

Summary, Findings, and Policy Strategies **1**

In fiscal year 1995, the United States will spend approximately \$12.6 billion for bilateral and multilateral international development and security assistance to serve a broad range of policy goals.¹ Many foreign assistance programs have encountered increasing resistance in the past few years for reasons that include the uneven record of previous programs; the rise of former recipients as major U.S. competitors; a questioning of the foreign aid rationale in the light of the collapse of the Soviet Union and the postwar security system, as well as more general concerns about the size of government and government spending.²

To ensure that foreign assistance programs serve the interests of the United States as well as those of developing countries, some policymakers are seeking to link aid policies more closely to national trade objectives. To this end, for example, the Peace, Prosperity, and Democracy Act of 1994 (S1856), which was introduced by the Clinton Administration in the 103d Congress, would provide U.S. businesses greater support

for establishing markets in countries benefiting from U.S. aid. The Trade for Aid Bill (S722)—first introduced in the 102nd Congress, and subsequently revised and reintroduced in 1993—goes even further, making aid in some cases contingent on trade. This bill not only limits the amount of foreign aid that can be provided in the form of cash transfers; it also requires that more funding be targeted for capital projects, which generally have the greatest payoff for American businesses and workers.

Communication and information technologies are particularly well suited to mutually serve foreign aid and trade goals. These technologies are of critical importance in today's knowledge-based global economy. Not only do they provide the networked infrastructure on which global business will increasingly take place; they also constitute one of the fastest growing sectors of world trade and investment.

There is already mounting evidence, and a growing appreciation of the positive role that communication and information technologies

¹ U.S. Agency for International Development, *Congressional Presentation, Summary Tables, Fiscal Year 1996*.

² Anne O. Krueger, *Economic Policies at Cross Purposes: The United States and Developing Countries* (Washington, DC: The Brookings Institution, 1993); See also *Foreign Aid Reform: Hearings Before the Subcommittee on International Economic Policy, Trade, Oceans and Environmental Affairs of the Senate Committee on Foreign Relations* (Washington, DC: U.S. Government Printing Office, 1994).

can play in supporting economic development.³ These technologies have proven extremely useful not only in promoting and sustaining economic activities of all kinds, as well as in enhancing human potential—a key ingredient for the success of any development program.

The value of networked information technologies for economic growth and development will probably loom even larger in the future, given a more service-oriented global economy in which production and marketing activities are distributed on a world-wide basis.⁴ In preparation, many developing countries are currently looking to communication and information technologies to help them bypass the long and arduous process of industrialization, allowing them—straight away—to become providers of global information services.⁵ In contrast, developing countries that fail in these new circumstances to keep pace with the advance of technology, and to integrate their communication systems into worldwide business networks, will probably be left yet further behind.

The capabilities of information and communication technologies are also expanding to support development goals. For example, advanced satellite systems—such as low earth-orbiting satellites—will soon be able to provide sophisticated voice and data services on a global and, hence, more cost-effective basis. In addition, because communication systems are increasingly driven by software, their components can now be unbundled from the network to allow network

users much greater flexibility and control.⁶ As a result, communication networks can be recast and customized to meet the specific and, more often than not, varied needs of developing countries.

If developing countries are to take advantage of information and communication technologies to support development, however, they will need considerable foreign capital and expertise. In many developing countries, existing infrastructure is very primitive, providing in some extreme cases only one telephone per 1,000 persons. And the cost of upgrading these communication networks can be astronomical—on the order of \$60 billion to \$80 billion according to some estimates.⁷ Compounding the problem, many developing countries have only limited access to the foreign exchange required to purchase up-to-date equipment and services in the global market.

In today's increasingly liberalized, global telecommunications marketplace, many developing countries' communication needs can be met by the private sector. Already, many firms are eagerly competing to invest in and/or partner with developing countries to serve their rapidly growing communication markets. U.S. firms are especially well positioned in this regard. They are foremost in the development and deployment of communication and information technologies, and principal players in the information and communication technology and services trade arenas.

³ Robert J. Saunders, Jeremy J. Warford and Bjorn Wellenius, *Telecommunications and Economic Development* (Baltimore, MD: The Johns Hopkins University Press, 1994); see also Seth W. Norton, "Transaction Costs, Telecommunications, and the Microeconomics of Macroeconomic Growth," *Economic Development and Cultural Change*, vol. 1, October 1992, pp. 175–196.

⁴ Fernando Henrique Cardoso, "North-South Relations in the Present Context: A New Dependency," in Martin Carnoy, Manuel Castells, Stephen S. Cohen, and Fernando Henrique Cardoso (eds.), *The New Global Economy in the Information Age: Reflections on Our Changing World* (University Park, PA: University of Pennsylvania Press, 1993); See also Bruno Lanvin (ed.), *Trading in a New World Order: The Impact of Telecommunications and Data Services on International Trade in Services* (Boulder, CO: Westview Press, 1993); and U.S. Congress, Office of Technology Assessment, *Electronic Enterprises: Looking to the Future*, OTA-TCT-600 (Washington, DC: U. S. Government Printing Office, May 1994).

⁵ See, for instance, "Salinas' Rush for 'Bypass' Technologies," *Satellite Communications*, December 1992, p. 20.

⁶ Unbundling refers to the ability to separately purchase communication functions and services that were formerly available only as a single unit. For a discussion, see U.S. Congress, Office of Technology Assessment, *Critical Connections: Communication for the Future*, OTA-CIT-407 (Washington, DC: U.S. Government Printing Office, January 1990), chap. 3.

⁷ According to the ITU *World Telecommunications Development Report*, it will cost \$58.3 billion to provide basic communications infrastructure to most nations. The World Bank estimates the cost to be even greater, totaling \$80 billion. Steven Tisch and John Williamson, "World Conference Pushes for Policy Changes," *Telephony*, Mar. 28, 1994, pp. 9, 17.

This private-sector, trade-oriented approach to deploying technology for economic development serves today as the driving force behind the Clinton Administration's vision of the Global Information Infrastructure (GII). Speaking in March 1994 at the World Telecommunications Development Conference in Buenos Aires, Vice President Gore called on all of the world's leaders to adopt a global vision of the information highway. A global infrastructure based on private sector initiatives will, according to Gore, not only foster economic growth and development; it will also promote political stability, social improvement, and the spread of democracy.⁸

Some government incentives will probably be required, however. Although new technologies have considerable potential to improve social, economic, and political conditions across the globe, such an outcome is far from certain. How and to what purpose these technologies are developed and deployed will depend on more than the characteristics and capability of the technology; also important will be the social, economic, and political forces driving the technologies' deployment and use.

If, for example, developing countries are to employ information and communication technologies to improve their social and economic well being, access to advanced technologies will not be enough. For real technology transfer to take place, they must have the knowledge and hands-on expertise required to take full advantage of new technologies. Similarly, if communication technologies are to have a democratizing impact, they must be widely shared so that the power of the dominant groups in society is effectively counterbalanced by the power of those in subordinate positions. It must also be stressed that, although communication is sometimes viewed as a means of reducing conflict, it can just as easily serve to destabilize political situations and/or exacerbate conflicts among people of different origins and cultures.⁹

Thus, despite the growing availability of private investment for infrastructure deployment in

developing countries, foreign assistance can still play a complementary—but nonetheless—pivotal role. Foreign aid programs can be targeted to address specific market failures and to create appropriate incentives to ensure that technology deployment is carried out in a way that promotes economic development, democracy, and greater political stability.

