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**Maximizing Benefits From New Telecommunications
Technologies : A Development-Based Approach
To Communications Planning**

by

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MAXIMIZING BENEFITS FROM NEW TELECOMMUNICATIONS TECHNOLOGIES: A DEVELOPMENT-BASED APPROACH TO COMMUNICATIONS PLANNING

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1. Telecommunications in the Development Process

The importance of information in social, cultural, and economic development was recognized by UNESCO's MacBride Commission, which stated: "There can be no genuine, effective independence without the communication resources needed to safeguard it." 1 While characterized initially in terms of news flow, the imbalance in access to information includes access to the tools of telecommunications and information, and the necessary expertise to utilize them effectively.

Yet telecommunications is a "missing link" in much of the developing world, as the Maitland Commission noted (International Commission, 1985). The telecommunications link is not simply a connection between people, but a link in the chain of the development process itself.

How do telecommunications technologies contribute to the development process? Telecommunications is a tool for the conveyance of information, and thus can be critical to the development process. By providing information links, telecommunications can overcome distance barriers that hamper development. Access to information is key to many development activities, including agriculture, industry, shipping, education, health and social services.

Advances in communications technology now make it possible to extend reliable communications to any community, no matter how isolated, whether in the desert, in the mountains, or on a remote island. But the progress in taking advantage of these technological advances to meet the needs of rural people in the developing world has been painfully slow. Until recently, telecommunications was considered a luxury to be provided only after all the other investments in water, electrification, and roads, etc. had been made -- and after all the demand for telecommunications services in the cities had been met.

Yet, telecommunications should be considered a vital component in the development process -- a complement to other development investments, that can improve productivity and efficiency of rural agriculture, industry, and social services, and can enhance the quality of life in developing regions.

Historically, rural development took place where there was geographic advantage in the form of arable land or natural resources. Increasingly, new economic development depends on human resources and telecommunications and information-processing infrastructure. In the provision of physical goods and services, rural areas could only compete across barriers of distance and geography if they had a natural resource advantage. In the provision of information goods and services, reliable telecommunications infrastructure can make geography and distance irrelevant.

Another disadvantage faced by many developing countries is economic specialization. As they strive to diversify their economies, timely access to information becomes even more critical. As developing countries also join the global market by attracting multinational corporations, establishing joint ventures, and developing service industries, they soon recognize the need for a reliable and modern telecommunications network. Telecommunications is also vital to the emerging information sectors in developing regions. The great distances between the major research institutes and development centers and the vagaries of postal services and expense of airfares mean that experts are isolated from each other as well as from the people they are trying to help.

The newly industrialized countries in Asia have commercial information sector activities that are even more dependent on fast and reliable transmission of information. For industries specializing in the provision of information goods and services, reliable telecommunications infrastructure can make location and distance irrelevant. Singapore, for example, has become a major financial and trading center. Taiwan and Korea are now major suppliers of electronic equipment to world markets. Some countries such as the Philippines and South Korea have attracted "back office" information industries in data entry and processing. Indian engineers transmit software code to Texas Instruments from Bangalore. Entrepreneurs in these countries need instant access to global information to monitor market trends and to keep up with the most recent technological innovations.

Telecommunications can also play an important role in the delivery of health services and education. Studies in India, Costa Rica, Egypt, Papua New Guinea, all showed that about 5 percent of rural calls were for emergencies and medical reasons. The indirect benefits of these calls in terms of saved lives and reduced suffering are highly significant. For example, in the South Pacific, the experimental PEACESAT satellite network has been used to summon medical teams during outbreaks of cholera and dengue fever, and to coordinate emergency assistance after typhoons and earthquakes.

Many developing countries now rely on paraprofessionals for delivery of basic health services, particularly in rural areas. These health workers receive basic training in treatment and prevention of common health problems, but need supervision and assistance in diagnosing and treating uncommon diseases and coping with serious health problems. Telecommunications links between village clinics and regional hospitals or health centers can be used for consultation and supervision.

