regime based on a communication system which will combine efficiency with equity (Tobin Foundation Report 1982).

The leading country in the race towards innovative communication technology, namely the U.S.A., finds that over half its national payroll

accrues to those who manipulate symbols rather than produce things (Douglas Cater 1981). This happens because the resource which feeds this trend is information, which is fast becoming an important ingredient of the production function. It serves as a catalyst and its diffusion through telecommunication channels becomes a major determinant in altering the working and living patterns of those who participate in today's Information Society.

This paper examines the variable relationships that, over time, are likely to change the structure of institutions and alter the foundations of global policies. Specifically, it will examine future trends in technologies such as communication satellites, computers, teletext, videotext, and integrated services digital networks and their impact on global economic and social relationships. It will raise issues for discussion at the conference; issues that need to be considered before technology overtakes existing systems. These issues emerge as telecommunications effectively reduces distances for information exchange to zero.

The role of the information explosion wrought by telecommunications technology in altering economic and social values is just beginning to be understood. Industrially advanced countries find that concepts of power and equity are really dimensions of information power and information equity in the wake of changing communications. The transnational corporations, with their own value-added networks, have, so far, internalized information flows and profited from the power they give over the market economy. Will transborder data flows through computer-to-computer communications tend to erode this power and introduce equity, or will information still be concentrated in data bases located in the few technologically advanced countries? Just as in the post-Second World War era capital equipment for the manufacturing industry was considered the engine of growth, in the coming decades the hard and software of

telecommunications will become the major determinant of the growth of national income (Jussawalla 1982). Alternative futures in telecommunications pose greater and more exciting opportunities. Telecommunication is rapidly becoming what Business Week (82) describes as everybody's favorite growth business.

II The Global Span of Satellite Technology and Its Future

The epoch-making entry of satellite technology for communications wrought far-reaching changes for broadcasting, for television, and for telecommunications. Its cost and complexity and the fact that only two countries manufacture satellites and three launch them make its application to low-income economies a questionable one. How does satellite communication impinge on cultures and people still far away from modernization?

Within two decades some of the smallest nations in the Pacific, whose economies are based on household self-sufficiency and barter, currently participate in the PEACESAT system which they alone govern and select programs for information sharing. Many countries in the Asia-Pacific region, as well as Latin America and Africa, are now seeking low-cost, high-speed telecommunications through satellite links. For them such services are vital for raising the productivity of their farms and factories and for generating investment and employment in their electronics industry (Jussawalla 1983). The economic advantage lies in using satellite technology for domestic telephones and telex communications to remote areas and islands which cannot be cost-effectively linked by terrestrial or undersea cables. Satellites offer cost-insensitive communications for distance and long hauls.

Ever since the launch of Telstar in 1962 the geostationary orbit (the Clarke orbit) is crowded with satellites three to four degrees apart from each other, and there is a growing demand for greater on-board power for platforms

in space with multi-beam antennas. This would enable earth station costs to decline rapidly and to place direct broadcasts to rooftop antennas within reach of businesses, schools, hospitals, and households.

Even as the Challenger launched Palapa II for Indonesia and Anik-C for Canada, countries of the Western hemisphere met in June 1983 to tackle issues of parking slots for satellites that broadcast direct to the users' antennas. Rules for allocation may be agreed upon at the International Telecommunications Union's (ITU) conferences, but changing technology makes a mockery of these very rules. The economic dimension of the scramble for orbital slots is the fact that the Clarke orbit is a finite, invisible common property resource subject to congestion, but not to depletion. This implies that the economic value of the resource increases with its use. Since exclusive property rights are difficult to enforce, it becomes possible either to over-invest in the resource or let it be wasted. Technology has made it possible for the industrially advanced countries to virtually monopolize the use of the orbital arc with nationally and privately owned communication satellites. Assuming that externalities are the same as in other natural resources, such oligopolistic use is claimed to result in optimizing efficiency. The orbit is not a marketable resource and current ITU rules do not award orbital space in perpetuity, so that "squatters rights" are being contested by less developed countries (LDCs). It is possible for a single orbital slot to accommodate more than one satellite. Several countries may share a slot, as Britain and Ireland do and may have several satellites in orbit. The U.S. and Canada are seeking DB satellites to be spaced two degrees apart with 58 watts of satellite power. Most countries have a strong interest in squeezing as many satellites as possible in the space available (The Economist, June 18, 1983). But the developing countries of Region II also plan to have at least one satellite each

by the end of the 1980s. Brazil is claiming five orbital slots, Mexico two, Cuba one, and Colombia one. They are all urging 'a priori planning' of orbital space allocation.