If the U.S. government is to use foreign aid to provide appropriate incentives, it will need a clearer understanding of the opportunities and problems associated with the deployment of communication and information technologies, as well as of the technical, political, economic, and social conditions required for their optimal use. This assessment seeks to contribute to such an understanding. Examining the probable scenarios for deploying communication and information technologies in support of global trade and economic development, it identifies the policy issues, market failures, and institutional barriers that need to be overcome. In addition, it identifies and analyzes telecommunications-related foreign aid policy strategies that the federal government might pursue, which are designed to address these problems.

REQUEST FOR THE STUDY

This study was requested by the U. S. House of Representatives' Committee on International Relations. In its letter of request, the committee asked OTA to conduct a study that would provide a conceptual framework for assessing the tradeoffs between U.S. trade policy with respect to communication and information technologies and services and the U.S. foreign policy objectives of promoting international stability, economic development, democratization, and nation-building. In addition, OTA was asked to identify the extent to which, and how, foreign aid policies might be structured so as to reconcile potential conflicts between trade and foreign policy goals while at the same time improving the efficiency and effectiveness of U.S. foreign assistance.

⁸ Steven Tisch, "Gore Urges Ambition for Global Telecom," *Telephony*, Mar. 28, 1994, pp. 10–11.

⁹ Samuel P. Huntington, "The Clash of Civilizations," *Foreign Affairs*, summer 1993, vol. 72, No. 3, pp. 22–50.

SCOPE AND ORGANIZATION OF THE REPORT

Advances in communication and information technologies can help developing countries to cope better with their domestic social and economic problems and to become more fully integrated into a global economy. The United States has much to gain from the Third World's success in this regard. Already, developing countries constitute one of the fastest growing markets for trade in telecommunications and information technologies and services, and the rapid deployment of these technologies will open up economic opportunities in other sectors as well.

One way of fostering such a mutually beneficial outcome is to develop foreign aid programs that incorporate a telecommunications component. Whether or not such programs will be successful, however, will depend on three major factors: 1) the overall design and effectiveness of aid programs; 2) the "fit" between the design and capabilities of communication technologies and the needs of developing countries; and 3) the

effectiveness of the global market in diffusing information and communication technologies on a worldwide basis. As depicted in figure 1-1, by examining each of these three sets of factors, and relating them to one another, it is possible to identify a number of criteria for successful telecommunications-related aid policy strategies, and to develop policies that meet these criteria.

This conceptualization forms the basis for the scope and organization of this report. This chapter, chapter 1, lays out the findings, criteria for making policy choices and strategies to meet these criteria. Chapter 2, "Foreign Aid Policy: The Lessons Learned," describes the basis for a sound foreign aid policy. Chapter 3, "Communication Technologies to Promote Foreign Aid Goals," outlines technology characteristics and capabilities as they relate to developing country needs; and chapter 4, "Technology Diffusion in a Global Market Place," examines the effectiveness of the market in deploying telecommunication and information technologies on a worldwide basis.

FIGURE 1-1: Organization of the Report



KEY FINDINGS

■ A Continued Role for Foreign Aid

As the leader in an increasingly integrated global order, the United States has a vital stake in promoting democracy, sustainable growth, and political stability worldwide. This stake will probably loom even larger in the future. Just as national boundaries are increasingly penetrable to the flow of commerce, ideas, and people, so too these boundaries will no longer constrain the spread of political, economic, and environmental problems. Foreign assistance provides a key foreign policy tool for addressing such problems, and it will continue to do so in the future. The role of foreign aid will also loom larger in generating new opportunities for trade. Today, Japan and many newly industrialized countries are competing for developing-country markets not solely on the basis of their products; increasingly they are promoting their own model of economic development, which—if replicated by Third World countries—will lay the groundwork for establishing closer trading relationships.

The euphoria that accompanied the demise of the Soviet Union and the Communist regimes in Eastern Europe has, of late, been dampened considerably. Instead of signaling a new era of greater peace and security, these events were a prelude to the collapse of the social order in many countries, where authoritarian regimes were replaced not by democracy but by ethnic conflicts and civil wars. Included among these outbreaks of violence, for example, have been civil wars in Afghanistan, Somalia, Rwanda and Bosnia as well as ethnic conflicts in India, Iraq, Liberia, and Sri Lanka.

These events have led to a continued, if not expanded, U. S. military presence in the world.¹⁰ Operating under the auspices of the United

Nations, the United States has become involved in a growing number of peacekeeping operations. As compared to 1988, when the United Nations was engaged in five such operations, peace-keeping troops are today deployed in 16 locations.¹¹ During the same period, the number of military personnel deployed has increased from 9,570 to 62,333, while the United Nations annual peace-keeping budget has grown from \$230 million to approximately \$3.6 billion.¹²

Deteriorating social and economic conditions in many Third World countries do not bode well for a better future, at least in the short and medium terms. Over the past three decades, income disparity across the globe has doubled. Now, the richest 20 percent of the world's population receive an income that is 150 times the amount received by the poorest 20 percent.¹³ Nearly 35 percent of the world's adult population are, moreover, illiterate. In addition, infant mortality rates continue to hover at 114 deaths per 1,000 live births.¹⁴

Economic progress in many developing countries is far from adequate to address these thorny problems. In the area of sub-Saharan Africa—where these problems are the gravest—only marginal improvements in per capita income and consumption are anticipated, even under the most positive growth scenarios.¹⁵ Assuming a less favorable global economic environment, a number of Latin American countries will probably also experience difficult times. Continued unrest in the Soviet Union and Eastern Europe would make economic growth in this region problematic as well (see table 1-1).

The short-term steps that many developing countries are taking to relieve their immediate social and economic problems could complicate, or even jeopardize, their prospects for long-term sustainability. For example, in some cases, there

¹⁰ David C. Hendrickson, "The Recovery of Internationalism," *Foreign Affairs*, September/October 1994, vol. 73, No. 5, p. 41.

¹¹ Boutros Boutros-Ghali, "Peacemaking and Peacekeeping for the Next Century," *Vital Speeches of the Day*, Mar. 15, 1995, vol. 61, No. 11, pp. 322–324.

¹² Ibid. In FY 1994, Congress appropriated \$401,607 million for current peacekeeping operations. See Mark M. Lowenthal, *Peacekeeping and U.S. Foreign Policy: Implementing PDD-25*, Congressional Research Service, IB94043, updated Sept. 23, 1994.

¹³ *Human Development Report 1993* (New York, NY: United Nations Development Program, 1993), p. 11.

¹⁴ Ibid., pp. 11–12.

¹⁵ *Global Economic Prospects and the Developing Countries* (Washington, DC: The World Bank, 1994), pp. 1–7.

TABLE 1-1: Developing Regions: Growth of Real GDP
(percentage changes per year)

Developing region	Trend	Recent estimates	1994–2003	
	1974–90	1991–93	Forecast	Low case
All developing countries	3.4	0.9	4.8	3.6
Sub-Saharan Africa	2.1	1.7	3.9	2.4
Middle East and North Africa	0.9	3.0	3.8	3.2
Europe and Central Asia (ECA)	3.1	-9.8	2.7	1.5
South Asia	5.0	3.5	5.3	4.2
East Asia	7.3	8.3	7.6	7.1
Latin America and the Caribbean	2.5	3.2	3.4	0.8
<i>Memorandum item</i>				
All developing countries, excluding ECA	3.5	4.6	5.2	4.0

SOURCE: *Global Economic Prospects and the Developing Countries*, A World Bank Book, 1994.

has been excessive cropping, grazing, and timbering in areas that are already extremely fragile from an ecological standpoint (see table 1-2).