Use of telecommunications for distance learning may reduce student drop out rates and staff turnover at remote locations. The University of the South Pacific operates a satellite-based audio conferencing network linking its main campus in Suva, Fiji, with its agricultural college in Western Samoa and with extension centers in nine Pacific island nations. The system is used for administration of extension services activities and courses, tutorials for students taking correspondence courses, and out-reach services to bring the resources of the University to the people of the region -- through consultation, in-service training, seminars by UN and other development agencies, etc. The benefits of this experimental network have been significant. The savings in travel time and costs resulting from having meetings over the network rather than bringing a representative from each location to Fiji, have been at least ten times the cost of using the network. Drop out rates of correspondence students in courses with effective satellite tutorials have also been reduced.

To summarize, the ability to communicate instantaneously can facilitate the development process by increasing:

efficiency, i.e., the ratio of output to cost;

effectiveness, or the extent to which development goals are achieved;

equity, i.e., the distribution of development benefits throughout the society.

Research over the past decade has shown that telecommunications can contribute significantly to socio-economic development. However, many other factors may influence whether and to what extent telecommunications may make an impact. Generally, certain levels of other basic infrastructure as well as organizational activity are required for the indirect benefits of telecommunications to be realized -- that is, telecommunications may be seen a complement in development -- not a sole contributor. For example, a well managed decentralized organization such as a manufacturing enterprise, a tourist development, or a health service will derive more benefits from telecommunications than a poorly managed or understaffed operation. Telecommunications may also serve as a catalyst at certain stages of the rural development process, becoming particularly important when other innovations are introduced such as improved farming practices, lines of credit, incentives for decentralization and diversification of the rural economic base.

2. New Technologies and Services

Fortunately, recent innovations in telecommunications and other information technologies have resulted in new equipment and services that are particularly suitable for developing country applications. The following are examples of these technologies and services:

Small Satellite Earth Stations: The advent of small low cost earth stations such as those used for rural telephony with domestic satellites and the VISTA terminals used with INTELSAT satellites bring voice and data communications to isolated regions such as deserts, jungles, mountainous regions, and offshore islands. These earth stations may be installed in any community or project site without the need for expensive terrestrial links to the national network. They may serve the surrounding territory through line-of-site radio links (Hudson, 1990). Small earth stations may also be used for television reception, either directly for individual or community use, or for retransmission through local cable or rebroadcast systems.

VSATs (very small aperture terminals) now makes it possible for wire service information to be disseminated to virtually any location. Wire service copy is transmitted by satellite from a hub earth station which may be shared with other data, voice, and video customers. In Asia, the World Broadcast Service based in Hong Kong uplinks news service feeds to INTELSAT's Indian Ocean satellite which covers 80% of the world's population. The first customer for the WBS is China's Xinhua News Agency.

Microcomputers or terminals linked to mainframes via interactive VSAT technology can be used to collect and update information from the field. A VSAT network called NICNET operated by the Indian government's National Informatics Centre (NIC) now links more than 500 locations. Similar systems may be used for electronic banking, whether linking teller machines to computers, or remote bank branches to headquarters --- and for other interactive applications such as reservation systems, weather and pipeline monitoring, and other field data collection.

New Radio Technologies: Advances in radio technology such as cellular radio and rural radio subscriber systems offer affordable means of reaching less isolated rural customers. These technologies make it possible to serve rural communities without laying cable or stringing copper wire (Parker, Hudson, et al. 1989). Fixed cellular systems are being used to extend rural telephony in Malaysia and the Philippines.

Facsimile: Another technology with widespread development applications is the facsimile machine, which enables any type of hard copy including print, graphics, handwritten messages, etc., to be transmitted over a telephone line. Also, "fax boards" may now be installed in personal computers to allow a message created on a personal computer to be sent directly to a facsimile machine.

CD-ROM (Compact Disk, Read-Only Memory): Information in the form of data bases, full text of journals, video images, and other graphics may now be stored on compact disks and retrieved with a relatively inexpensive reader attached to a microcomputer. CD ROM's advantages include vast storage potential, low cost, durability, and ease of use. In addition, CD ROM can be used on a stand alone basis, without the need for online access to data bases. Of course, the disks must be frequently updated to keep information current.