The economic issues of the future are, among others, whether Western countries should plan new satellite technology that will render their investments viable or should they freeze it until after the 1985 WARC. Is it possible to create a lease market where assignments to specific slots can be bought and sold (Levin 1983)? The danger of such an alternative is that if the lease rents are exorbitant, these very LDCs will be priced out of the market unless stakeholder rights are pre-determined. At present under a zero-pricing system lease rents cannot be determined. Should then the spectrum be shadow-priced? Will stakeholder rights enable the LDCs to cartelize? Will they lose their present advantages of latecomer access or benefit from access to preferred orbital slots? The most critical issue for determining the future of satellite technology is whether maximum value dispersion of information pathways is to be achieved at the cost of economic efficiency or of distributive equity. As Naisbitt (1983) asserts "instead of turning us outward toward space, the satellite era turned the globe inward upon itself," making satellites the instruments for fulfilling Marshall McLuhan's "global village."

Many of the issues that are currently politicized in international fora are, to a large measure, overcome by the INTELSAT system. It specializes in traffic leased on differential demand emerging from continents surrounding three ocean basins. Simultaneously, its new generation systems provide domestic communications to Asian countries which lease portions of transponders for this purpose.

Tariffs imposed by INTELSAT are still too high for some of the Pacific Island countries and other low-income economies of Asia. Whether these tariffs

will become more competitive with the challenge of Orion in transatlantic communications or whether INTELSAT will retain its monopoly pricing power will depend on reductions in unit costs of transmission and of the 'last mile' in network architecture.

For LDCs, the opportunity costs of satellite communications are high even when equipment costs decline. Demand elasticity in such regions defies measurement which makes it difficult to devise a tariff structure with a built-in subsidy for low-income consumers. INTELSAT should offer preferential tariffs to make the trade and marketing systems of LDCs more profitable through reliable communications. Tomorrow's satellite communications should not be placed out of reach of poor countries because of prohibitive tariffs and rigid lending policies of the World Bank.

III Computer Versus People

When Time magazine declared the computer as its "Man of the Year" in 1982, it became amply evident that information processing technologies had invaded not only the factory, the bank, the office, but the home in most of the developed countries. Concurrent with the advance of computer technology has been the equally rapid advance in interconnecting networks for communications. This has led to such a blurring of products and markets that 'telematics' portends a synergistic future 'nerve system' for all facets of a country's economy--be it finance, education, government, commerce, or trade. Producers of telecommunications hardware now include computer networks as part of their product mix and firms move between markets making it difficult for estimating marginal costs of any one product in the telematics sector.

This trend overtakes the markets of NICs and near NICs, bringing profound changes to the societies of developing countries as they have to the

inhabitants of high technology countries. This development became more feasible with the spread of subsidiaries owned by transnational corporations which used their own computerized networks and internalized their information flows. With the acceptance and use of SWIFT and SITA, GLOBCOM and EUREX, developed and developing countries got drawn into the vortex of global networks.

Demand for computer communications has become the catalyst for economic progress, so much so that new entrepreneurs are in search of new profits from new innovations. The recent generation of digital communication systems makes it possible to build in services like automatic call-back, conference calls, and caller identification at subscriber terminals. The structure of the telematics industry is complicated by the essential "jointness" of activities, i.e., computers are demanded because of the demand for records, data bases, networks, and conferencing to name a few of the joint activities. Despite this complexity, the major variables that will influence the future of international division of labor for computer products are:

1. The impact of factor productivity in the output of computer goods and services, and
2. The impact of changes in such factor productivity relative to the response of demand to falling prices.

The race for super computers that perform functions at speeds in billions per second threatens to plunge the U.S. and Japan into costly competition, leaving the French aspirations for Telematique way behind. The nationalization of the French telecommunication and information processing industries has thrown the Telematique program into disarray, while the Japanese, also distrustful of the marketplace magic, are investing $200 million to capture the world market for super computers. The advantages of the super computer lie in

high speed and greater operational efficiency for the mega systems of information processing, but the production of information still lies with the human beings who develop and manage these systems.