Population growth and per capita income growth will put new strains on the global environment. In 1960, for example, the world's population was about 3 billion. Today it stands at 5.3 billion, and—based on a midrange forecast—it could increase by 70 percent to roughly 9 billion by 2030. Moreover, if global per capita incomes increase at an estimated rate of 80 percent, world economic output could grow to as much as \$69 trillion, 3.5 times more than at present.¹⁶ If pollution keeps pace with this projected development, the environmental damage could be astronomical.

Trends such as these not only affect the long-term sustainability of the international environment; they give rise to more immediate, international political problems, as well.¹⁷ Faced with such overwhelming odds, governments in developing countries may well lose their capacity to govern and to provide essential services. If the social order breaks down as a result, people,

instead of cooperating to help one another, may seek support from competing tribal leaders and local warlords, whose only mainstay is violence and the use of force.¹⁸

As the United States tries to cope with these kinds of problems, it may find that foreign aid, conceived of as a long-term preventive measure, is often its best recourse. Disputes involving social mores, ethnic tensions, and farming practices—which are generally not politically defined—are much less amenable to international negotiation than problems such as boundary disputes and disarmament agreements. Nor can the United States routinely resort to economic sanctions and armed intervention, given that such action will probably lead to further disintegration of civil society. Withdrawing into isolationism is also not a realistic option. Such an approach will entail a number of opportunity costs so that, if problems persist, the United States may be faced with far more serious threats in the future as well as less favorable options for dealing with them.¹⁹

¹⁶ Developing country per capita incomes are estimated to grow by 140 percent. Calculated from data contained in the World Bank, *World Development Report*, 1992 (Washington, DC: World Bank, 1993).

¹⁷ See Robert D. Kaplan, "The Coming Anarchy," *The Atlantic Monthly*, February 1994.

¹⁸ Lester R. Brown, "Nature's Limits," in Lester R. Brown et al. (eds.), *State of the World 1995: A World Wide Institute Report on the Progress Toward a Sustainable Society* (New York, NY: W.W. Norton Co., 1995).

¹⁹ Richard M. Haas, "Paradigm Lost," *Foreign Affairs*, January/February 1995, vol. 74, No. 1, p. 50.

TABLE 1-2: Estimates of Environmental Damage in Selected Countries

Country and Year	Form of Environmental Damage	Annual Costs as a Share of GNP
		(percent)
Burkina Faso (1988)	Crop, livestock, and fuelwood losses from land degradation	8.8
Costa Rica (1989)	Deforestation	7.7
Ethiopia (1983)	Effects of deforestation on the supply of fuelwood and crop output	6.0–9.0
Germany (1990) ¹	Pollution damage (air, water, soil pollution, loss of biodiversity)	1.7–4.2
Hungary (late eighties)	Pollution damage (mostly air pollution)	5.0
Indonesia (1984)	Soil erosion and deforestation	4.0
Madagascar (1988)	Land burning and erosion	5.0–15.0
Malawi (1988)	Lost crop production from soil erosion	1.6–10.9
	Costs of deforestation	1.2–4.4
Mali (1988)	On-site soil erosion and losses	0.4
Netherlands (1986)	Some pollution damage	0.5–0.8
Nigeria (1989)	Soil degradation, deforestation, water pollution, other erosion	17.4
Poland (1987)	Pollution damage	4.4–7.7
United States ² (1981)	Air pollution control	0.8–2.1
(1985)	Water pollution control	0.4

¹Federal Republic of Germany before unification.

²Measures the benefits of environmental policy (avoided rather than actual damages).

SOURCE: "Environmental Damage Robs Countries' Income," *World Bank News*, March 25, 1993, based on David Pearce and Jeremy Warford, *World Without End* (Washington, DC: World Bank, 1993).

An isolationist policy might similarly have negative opportunity costs in terms of trade. These costs will probably increase in the future insofar as developing countries are now driving worldwide economic growth. The 16 largest developing economies are now expected to grow at an average annual rate of 6 percent, twice that of the mature economies of North America, Japan, and Europe.²⁰

The Japanese have already proven to be particularly successful in exploiting the commercial benefits associated with aid to developing countries, and they are becoming increasingly more sophisticated in their approach. Now the world's largest donor country—with contributions totaling \$11.26 billion in 1993—Japan has recently moved to broaden its assistance programs to

focus more on environmental, population, and healthcare goals.²¹ Instead of using tied aid to promote its commercial ends, the Japanese are leveraging their own economic development model, in the hope that trade will follow the path of shared research, training, technology transfer, and personal exchanges. Not surprisingly, therefore, much of Japan's aid is centered in Asia, which is fast becoming Japan's largest market.²²

■ The Need for More Cost-Effective Approaches to Providing Foreign Aid

If foreign aid policy is to better serve U.S. foreign policy goals and objectives, adjustments and innovative approaches are called for to assure that aid programs are more cost-effective. The

²⁰ "Global Growth Is on a Tear," *Fortune*, Mar. 20, 1995, p. 108.

²¹ Hiroshi Hirabayashi, "Changes in the International Environment and the Direction of Japan's ODA," *Japan 21st*, vol. 39, No. 12, December 1994, pp. 23–27; and Peter Evans, "Japan's Green Aid," *The Chinese Business Review*, July/August 1994, pp. 39–43.

²² Jonathan Friedland, "The Regional Challenge: Asia has Become Japan's Biggest Market," *Far Eastern Economic Review*, June 9, 1994, pp. 40–42.

success rate of aid programs will probably be improved to the extent that they are designed around a more flexible and holistic approach that can reconcile multiple goals and fully incorporate the wide ranging lessons garnered from past experience.

Over the past 50 years, the United States has employed foreign aid to achieve a variety of national goals. Aid has been provided, for example, for humanitarian reasons; to promote worldwide security and political stability; to support economic development and growth in trade; to maintain the integrity of the international monetary system as well as to foster democracy and protect the environment. To achieve these ends, the United States has employed a number of different policy tools. Included among these, for example, are direct monetary grants and grants-in-kind for humanitarian purposes and basic human needs, military assistance, emergency funding to support exchange rates in times of financial crisis, grants and loans for special capital/infrastructure-related projects, funding to insure private sector investments against excessive risks, etc. These tools have been used, moreover, by a wide range of aid organizations—public, private, national, regional, and/or multinational.

Developing appropriate foreign policies to address today's global challenges can benefit greatly from the lessons derived from this experience (see chapter 2). The case of the Marshall Plan is particularly instructive, given its fundamental success. What distinguishes the Marshall Plan experience from subsequent aid programs is the extent to which aid policy tools were tailored—whether purposefully or not—to the situation at hand. Equally important was the degree to which policy tools served to reinforce multiple foreign aid goals (see table 1-3).

Thus, for example, the U.S. decision to make aid contingent on European structural economic

reforms was coupled with changes in the U.S. economy as well as to the broader revision of the international monetary system. Similarly, the transfer of financial capital to Europe was linked to the prospect of future U.S. trade opportunities there. Likewise, postwar defense arrangements in Europe served not only to protect the West against the Soviet threat; they also promoted regional political stability, so that Western European governments could focus their attention on cooperation and economic growth.

Today's situation is considerably less conducive to success (see table 1-3). Trade policies are now intensely competitive; fewer resources are available for aid; the United States and other donor countries are increasingly preoccupied with domestic issues; the goals of the United States and recipient countries (as well as other donor countries) are often in conflict; recipient countries lack the political and social resources to fully benefit from aid; etc.