Among the services that these new technologies make possible are the following:

Audio conferencing: A thin route service with considerable promise for development applications is audio teleconferencing. Several sites can be linked together through a bridge at a switching point or through assigning a common frequency on a satellite audio channel. Audio conferencing can be used for electronic meetings for project administration and planning, training of field staff, and distance education. The University of the South Pacific (USP) uses audio conferencing for tutorials for its correspondence students throughout the Pacific. The University of the West Indies (UWI) offers a similar network in the Caribbean. Audio conferencing may be used to update field staff without bringing them to the cities for training. For example, in Peru the Rural Communication Services Project linked seven rural communities, three via satellite, and four via VHF radio and then via satellite to the national network. More than 650 audio teleconferences concerning agriculture, education, and health were carried out during the project (Mayo et al., 1987).

Electronic Mail: Communication via computer is a means of exchanging information immediately. Microcomputer users worldwide may now interact using various electronic mail networks. Messages may be sent from one computer to another by communication through a host computer that is equipped with communications and message processing software including "mail boxes" for subscribers. These services are cheaper than voice communications, and overcome the time zone differences that hinder real time communications. Users may dial into local nodes of packet-switched networks to reduce transmission costs. Specialized electronic mail networks have been established for developing country users (International Development Research Centre, 1989).

Computer conferencing: Another application of computer communications is computer conferencing, i.e. interaction of many users through a central host computer. Each conference member may share ideas with the others and respond to their comments. Participants may log on at their convenience, thus avoiding the need for scheduling to accommodate individual schedules and time zone differences.

Desktop Publishing: Enhanced graphics capabilities of microcomputers now make it possible to produce newsletters and other printed materials without typesetting. These features may be particularly valuable in countries where newspapers, texts, and development materials in local languages may be scarce and costly to produce. Development agencies may now produce their own materials in house. Store front desktop publishers may enable many small users to share the desktop publishing equipment and software. Desktop publishing may be combined with telecommunications, for example, facsimile, so that publications may be inexpensively produced and distributed.

Access to Databases: Computer terminals or personal computers with modems linked to the telecommunications network can provide access to data bases anywhere in the world. Agricultural researchers, for example, may access the Food and Agriculture Organization (FAO) databases in Rome. Health researchers may search the data base of the National Library of Medicine in Bethesda, Maryland. Others may search specialized development data bases such as those for agriculture and energy in India and for development project management in Malaysia.

Electronic Transactions: Computers combined with telecommunications enable organizations to conduct business from virtually any location. Banks may transfer funds internationally using the SWIFT network (Hudson and York, 1988). Airlines may book reservations from ticket offices, airports, and travel agencies. Brokers and traders may buy and sell coffee, soybeans, copper, petroleum, etc., electronically. With reliable telecommunications links, these activities need not be limited to cities. Agricultural cooperatives may use computer terminals to find where to get the best prices for their crops. Tourist lodges in scenic areas may book reservations.

Video conferencing: Recent advances in digital video compression are reducing the price of video codecs (coders/decoders) and transmission costs through use of limited bandwidth. A compressed video network now links several Aboriginal communities in Outback Australia.

Voice messaging: We tend to think of voice mail as an urban business application. However, voice mail boxes have been proposed for rural residents who lack individual telephones but have access to a public phone. They could access the voicemail box for messages, and thereby have the functional equivalent of a private telephone for receiving messages.

3. Implications for Telecommunications Planning

3.1 New and Changing Demands for Services

This proliferation of technologies and services has several implications for telecommunications planning. First, technologies are converging. The same technologies such as VSATs and digital compression may be used for interactive and broadcasting services. Second, there are likely to be new and changing demands for telecommunications services:

Voice and Data: While basic voice communication is still the first priority, many users now have requirements for data communications as well, particularly facsimile and relatively low speed data communications. Thus transmission channels must be reliable enough to handle data as well as voice traffic.

Urban and Rural: The availability of relatively low cost radio and satellite technologies for serving rural areas makes it possible to reach even the most remote locations, and to base priorities for service on need rather than proximity to the terrestrial network. But these links also need to be highly reliable if rural users are to take advantage of the applications of facsimile and data communications described above.