The U.S.A.'s Cray project and the Trilogy Project, and the Japanese consortium for the Fifth Generation computer, together with robotization all create threats to national employment levels which, through the operations of TNCs, challenge employment in LDCs that lost their subsidiaries. There is the threat that present off-shore production and processing units located in LDCs will be returned to their parent corporations. This threat becomes more real as the race for superfast computers leads to devices based on light. Just as integrated circuits and transistors substituted values in transforming the design of computers, so too could the substitution of photons of light for electrons (Economist February 26, 1983). Extensive application of computerization to manufacturing industry and the services sector challenges employment and lines up the Luddites in society to oppose information technology altogether. However, these fears may prove groundless. The development of micro-electronics has given rise to a new, fast growing industry during recessionary times (King 1982). The Club of Rome's report "For Better For Worse" (1982) indicates the enormous potential for employment and improved life styles that micro-electronics have ushered in. The employment effect of computer applications is a function of income growth (Jussawalla 1983). If productivity and output are enhanced, then employment will increase over the long term, even if the short-term effect is disruptive. New avenues of training and employment constantly open up. The main danger for the short run is that increased efficiency in any one industry gives it a dominating position driving down its competitors and thereby reducing employment.

The market for computer software is exploding even in the Asian NICs, so that custom-built software opens up further avenues of future employment and provides export possibilities.

IV Integrated Services Digital Networks (ISDN)

This will be the single most important technological development of the last quarter of the twentieth century. Its future applications are still undetermined even though its spinoffs for various information systems are likely to be tremendous. ISDN promises the complete integration and inter-operation of all computer and telecommunication systems which provide services for information storage, processing, and distribution (Wedemeyer and Jussawalla 1983). Using digital signals, ISDN is cost-effective. A single connection serves the widest range of needs. The marginal cost keeps declining with increased economies of the leverage of specialization. It is also an intelligent system able to allocate cost-efficient combinations of information handling. AT&T in the U.S. and NTT in Japan are already planning its widespread implementation. The ITU is working on international standards for ISDN. This is a crucial necessity because a global phenomenon like ISDN requires uniform standards for all users.

With the active push of this new technology most countries succumb to taking an anticipatory role instead of allowing the technology to jolt them into hasty decisions. Not even the poor countries like the Pacific Islands desire to remain in isolation and lose out on the benefits that integrated communication networks will bring. International markets come closer, disaster warning and relief gets speeded up, and foreign exchange reserves get conserved. In 1988 a Trans-Pacific link using optical fiber will bring these island countries into closer ties with Japan, U.S.A., and the Asian NICs. Such

a digital network will give a tremendous boost to their resources for government, education, and business. Every location or node on the ISDN system becomes a critical part of global information based activity.

With the technology comes the issue of investment finance. Can low-income countries afford to plug into the system at high opportunity costs? Will such costs be higher if they opt out of the system? What international policies can be set in place to regulate optimal efficiency without destroying distributional equity? Should the use of the networks carry a tariff subsidy for low-income countries or should there be an internationally uniform usage-sensitive pricing? With ISDN will emerge legal issues of data privacy, quality, and content of proprietory information and related legal issues. Are we ready to cope with the socioeconomic impact of such a futuristic technology? What kind of transitional scenarios can be envisaged to move societies from the technologies of today to the ISDN world of an information economy? Unless these issues are sorted out on an a priori basis, the displacement of persons and institutions and the social impact in value terms will be juxtaposed against technological determinism.

V EFT, Teletex, Cellular Radio, Interactive Cable

Industrially advanced and newly industrializing countries are increasingly using electronics funds transfer systems. Large amounts of money get transferred in milliseconds between banks within and outside these countries. Electronic money stored and processed in computers and transferred via telecommunication systems pose a hazard to national security and to the smooth functioning of the international monetary system (Parker 1982). EFT is, in fact, part of the trends that are remaking society and an awareness of these trends entails policies to cover competition among banks, the impact on users,

and regulators as well as suppliers. What are its costs and benefits to the consumer and to the less advantaged members of society? How are records controlled under EFT to safeguard privacy and confidentiality? So far it has not ushered in the checkless/cashless society claimed for EFT a decade ago. But it still may happen. This is because EFT works within an institutional and organizational context, so that as its impact becomes more widespread, organizations may need adjustments to keep in step with inherent possibilities of technological change (Colton and Kraemer 1980). EFT is synergistic in its impact with changing telecommunications technology. Financial centers in Tokyo, Seoul, Singapore, and Hong Kong are all availing themselves of it for international transactions that may soon minimize if not eliminate arbitrage gains. As James Martin (1979) predicted, man's credit rating will mean more than his pedigree and concepts of privacy may change in a world of interconnecting computers when money becomes information. The SWIFT (Society for Worldwide Interbank Financial Transactions) system destroys the theoretical concept of velocity of circulation of money and its effect on price levels through transactions. National monetary policies in the near future will have to contend with the global velocity of purchasing power generated through computerized networks.