Drawing on the lessons of the past in the light of present conditions, table 1-3 identifies the policy challenges that the United States faces in developing a more cost-effective foreign aid policy, and identifies a number of policy strategies that, when joined together into an integrated package, might provide a more suitable model for existing conditions in developing countries today.

In the past several years, foreign assistance programs have focused, for the most part, on structural economic and state administrative reforms. Although such programs are undoubtedly needed, they are hardly sufficient. For both democracy and free markets to thrive, what is required is not simply the establishment of free markets and strong, competent governments. As a growing body of evidence makes clear, equally if not more important are social and cultural institutions that foster trust and cooperation.²³ Trust and cooperation constitute a form of

²³ Robert Putnam, *Making Democracy Work* (Princeton N. J.: Princeton University Press, 1993). See also Fred Block, *Postindustrial Possibilities: A Critique of Economic Discourse* (Berkeley, CA: University of California Press, 1990), pp. 41–42.

Key Factors	Status of World Economic Regulation	Quantity and Allocation of Resources Devoted to Aid Programs	National Support/ Perceived Stakes Involved
Marshall Plan	Expanding trade in the context of trade liberalization and internationally coordinated post-War monetary system	High levels of mutually reinforcing financial and military commitments were focused on Europe The U S spent \$554 billion (an average of \$13,8 billion in 1981 prices), Joint participation in defense arrangement with the formation of NATO	Stakes were perceived as very high and linked to the notion of containing the Soviet threat. President Truman's Four Point Program provided a vision to sustain political support for aid
Today's Context	Increased integration and interdependence in global economy, driven by growth in trade, transnational corporations and financial institutions Aggressive trade policies to capture big emerging markets Trade liberalization accompanied by new forms of protectionism Strain on post-War international monetary system	Dollar amount of economic aid in the aggregate is equivalent to the Marshall-Plan era, but resources are spread more thinly and unevenly Areas requiring economic aid are not necessarily the same as those requiring military assistance A large proportion of U S assistance focused on strategically important areas such as Egypt and Israel	Shift in concern from international issues to domestic problems — growing Federal debt General questioning of the cost-effectiveness and success of aid programs
Today's Policy Challenge	Incorporate developing countries into the global economy with win-win outcomes for all.	Develop more cost-effective ways to promote aid goals.	Greater vision for aid policy that better relates to present U.S. priorities and concerns (i. e., trade)
Today's Policy Criteria	1) Develop mutually beneficial trade agreements 2) Aid to support global economic institutions in developing countries -- i.e. standards financial markets, infrastructure privatization regulatory reform	1) Leverage across programs and agencies 2) Gain economies of agglomeration by focusing comprehensive programs more locally	1) Global exchange programs. 2) Involvement of business and other key groups in executing aid programs

TABLE 1-3: Criteria for Successful De

Donor/Recipient Relationship	Social/Political/institutional Context of Recipient Countries	Measurability of Success/ And Feedback	Key Factors
Aid to Europe provided on a quid-pro-quo basis involving economic reforms and European regional cooperation But U S and Europe were in basic ideological agreement about post-War priorities and institutions Europeans negotiated and helped design the structure of the Marshall Plan	A shared common history and continuity of political and economic institutions and a socioeconomic infrastructure was capable of absorbing and efficiently allocating aid resources	Aid programs fostered both economic and security goals and were perceived as being highly effective Because of its widely acclaimed success, the Marshall Plan served as the inspiration for U S bilateral aid to developing countries	Marshall Plan
We-They attitude persists as a result of debt crisis when donors imposed conditions on aid recipients Developing countries are now more inclined toward liberalization and greater integration into the world economy, but many find Asian development model more appealing than U.S. version	Diverse settings weak institutional frameworks, problems of political disorder and social upheaval	Few consensus measures of success. General perception of poor performance and failure of aid to have an impact Inadequate feedback mechanisms to achieve aid accountability and Improve development models	Today's Context
Find ways to negotiate aid agreements that enhance donor-recipient cooperation and that are mutually responsive to both sets of needs	Develop comprehensive aid programs that foster social/political institution-building without undermining economic reforms	Enhance our understanding of the development process and develop qualitative and quantitative measures to better evaluate aid programs	Today's Policy Challenge
Revitalize existing forums or establish new forums that cut across G7/G66 boundaries where aid conditions can be negotiated in the context of joint interests	Incorporate into aid policies mechanisms to foster cooperation that build on existing cultural strengths and social networks	1) Experiment with small, innovative pilot projects 2) Develop databases and networks for collecting and disseminating aid-related information and results	Today's Policy Criteria

SOURCE: Office of Technology Assessment, 1995.

“social capital” that supports both free markets and democracy, while serving at the same time to better balance the relationship between them (see chapter 2).

Many developing countries have minimal “social capital” on which to build either efficient markets or sustainable democracies. Their political cultures are characterized not by mutual respect and reciprocity but, rather, by distrust and alienation.

Foreign assistance programs might be specifically designed to counter this atmosphere, fostering community interaction and a basis for local cooperation. Building trust is a problem of collective action, so generating it is no simple matter. Living in a society devoid of goodwill, people fail to act in mutually beneficial ways, even when it is in their own best interest. This situation is a classic example of what economists call the “prisoner’s dilemma.” Each person holds back, fearing that—if he or she is the first to act honestly—others will surely take advantage. Once started, however, cooperation tends to be self-sustaining.²⁴ Thus, foreign aid investments in cooperative behavior can, if successful, have a high payoff. Over time, policies that promote cooperation can help to generate the social capital that is required for both free markets and democratic politics. This social capital can also be drawn on to maintain government stability in future times of trial (see chapter 2).

■ Leveraging the Unique Role of Communication Technologies

Communication and information networking technologies are uniquely suited to support eco-

nomic development, democracy, and political stability in the Third World, because communication is inherent in all these processes. These technologies serve not only to sustain social processes; equally important, they mediate and structure social activities. Thus, if communication technologies are to prove effective, they must be well matched to the tasks at hand. Depending on their design and capabilities, and the social and economic context in which they are deployed, communication technologies can be used either to promote or hinder U.S. foreign aid goals.

The development challenges facing Third World countries today are monumental. Unlike the countries of Western Europe, developing countries do not have the luxury of executing the processes of nation-building, economic growth, and democracy in a sequential fashion, spread out over centuries.²⁵ Instead, these three processes must be carried out simultaneously, even though they are not always mutually reinforcing.²⁶

Compounding their problems, developing countries must deal with these challenges in an open, and increasingly networked, global economy. To be successful in such an environment, they must become further integrated into the world economy. Yet, by being more open, these countries run the risk that international players, with agendas of their own, could undermine their efforts at nation-building by competing for economic resources as well as political and cultural loyalties.²⁷

Third World resources to meet these challenges are severely limited, especially in the least

²⁴ See Robert Axelrod, *The Evolution of Cooperation* (New York, NY: Basic Books, 1984).

²⁵ For discussions of the implications of sequence see, E.A. Nordlinger, “Political Development, Time Sequence, and Rates of Change” in Jason L. Finkle and Robert W. Gable (eds.), *Political Development and Social Change* (New York, NY: John Wiley and Sons, 1971), pp. 455–471; and Leonard Binder, James S. Coleman, Joseph La Polembra, Lucien Pye, Sidney Verba, and Myron Weiner (eds.), *Crisis and Sequence in Political Development* (Princeton, NJ: Princeton University Press, 1971).