Responding to Demand for New Services: The new technologies now available are likely to create demand for new services such as packet data networks and audio conferencing networks, as well as television reception. Communications managers must be able to respond to these demands both by providing the technical facilities and setting realistic tariffs if users are to take advantage of the information sharing potential now possible via telecommunications.

3.2. User Involvement

Users are rarely heard from when the telecommunications plans for developing countries are being prepared. Yet the users are the most important element of any plan; without an understanding of their needs and constraints, telecommunications services may be inappropriately designed or priced. Why are users so often silent? They may not have the technical expertise usually expected in planning activities; they may also be unaware of how and when to get involved.

In a sense, telecommunications planners have to act like extension agents to get out and meet with users, learn about their needs, and help them to translate their requirements into facilities and services. This is a new role for telecommunications carriers worldwide. Yet it is a particularly important function in developing countries where resources for new facilities are limited, and failure to meet user needs can hinder the economy as well as limit the carrier's projected revenues.

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3.3. Telecommunications Planning to Support Development

Telecommunications planning needs to be coordinated with planning of other sectors, so that facilities are available to support development projects such as new towns, health care campaigns, tourist centers, mining operations, etc. There also needs to be coordination between the telecommunications administration and the broadcasting authority. In some countries, rural residents receive television before telephone service, although reliable two way communication is virtually always listed as the top priority. A policy that brings in television without telephones not only deprives people of the means of getting help in emergencies, but of the means of having a voice in their own development.

In other words, broadcasting should be provided only where there is telephone service. Via satellite, for example, the same earth station can be used to provide both telephony and broadcasting. Such coordinated planning of telecommunications happens all too rarely, often because the telecommunications and broadcasting functions are under the control of separate agencies.

To summarize, for coordinated communications planning to occur:

- telecommunications administrations must be informed about national priorities and development plans;

- national planners must be made aware of the importance of telecommunications infrastructure to national development;

- resources for extension and improvement of facilities must be allocated to the communications sector, and resources for training and utilization of facilities must be included in the sector budgets;

- potential users must be made aware of the services available and how they could benefit from them.

4. Bottlenecks and Bypass

But what if telecommunications administrations are not responsive to customers or innovative in offering new services? When users are unable to obtain the capacity they need, or to afford to use available services, they look for alternative solutions. In the old days (and still today in some parts of the developing world), they turn to high frequency (HF) radio. HF is frustrating in its signal quality and varying reliability, but the price is right. If the users own their radios, they can use them whenever they want without paying a carrier. Now, satellites offer a more reliable bypass option.

Two examples of public service satellite bypass illustrate the problems small users face. The PEACESAT network was founded at the University of Hawaii in 1971, and linked universities and development centers throughout the Pacific using the "experimental" ATS-1 satellite operated by the National Aeronautics and Space Administration (NASA), until ATS-1 finally drifted out of orbit in 1985. By that time, most of the island nations were linked to each other and the rest of the world via the commercial INTELSAT system. However, the PEACESAT members were unable to afford to use INTELSAT. They therefore searched for funds and a "free" satellite to re-establish their network. In 1987, the U.S. National Telecommunications and Information Administration (NTIA) received a congressional appropriation to restore the PEACESAT network using the GOES-3 satellite (Geostationary Operating Environmental Satellite), a meteorological satellite operated by the U.S. National Oceanic and Atmospheric Administration (NOAA) (Cooperman et al., 1991). Thus, although commercial satellite service is now available throughout the Pacific, PEACESAT, with U.S. government support, turned to another stop-gap experimental satellite because it was free.

Another nonprofit development organization has gone even farther, and launched its own satellite for medical communications in the developing world. SatelLife launched a "microsatellite" in July 1991 that will provide store-and-forward data communications to small terminals in developing countries. SatelLife was founded by the International Physicians for the Prevention of Nuclear War, to reflect their belief that the greatest threat to our common humanity is the gap that exists between health conditions in the developing world and those in industrialized countries.