Most industrialized countries have created the infra-structure for text communications that can optimally utilize person-power and render office work less labor-intensive. An efficient use of packet-switched data networks and leased lines requires terminals to be compatible. Teletex renders interworking possible with other communication services. Britain has used the Ceefax service since 1975 on a nationwide experimental basis. Viewdata was introduced in Hong Kong in 1980, allowing data to be transmitted through a public-switched telephone network. It also uses a Financial Vision service which delivers

business information on Viewdata screens. Singapore is studying its national demand for teletex services. The market for this technology has not grown commensurately with the innovations which leads to the problem of a technology in search of a market (Thomas 1983). The problems encountered by Prestel in the U.K. illustrate the danger of providing consumer-financed services to a mass market. The U.S. market, on the other hand, has the potential for greater exploitation through mass marketing and scale economies. With 100,000 personal computers already in use, 30 percent penetration of cable television, and 100,000 subscribers to financial news services, the market is already in place for mass videotex systems. It is anticipated that videotex in the U.S. will have a 7 percent penetration by 1990. New Zealand and Australia are awaiting decisions on standards before introducing this service to their users. With the introduction of intelligent terminals, the scope for using videotex in various ways is enhanced and its corporation applications are much greater now than when the service was first introduced. Corporate systems become increasingly cost effective in processing and distribution of information and in decentralized decision-making with the use of videotex.

Cellular mobile radio is another spectacular innovation in telecommunications technology that promises to change the ways of telephone usage. Each mobile phone is to be linked by microwave to a computerized switch which will transfer a cell to another mobile phone or any other phone (Dizard 1983). Canada, the U.S.A., Japan, Germany, Saudi Arabia, and Singapore are all either using or planning to use cellular mobile radio and as costs decline, more aggressive marketing will make this technology as commonly used as the transistor radio once was. It holds tremendous potential for developing countries in bridging the communication gap between the urban elite and the rural population, between the government headquarters and the agencies that

operate at the village level. It opens up possibilities for planning interactive communications from the grass roots upwards enabling a new paradigm for development to succeed.

Interactive cable television is another new media technology that ushers in the benefits of market information access for consumers while simultaneously creating price barriers which may deprive low-income households from entering the market for this access. Interactive consumer information delivery through cable TV is perhaps best evidenced by the Qube system in the U.S.A. News and financial services, and interactive advertising all become possible along with access to educational materials. These subscriber-response-services not only hold a growing revenue potential for the provider, but many flexible uses for the consumer. However, the growth of entry-costs raises issues of who will benefit most from interactive cable TV. Will it be primarily professional and managerial workers (Kalba 1980)? Will it exclude households with low incomes and low media literacy from the benefits of market information? Does it create a paradox in offering industrial benefits at the cost of impoverishing culture and raising social barriers between users and non-users? While the Hunt Inquiry in Britain favored the use of cable TV, there is the problem of linking entertainment to information access and introducing the artifacts of a post-industrial society (Tracey 1983).

VI Technology Transfer for the Developing World

Specialized resources of skills and physical equipment as well as finance place the developing countries in a position of technological dependence. Their aspirations for self-reliant growth create demand for innovative communications technology which LDCs are now importing at high opportunity costs. Social systems parameters within these economies require such

technology transfer as results in an optimal mix of labor-using and equipment-using technologies. Costs of such transfer are closely linked to external deficits and international debt.

In most LDCs telecommunication services are a public monopoly, because the price of some services can be subsidized at the cost of others. This trend is no longer sustainable because it is an artificial monopoly which does not have a single output. Bandwidth demand has a variety of uses. It becomes difficult to sustain an artificial monopoly, so that newer technologies make it incumbent on LDC governments to remove the monopolies.

Future trends are clear. New technologies appear on the market at a rate faster than LDCs can afford or absorb. Nevertheless these nations are waiting to reverse the trends of unequal development and actively participate in the Information Revolution (Jussawalla 1983). While these countries vary in levels of economic development and social institutions, their participation in the North-South Debate indicates their impatience to enter the Information Age. They will not permit the micro-electronics revolution to pass them by as did the Industrial Revolution. They exhibit an awareness of the leading role of telecommunications in development. They are investing in reinforcing their production and services infrastructures with information technology. Comparative advantage for international trade is no longer dependent on traditional resources. It is a man-made advantage stemming from the mastery of science and technology (Rada 1981).

Transnational corporations have become instrumental in demonstrating to LDCs the viability of the micro-electronic technology. The TNC becomes a nucleus of a vast network of information flowing from high technology countries. Are there hidden costs in such transfer of information? When telecommunications technology enters the welfare calculus, market distortions

have to be assessed. Under conditions of oligopoly in the supply of computers, data bases, and launching of satellites, global welfare gets restricted by making LDCs importers of innovative technology.