²⁶ Thus, for example, democracy and political stability are not, as has generally been believed, highly correlated. Statistical evidence shows that, in becoming mature democracies, countries experience a difficult transition, when mass politics tends to exacerbate nationalism and national aggression. See Edward D. Mansfield and Jack Snyder, “Democratization and War,” *Foreign Affairs*, vol. 74, No. 3, pp. 79–80.

²⁷ For a discussion of the relationship between local political participation and globalization, and its effect on the nation state, see Zdranko Mlinar, “Local Response to Global Change,” *Annals of the American Academy of Political Science*, July 1995, No. 540, pp. 145–156.

developed countries.²⁸ Having yet to recover from the debt crisis of the 1980s, many countries continue to experience low growth rates, with the average for all developing countries ranging between 1.4 and 1.6 percent.²⁹ Consequently, they have minimal capital at their disposal to invest in improvements of any kind. Not surprisingly, therefore, despite deteriorating infrastructure, high rates of illiteracy, and highly inadequate health care, the less developed countries also have the lowest per capita investments in such areas.

Communication and information technologies, as they are advancing today, can make a critical difference in determining Third World success or failure. Ideally, these technologies can serve not only to foster economic development, democracy, and political stability, but also to balance these processes, so as to make them more mutually reinforcing. Moreover, they can help developing countries reinforce national and local community ties while at the same time fostering their global integration.

Table 1-4 lays out this interrelationship between today's technology advances and changes in social processes. Column 1 describes technological trends and the technology developments reinforcing them; column 2 lays out the technological implications of, and the new applications that result from, these trends; while column 3 identifies their potential social, economic, and political impacts (see chapter 3).

In examining this table, it is important to note that it is the new capabilities and applications made possible by advanced technologies that engender social, economic, and political impacts, and not the technologies or the trends themselves. Secondly, it is necessary to recall that technologies are not neutral with respect to their outcomes. Different trends give rise to different impacts, all of which must be understood.

Technology Applications for Economic Development

As can be seen from table 1-4, advances in communication technology can foster economic development in a variety of ways. If, for example, developing countries take advantage of greatly improved cost/performance ratios to deploy communication and information technologies on a national basis, they can increase the size and efficiency of their markets as a result of lower, information-related transaction costs. This possibility is very important for developing countries where, in some cases, markets do not exist for lack of information. Many developing country markets are characterized by imperfections of institutions, structures, and operations, so that economic signals and incentives fail to reflect the "real costs" of commodities or factors of production (see box 1-1).³⁰ There will also be productivity gains, because larger, better integrated markets will allow Third World businesses to gain greater economies of scale and scope—a benefit that was not available to them, in most cases, until now.

The trend towards decentralized intelligence throughout communication systems will also give rise to economic benefits. Within developing countries, there is a lack of people with mid-level skills required for knowledge workers and middle management. Nor is there an adequate commercial and legal structure—such as banks, insurance companies, commercial lawyers, and stock companies—to permit Third World companies to effectively exploit many new business possibilities. With the type of interactive, intelligent information systems that decentralized intelligence allows, businessmen in developing countries can access the required information services via technology. Intelligent networks also provide a platform on which Third World countries can, over the long run, develop their own

²⁸ The World Bank defines these "low-income countries" as those with a gross domestic per capita income of less than U.S. \$635.

²⁹ *The Least Developed Countries Report* (Geneva, Switzerland, UNCTAD, 1995). Of the 54 countries considered to be "low-income countries," 32 continue to have severe debt problems. Most of these are in Africa. Together, their debt totals four times their exports, and it is greater than their combined gross domestic products. "The Debt Trap and How To Escape It," *The Economist*, May 6, 1995, pp. 74–75.

³⁰ Karla Hoff, Ayishay Braverman, and Joseph Stiglitz (eds.), *The Economics of Rural Organization* (New York, NY: Oxford University Press/World Bank, 1993).

TABLE 1-4: Impact of Technology Advances

Technology Trends	Technology Capabilities and Applications	Social, Economic, and Political Impacts
Increased performance at greatly reduced cost — e.g., microelectronics, fiber optics, voice and video compression, fast-packet switching, very high-density storage technology	Permits LDCs to leapfrog to advanced technology, maximizes advantage of existing technology Technologies also provide greater geographical coverage	National political/economic integration more efficient markets and more effective political control and administration Potential for the erosion of national boundaries due to reinforcement of global ties — e.g. PeaceNet, EcoNet, etc
Technology convergence due to digitization, wideband transmission, compression technologies, and standards developments	Cost efficiencies in service due to economies of scale and scope and greater networking versatility Greatly enhanced applications, such as real-time video transmission, videoconferencing and multimedia applications for the home, the desktop, or (less expensively) public point-of-sale terminals	Greater support for the low-cost provision of public services such as health care and education. Multimedia is especially useful in LDCs given high illiteracy rates. Supports business applications, such as computer-aided design, desktop fax videoconferencing.
Unbundling of communication functions and services due to the emergence of competing technologies, the dispersal of intelligence throughout communication networks, the demand of large users, and deregulatory communication policies	Permits users to separately purchase communication functions and services Allows for greater flexibility in network design and architecture. More networking options and freedom to customize networks to minimize costs or to match specific needs Lower costs also due to greater competition among vendors and service providers. Interoperability, network integration, and network management likely to require greater technology expertise.	Democratic process likely to benefit from greater diversity of communication sources and network designs. Allows developing countries to manufacture low-end components and gain technology expertise. Less elaborate and expensive systems may provide more “appropriate” technology to meet developing country needs. On the other hand, problems of interoperability and increased complexity can create new reformation bottlenecks with consequences for politics and the economy. Technology experts and system integrators become new information gatekeepers.
Increased ease of use as a result of advances in storage, microelectronics, speech recognition, and search engines Applications include simple-to-use graphic user Interfaces (such as Windows), network browsers (such as Netscape) and intelligent agents	Supports greater network access and usage, promotes deployment, and reduces the level of expertise required to take advantage of information technologies	Reduces access barriers with positive benefits for both competitive markets and democratic politics

TABLE 1-4: Impact of Technology Advance

Technology Trends	Technology Capabilities and Applications	Social, Economic, and Political Impacts
Decentralized Intelligence throughout communications systems due to software-driven and software-defined communication networks.	Provides for two-way interaction and greater user control Applications include interactive television, personal digital assistants, desktop publishing, intelligent networks, and expert systems. Provide a platform for creating value-added services, such as 800 number, point of sale, credit authorization.	In most LDCs, two-way, Interactive media can support local grass-roots participation, thereby enhancing democratic processes. Provides an opportunity to develop specialized or local content to reinforce community ties Value-added services provide or substitute for a lack of an information infrastructure (banks Insurance, legal
Increased networking capabilities due in part to advances in integration and switching technologies such as routers, intelligent hubs, and asynchronous transfer mode (ATM), frame relay, together with advances in wideband transmission technologies such as SO NET, and software support applications such as CAD-CAM, EDI, groupware, as well as the development of standards and networking protocols such as TCT/IP and application programming interfaces.	Supports distributed client-server computing and cooperative work applications such as e-mail, EDI, computer-integrated manufacturing, teleworking and groupware Provides support for the development of specialized functional networks, such as financial services networks or special interest group networks such as EcoNet	Supports democratic politics by helping individuals locate information, identify like-minded people, deliberate, and voice opinions Networks help businesses and firms reduce their costs by integrating processes and information, and to gain a strategic advantage by developing exclusive networks that lock in customers and suppliers, Without access to advanced networking technologies, developing countries may become locked out
Increased mobility and portability due to distributed intelligence and advances in wireless technologies such as satellite/VSAT, cellular telephony, PCS, radio paging, digital radio, and wireless LANs, WANs, and PBXs.	Low-cost alternative to wireline technologies for use in difficult-to-reach, high cost areas. Greater ease and speed of deployment Allows for greater network flexibility and support for remote information access and processing Applications include wireless networks based on a mesh rather than hub architecture When combined with unbundled, intelligent peripherals, wireless networks support the widespread distribution of information and "intelligence" to all areas Applications include CD-ROM libraries or expert health care systems	Facilitates open markets and democratic politics by supporting access to political and economic Information and communication networks as well as to expertise and "intelligence" from and to anywhere Facilitates network configuration and shared Information systems which support the competence of local governments, and reinforces community ties

SOURCE: Office of Technology Assessment, 1995.