Why did physicians feel compelled to raise funds for their own satellite? Because, despite modern technology, telecommunications facilities in the poorest regions were either unavailable or unaffordable. "The need in Africa for electronic mail not dependent on traditional communications infrastructures is desperate: In Zambia, international calls are billed at US\$6 per minute. In Kenya, a fax costs \$7.70 per page outgoing. In Tanzania ... the minimal cost of a telex [is] a little more than US\$25" (Clements, 1991). African researchers will be able to use the satellite for free for the first three years, and will gain access to medical libraries and other sources of expertise (Johnson, 1991).

Now in Asia, we see dramatic examples of bypass, as viewers across the ASIASAT footprint install VSATs for reception of the STAR TV package, and in some countries have also constructed their own redistribution systems using cable, cassette theatres or possibly minitransmitters.

5. Toward a Development-Based Approach to Communication Planning

5.1. Developing a Plan

How can Asian countries implement a development-oriented approach to telecommunications regulation? Setting goals must come first. In the U.S., Several states have established task forces to produce a statewide telecommunications plan. It will be necessary to involve several government agencies in addition to communications, such as education, health and social services, agriculture, and economic development.

This may not be an easy task because, as we stated in *Electronic Byways*, telecommunications and economic development are often like two solitudes. The people in these fields don't often intersect, and probably think they have little to say to each other. urban and rural locations to identify development needs.

Since this may be a time-consuming process, and technology does not stand still, you may need to make some assumptions. For example, nations in general seek to improve educational standards, to provide health care to all, to create jobs, to reduce disparities between haves and have nots, both urban and rural. As we have seen above, telecommunications to contribute to many of these goals. Here, academics can play a useful role in pointing out the role of communications to policy makers.

5.2. Setting Goals

The second step is to translate these general development goals into specific telecommunications goals. These might include universal access to communication services such as community telephones, community video reception, reception of distance education programs, etc. Specific criteria may need to be developed to set priorities and targets.

5.3. Strategies to Achieve Goals

The third step is to devise a set of strategies to achieve these goals. Here, incentives will be important. An alternative to financial incentives would be a management by objectives approach where policy makers and/or regulators would set objectives and carriers would be rewarded for achieving them. These objectives could include service upgrades such as extension or service to rural areas or meeting quality of service targets.

Carriers could also be required to propose innovative strategies for encouraging educational and social service applications such as pilot projects and trials, use of off-peak, bulk rate, or other discount rates. Regulators, in turn, could provide waivers of existing rates for trial periods and for educational or other social services.

5.4. Monitoring Progress

The fourth step is to establish a set of performance indicators and measurements to track progress toward implementing the plan. Here, again, academics could play a useful role in designing the monitoring scheme. It does not need to be complex. The point is that you need some simple ongoing way to measure progress, especially when staff and funding resources for extensive data collection are limited.

6. Implementing the Vision

Telecommunications regulation and economic development planning in the past have seemed to be "two solitudes." However, the importance of access to information for economic development activities and social service delivery now point to the need to bridge the gap between these disciplines and responsibilities.

The above approach, which I have termed a "development-based approach to communication planning" is based on the assumption that communication planners must consider the socio-economic implications of communications policies. In other words, they should include assessments of indirect benefits of telecommunications investment and utilization to the economy and the society in framing their policies and regulations.

This approach assumes a broadening of the definition of "public interest" beyond the simple assessment of pricing of services. It involves an analysis of the potential benefits of access to education and social services to citizens throughout the state; the impact of geographical as well as income-related disparities; the potential economic benefits of affordable access to information for both individual and commercial activities.

Many of the steps in implementing the vision will need to come from other entities: the communications industries themselves, government agencies that can fund pilot projects, users that can identify needs and develop strategies to aggregate demand and share costs. Yet the policy makers must take a prominent role, both in the agenda-setting process and in devising incentive based strategies to achieve national communications goals.

As Harlan Cleveland has noted: "The passing of remoteness is one of the great unheralded macro-trends of our extraordinary time....The fusion of rapid microprocessing and global telecommunications presents nearly all of us with the choice between relevance and remoteness."

Whether this promise is realized depends on developing an adequate telecommunications infrastructure based on an understanding of rural development needs and priorities. Without such capabilities, rural residents will find it more difficult to survive economically, let alone to prosper.

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