Despite these constraints Business Week (February 3, 1983) reports that the main engine of growth for the global economy during 1980-81 was the Third World. Most of the imports are in the form of complete packages of electronic hardware and software. The technological determinism pushed by TNCs will have to be carefully assessed by Third World policymakers in terms of investment, employment, and opportunity costs. What choices do these countries have and what are the social costs of leapfrogging into sophisticated networks that tend to reduce employment? So far only the NICs and near NICs are coping with the automated techniques of the Information Age. The Third World is geared for moving forward in taking advantage of the alternative futures for prosperity and growth offered by communication technology. The pace will vary depending on the level of development, the accumulation of skills, and the availability of finance.

VII Conclusions

The emergence of innovative communications technology is a force that a recession prone global economy has to grapple with. It is a force that gives both political and economic power to a few countries, a few corporations, and to the information elite. Can this power be harnessed for the amelioration of life styles, and for the enhancement in the PQLI (physical quality of life index) of the periphery populations in developing countries? Can new technologies usher in a new international division of labor such that LDCs will not continue to provide raw data and import processed information? Will the current patterns of Transborder Data Flows perpetuate such disparities (Sauvant

1983)? We cannot deny the benefits that societies will reap through the ubiquitous applications of new communications technologies in forging links between peoples and nations, in raising productivity and output, and in unifying cultures and thought processes. However, their potential for the ruthless use of information power, propaganda, and terrorism ought to be monitored if the global economy is to better provide the basic needs of individual and societal development.

References

Boorstein, D. J. (1978). The Republic of Technology. New York: Harper & Row.

Business Week (1982). "Everybody's favorite growth business," October 11.

Cater, Douglas (1981). "The Survival of Human Values," Journal of Communication (31) 1, Winter, pp. 190-194.

Colton, W. and K. Kraemer (1980). "Assessing the Individual and Social Implications of Electronic Funds Transfer Systems in Proceedings of the Fifth International Conference on Computer Communications, Atlanta, October, pp. 460-462.

Dizard, Wilson (1983). "Re-inventing the Telephone" in Intermedia, Vol. 11:3, May, p. 9.

The Economist (1983). "Is There a Better Way to Squeeze Satellites into Space?" June 18, p. 95.

Jussawalla, Meheroo (1983a). "The Race Towards a Computerized Society: The Case of the Asian NICs." Paper presented to a conference on the Critical Issues for National Computerization Policy," Honolulu: East-West Center, August (mimeo).

_____ (1983b). "The Economics of Telecommunications Infrastructure for Third World Countries" in Proceedings of the Tenth Annual Telecommunications Policy Research Seminar, ed. Gandy, Espinosa. Ordover. New Jersey: Ablex.

_____ (1982). "The Future of the Information Economy" in the Journal of the Institute of Communication Research, Vol. 19, Tokyo: Keio University, October.

Kalba, K.K. (1980). "The Impact of New Media Technologies on Consumer Access to Market Information" in Proceedings of the Fifth International Conference on Computer Communications, pp. 605-607.

King, Alexander (1982). "For Better and For Worse" in Information Society: For Richer, For Poorer, ed. Bjorn-Anderson, M. Earl, O. Holst, E. Mumford, North-Holland, pp. 36-37.

Levin, Harvey (1982). "Foreign and Domestic U.S. Policies: Spectrum Reservations and Media Balance," Telecommunications Policy, June, pp. 123-125.

Martin, James (1979). Future Developments in Telecommunications, New Jersey: Prentice Hall, pp. 6-9.

Naisbitt, John (1983). Megatrends, New York: Warner Books, p. 5.

Parker, D.B. (1980). "The Potential Effects of Electronic Funds Transfer Systems on National Security, in Proceedings of the Fifth International Conference on Computer Communications, Atlanta, October, p. 470-471.

Rada, J.F. (1981). "The Microelectronics Revolution: Implications for the Third World" in Development Dialogue, Vol. 2, pp. 41-67.

Sauvant, K.P. (1983). "Transborder Data Flows and the Developing Countries" in International Organization, Vol. 37:2, Spring, pp. 369-370.

Thomas, Hilary B. (1983). "Videotex Gets Down to Business," Intermedia, Vol. 11:3, May, pp. 16-17.

Tobin Foundation, The (1982). Structural Issues in Global Communications. A Report based upon a meeting at Leeds Castle, England.

Tracey, Michael (1983). "The Feature Film--a New Responsibility," Intermedia, op cit.

Wedemeyer, D. and M. Jussawalla (1983). "High Technology Policy Research: ISDN." Paper submitted to the Conference on High Technology for the State of Hawaii as a research proposal, June (mimeo).