BOX 1-1: Markets and Information

Communication is inherent in the coordination of all economic activity. A market relies on the communication of information to identify buyers and sellers, allocate resources, and establish prices. Within firms, the availability of timely and accurate information is key to decisions about whether to enter or exit markets, how to secure financing, how to organize working relationships, and how to market and distribute goods. Where adequate information is not available, markets will fail and economic performance will suffer because of higher business costs. Likewise, firms that lack adequate market information will be at a competitive disadvantage.

SOURCE: Office of Technology Assessment, 1995.

services and service industries. By taking advantage of such possibilities, the country of Singapore, for example, has become one of the leading business service providers in the world.

Technology Advance in Support of Democracy

The prospects for democracy in developing countries are also greater because of technology advances (see box 1-2). For example, improved networking capabilities, which make it possible to develop specialized, distributed, many-to-many applications such as bulletin boards and groupware, can help individuals locate information; identify like-minded people; deliberate their ideas, organize their activities; and lobby for their points of view. Already, such networks are being used to link special interest groups across national boundaries and with considerable effect (see box 1-3).

The trend towards the unbundling of communication functions and services can also have a significant payoff for democracy. Given the greater flexibility in network design and architecture that unbundling allows, developing countries can deploy customized, lower cost systems in remote areas, thereby extending information access on a much wider basis. The diversity of

communication networks is also important for democracy because it permits a greater variety of information sources. This capability is especially important in developing countries, where communications have typically been generated at the center of power and then disseminated outward. Technologies often have different geographic and spatial biases, with some being more capable than others in supporting communication both to, and within, remote areas (see chapter 3).³¹

Technology Advances to Support Political Stability

Just as technology advances hold promise to foster economic development and democracy in Third World countries, so too they can play a supportive role in helping to sustain political stability in these areas. For political regimes to be stable, they must not only prove themselves competent in carrying out the affairs of government; they must also be able to assure that basic public needs are met and that benefits are perceived to be distributed equitably.³² In addition, if governments are to provide such services without themselves becoming overbearing, the capacity of voluntary associations and local government must simultaneously be upgraded.³³ Communi-

³¹ James W. Carey, "Space, Time, and Communications: A Tribute to Harold Innis," in James W. Carey (ed.), *Communication as Culture: Essays on Media and Society* (Boston, MA: Unwin Hyman, 1989), p. 147.

³² Juan J. Linz and Alfred Stephan (eds.), *The Breakdown of Democratic Regimes* (Baltimore, MD: Johns Hopkins Press, 1978).

³³ As described in *Human Development Report 1993*, "Changing the power equation requires the organization of a countervailing force, or even a revolution. People's organizations—be they farmers' cooperatives, residents' associations or consumer groups—offer some of the most important sources of countervailing power. And they often exercise it most effectively through the sharing of information and ideas—it is ideas, not vested interests, that rule the world for good or evil." op. cit., footnote 13, p. 29.

BOX 1-2: Communication and Democracy

Communication and information pervade political life. Without them there could be no nation; for it is through the process of communication that people first develop a sense of community and a shared set of values that legitimize political authority. By magnifying and amplifying some actions, the communication process distinguishes between what is a private act and what is a public affair. It organizes what appears to be random activities to show how individuals and groups are related to one another in pursuit of power, providing a roadmap for individuals who want to influence the course of political events. Citizens rely on the communication process to gather information, identify like-minded people, deliberate their points of view, organize their forces, and articulate their political preferences. Furthermore, because it generates a common fund of knowledge and information, the communication system facilitates productive and rational debate. Without some form of knowledge and understanding of how others are informed and what they believe, individuals could not make reasoned and sensible arguments and decisions.

SOURCE: Office of Technology Assessment, 1995.

BOX 1-3: EcoNet

EcoNet is a virtual community of over 10,000 individuals and organizations in over 90 countries who are working for environmental preservation and sustainability. Members of EcoNet have access to hundreds of private and public online electronic mail conferences through which they exchange information and collaborate on environmental initiatives of local, national or global concern. Individuals or organizations in the United States may pay to join EcoNet through its parent organization—the Institute for Global Communications (IGC) in San Francisco—which is part of the larger Association for Progressive Communications. The EcoNet Internet server provides a gateway not only to the home pages of member organizations such as the National Audubon Society and the Earth Island Institute, but also to the Internet sites of thousands of organizations and government agencies worldwide with information on environmental issues.

SOURCE: Office of Technology Assessment, 1995.

cation technologies have something to offer in all three regards.

Taking advantage of the trends toward networking and decentralized intelligence, for example, developing country leaders can, like businessmen, enhance their governing capability by using interactive expert systems and databases (see box 1-4). For even greater benefit, these systems can be networked to let government officials remotely access the global store of

information.³⁴ Equally—if not more—important, these technologies can be used to help governments develop and network their own information resources regarding conditions in their countries. Today, many developing countries are dependent on foreign countries for information about themselves.³⁵

Communication technologies can also be used to distribute public services such as distance healthcare and educational services much more

³⁴ Jacques Gaillard, *Scientists in the Third World* (Lexington, KY: University of Kentucky Press, 1991). Commenting on the lack of scientific journals, books, and other sources of technological information in developing countries, Gaillard notes that of the career scientists interviewed in the course of this study, 36 percent had no communication with scientists in countries where they had originally studied and done their research.

³⁵ Raul Zambrano, “The UNDP Sustainable Development Network,” *Bulletin of the American Society for Information Science*, February/March 1995, p. 23.

BOX 1-4: The Sustainable Human Development Network Program

In many developing countries, decisionmakers do not have access to up-to-date information needed to make key policy decisions. One program designed to assist in this regard is the Sustainable Human Development Networking Program (SDNP), established by the United Nations Development Program in May 1992. Participants include 12 countries from Africa, Asia, and Latin America.

The aim of SDNP is to link users and providers of information on sustainable human development via computer networks that operate over the Internet. Designed to complement existing systems, SDNP provides support both for network deployment and training, information generation, and the norms of information sharing and exchange. The program is open to all interested parties, including national governments, nongovernmental organizations, academics, business, and the media. The SDNP program builds on local talent and expertise. In addition, each node on the system operates independently of each other, and definitions of sustainable human development are determined locally. Seed money is provided upfront, but projects are intended to become self-financing, so that funding will gradually be reduced by as much as 50 percent or more.

SOURCE: Raul Zambrano, "The UNDP Sustainable Development Network," *Bulletin of the American Society for Information Science*, February/March 1995, pp. 23–24.

cost-effectively.³⁶ Technology convergence, which provides the platform for nontext-based multimedia applications, is especially promising, given the high illiteracy rates in developing countries. Finally, both of these developments can be used in similar fashions to empower voluntary organizations and local governments.³⁷

■ Further Marginalization of Those Without Access

Because advanced communication technologies can serve so many developing country needs, countries without access to them will be at a considerable loss. Missed opportunities due to lack of communication access will have much more dire consequences in the future given intense competition among nations in an increasingly networked and knowledge-based, global economy. Assuming present rates and patterns of technology diffusion, and the global forces driving them, uneven access will probably exacer-

bate the gap that is already widening between the newly industrializing and the least developed countries.

The development pattern of the Third World countries began to diverge significantly in the early 1980s with the onset of the debt crisis (see chapter 2). Although developing countries all faced many of the same hardships, a number of them outperformed the others by a considerable margin. Most successful in this regard were the East Asian countries—Korea, Taiwan, Singapore, and Hong Kong, which developed highly successful export-oriented growth strategies. Between 1960 and 1989, for example, these countries increased their exports from \$2 billion (which constituted five percent of all developing country exports) to \$246 billion (or 32 percent of all developing country exports).³⁸ This export growth not only served to prime the newly industrializing countries', (NICs) domestic economies; it also provided the foreign exchange

³⁶ See U. S. Congress, Office of Technology Assessment, *Linking for Learning: A New Course for Education* (Washington, DC: U.S. Government Printing Office, November 1989); and U. S. Congress, Office of Technology Assessment, *Healthcare on Line* (Washington, DC: U.S. Government Printing Office, September 1995).

³⁷ Pieter Kok, "The Role of Information Technology in Community Empowerment and Development," *In Focus*, February/March 1995, p. 25.

³⁸ Anne O. Krueger, op. cit., footnote 2, p. 105.

necessary for them to survive the subsequent downturn in the global economy.

A similar line of demarcation is being drawn today. Unlike most developing countries, which continue to be mired in civil conflicts, political instability, and economic decline, 12 countries have improved their economic performance during the first half of the 1990s, with significant increases in per capita output. Included are Bangladesh, Benin, Cambodia, Equatorial Guinea, Guinea-Bissau, the Lao People's Democratic Republic, Lesotho, Mozambique, Myanmar, Sao Tome and Principe, the Solomon Islands and Sudan.³⁹ As was the case with their predecessors a decade earlier, the success of these 12 can be attributed, in part, to their ability to maintain internal stability while reaching outward to the global economy.

If other less developed countries are to be similarly successful, they too must gain the inner capacity that will give them the flexibility to adapt to the major structural changes taking place in their external environment (see chapter 3). Most importantly given these changes, they must be prepared to compete in a knowledge-based global economy in which production takes place on a worldwide, but nonetheless decentralized and flexible, basis. The first countries to adapt to these changes will gain a significant competitive advantage, while those failing to do so will probably experience greater decline.

Communication and information technologies are not only driving these trends, they can also help developing countries adapt to them. Taking

advantage of global communication networks, Third World countries will have a better opportunity to become full participants in the global economy, reaping a number of benefits as a result.⁴⁰

Using technology to access worldwide demand, for example, Third World businesses can operate on a larger, more efficient scale, thus becoming more competitive with firms in industrialized countries. Even small businesses will be able to expand their activities.⁴¹ For example, a small business that serves a single niche market in a developing country can increase its size by using communication technologies to identify similar niche markets in other countries. Small firms in developing countries can also use networking technologies to partner with the growing number of globally dispersed firms that outsource many activities to Third World countries. Or alternatively, small businesses can use communication networks to link their operations together, allowing them to function and compete as if they were much larger entities. This kind of networking approach was used, for example, by the Italian clothing manufacturer, Benneton, with remarkable success.⁴²

Equally important, by operating globally, Third World businesses will have access to greater financial resources and opportunities for technology transfer. In the past, most large scale Third World companies were subsidiaries of foreign firms. Because the parent firms were located, and directed their operations from, abroad—close to their major suppliers and mar-

³⁹ *The Least Developed Countries Report*, op. cit., footnote 29. As some OTA reviewers have pointed out, however, it is still not clear that these countries have in fact successfully reached the point of "take off."

⁴⁰ See for a general discussion that focuses on the post Uruguay Round environment, Richard Harmsen, "The Uruguay Round: A Boon for the World Economy," *Finance and Development*, March 1995, pp. 24–43.

⁴¹ As described by R. Badrinath, "Previously, gaining entry into distant markets was out of the question for a majority of SMEs [small and medium size enterprises]. Even assuming that they could organize the finance and production aspects of their operations effectively, foreign markets raised almost insurmountable obstacles. The process of market selection, buyer identification, visits abroad with quantities of samples, preparation of business offers and counter proposals, discussion of specifications and so on required large investments of time, energy, and resources. Today, much of this can be done without leaving the workplace, thanks to the telephone, fax and other telecommunication facilities." R. Badrinath, "Helping Small and Medium-Size Firms to Enter Export Markets," *International Trade Forum*, February 1994, p. 6.

⁴² Cristiano Antonelli, "New Information Technology and Industrial Organization—Experience and Trends in Italy," in *Information Technology and New Growth Opportunities* (Paris, France: OECD Development Center Studies, 1989). See also OTA, *Electronic Enterprises*, op. cit., footnote 4.

kets—there were few positive “spillovers” for developing countries. Today, this is no longer the case.⁴³ Local firms that partner with global companies as suppliers or value added providers have much more to gain, as India’s highly successful export-oriented software industry clearly attests.⁴⁴ Working with foreign firms, Indian software contractors have been able to access the latest standards, technological platforms, productivity tools, quality requirements, and upfront financing, all of which have been critical to their success.

If developing countries deploy advanced communication technologies in tandem with developed countries, they can also compete in the expanding global services markets on a more equal basis. One of the first countries to recognize this opportunity was Singapore, which has prospered greatly as a result. By 1990, Singapore had become the 17th largest trading nation in the world, and was home to the regional headquarters of more than 600 multinational corporations (see box 1-5).⁴⁵

National governments have not been alone in recognizing the potential for information networking to enhance global trade. Recently, for example, the United Nations sponsored the global Trade Point Program, which aims to promote trade through the establishment of a series of “trade points” or trade facilitation centers that provide companies with greater access to communication networks and trade-related information. Already, there are 59 such Trade Points in 45 countries serving as clearinghouses for trade leads, custom and tariff information, sources of financing, qualified freight forwarders and insurers, and market overviews. Trade Points offer services either physically, in a centrally located office, or on-line by connecting customers and service providers electronically. The United Nations estimates that 100 Trade Points will be in operation by 1996.⁴⁶

As the benefits of using communication networks increase, so too do the costs of not having access to them. Opportunity costs are especially high in the case of networking technologies,

BOX 1-5: The Singapore Strategy

When, in the early 1970s, multinational corporations began to transfer their manufacturing operations from Singapore to lower cost labor countries such as Malaysia, Thailand, and Indonesia, the government of Singapore was quick to adopt a more service-oriented, export-led strategy. Recognizing the role that the communication and information infrastructure might play in capturing the benefits of global trade, government officials undertook to create a totally electronic trading environment, with the aim of transforming Singapore by the end of the century into an “intelligent island.” By providing multinational corporations efficient, one-stop global networking and value-added trade services, Singapore was able to establish itself as the major trading hub in Asia.

SOURCE: Office of Technology Assessment, 1995.

⁴³ For example, a recent study examining the role of multinational firms in economic development found that foreign multinationals pay higher wages than domestic developing countries and provide significant technology transfer. “The Role of Multinationals in Economic Development,” *Columbia Journal of World Business*, vol. 29, No. 4, winter 1994, pp. 6–11. Alternatively, others argue that, in providing such benefits, multinational firms tend to aggravate income disparities within developing countries, thereby creating problems of legitimacy for political regimes. For this perspective see Kenneth Bollen, “World System Position, Dependency and Democracy: The Cross-National Evidence,” *American Sociological Review*, vol. 48, No. 4, August 1983, pp. 468–479.

⁴⁴ Nagy Hanna, Ken Guy, and Erik Arnold, *The Diffusion of Information Technology: Experience of Industrial Countries and Lessons for Developing Countries*, World Bank Discussion Papers, No. 281 (Washington, DC: The World Bank, 1995), p. 120.

⁴⁵ Robin Mansell and Michael Jenkins, “Networks, Industrial Restructuring, and Policy: The Singapore Example,” in *Technovation*, vol. 12, No. 6, September 1992.

⁴⁶ UN’s Conference for Trade and Development World Wide Web Server <http://gatekeeper.unctad.org/unptdc/>, and Trade Point U.S.A. Columbus Ohio, <http://www.natp.iftea.com/>

20 Global Communications: Opportunities for Trade and Aid

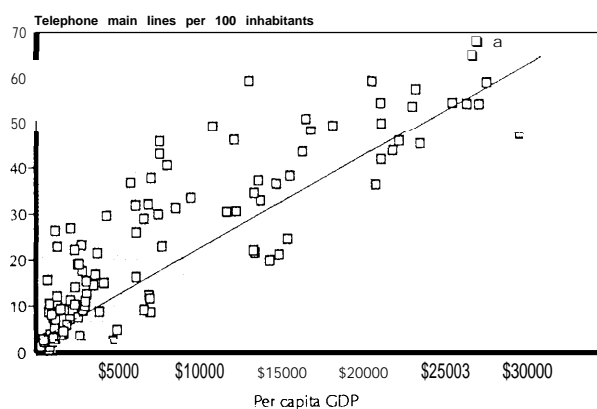
which give rise to “first mover advantages.” Thus, as Singapore clearly recognized, the first country to establish a technology-based global trade network can gain a hefty competitive advantage, not simply because the capital costs entailed are so high, but also because electronic networks require considerable “learning by doing.” Moreover, once business users have expended the energy, expertise, and financial resources required to use a particular network, and have become linked up with other network users, they tend to get “locked in.”⁴⁷

Given present rates and patterns of technology diffusion, and the forces driving them, the poorest developing countries, as well as the poorest regions within developing countries, will probably be left behind in a network-based global economy (see chapter 4). There are today tremendous disparities in the diffusion of information and communication technologies throughout the world. Because technology disparities mirror those in income distribution, they will probably reinforce the growing economic gap among nations (see figure 1-2).

Even more alarming, this gap between the telecommunications “haves” and “have nots” shows little signs of receding. In the 10 years since the Maitland Commission issued its report, *The Missing Link*—which first noted the telecommunications gap, and called on developed countries to take steps to reduce it—very little progress has been made.⁴⁸ There are today 50 countries, which together comprise more than half of the world’s population, that still have less than one main telephone line for every 100 persons. Given their present rates of technology deployment, many of these countries will fail to reach this level of teledensity by the year 2000 (see figure 1-3 and figure 1-4).

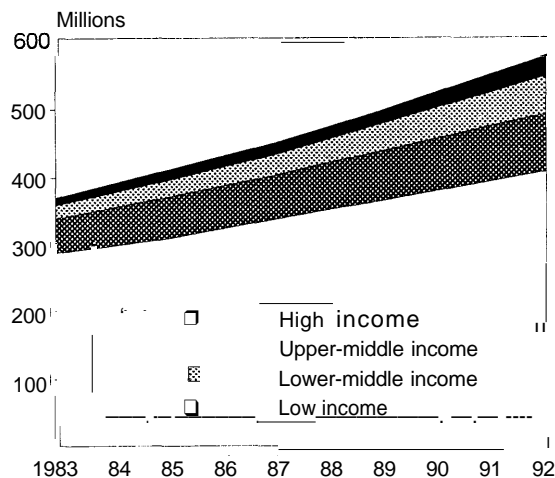
Assuring the relatively even deployment of communication technologies presents problems of staggering proportions. Even as some countries race to keep up, others are deploying yet

FIGURE 1-2: National Wealth and Telephone Density



SOURCE: ITU, UN, World Bank, OECD

FIGURE 1-3: Main Telephone Lines



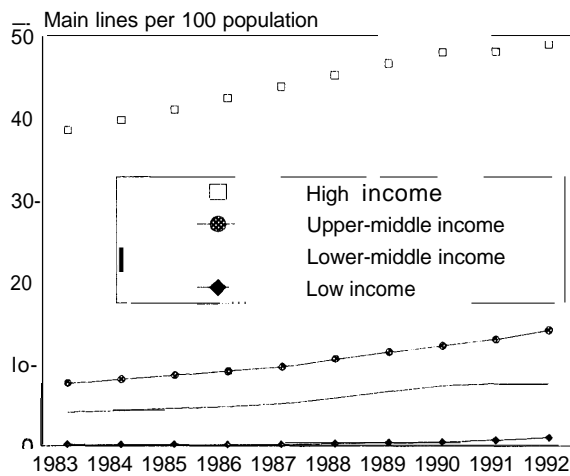
SOURCE: ITU/BDT Telecommunications Indicator Database

more advanced technologies. Thus, for example, it is estimated that it will cost \$120 billion

⁴⁷ Joseph Farrell and Garth Saloner, “Horses, Penguins and Lemmings,” in H. Landis Gabel (ed.), *Product Standardization and Competitive Strategy* (The Netherlands: North Holland, 1987).

⁴⁸ World Telecommunications Development Report (Geneva, Switzerland: International Telecommunications Union, 1994), p. 73.

FIGURE 1-4: Telephone Density



SOURCE: ITU/BDT Telecommunications Indicator Database.

between now and early 2005 just to upgrade the Central and Eastern European communication networks. During the same period, the European Community plans to spend approximately \$24.8 billion per year to develop a broadband telecommunications infrastructure.⁴⁹

A lack of education and technical expertise will also make it difficult for developing countries to take advantage of many technologies (see box 1-6). For example, although the Internet provides developing countries with an inexpensive way of gaining access to networking services such as e-mail and remote file transfer, its usage requires a level of technical understanding and comfort that is unlikely to be found in poorer areas. Not surprisingly, therefore, Internet growth has been strongest in countries such as India and Malaysia, where a computer culture already exists.⁵⁰

■ The Trade Dividend

In today's increasingly liberalized, global telecommunications marketplace, many developing countries' communication needs can be met by the private sector. Already, many firms are eagerly competing to invest in and/or partner with developing countries to serve their rapidly growing communication markets. U.S. firms are especially well positioned in this regard. They are foremost in the development and deployment of communication and information technologies and principal players in the information and communication technology and services trade arenas. Some foreign support and incentives will be necessary, however, if all developing country needs are to be met. By providing such telecommunication-related foreign assistance on a targeted basis to those countries and rural areas least likely to be served, the United States can not only foster U.S. foreign policy goals; at the same time, it can also promote deregulation and generate greater telecommunications demand, thereby creating new trade and investment opportunities for the United States.

Information and communication technologies, operating in a newly deregulated and increasingly competitive economic climate, are rapidly reconfiguring national communication systems and linking them together into networks spanning the globe. These changes have greatly reduced telecommunication costs, and generated a broad range of new products and services that can be produced and traded on a global scale. As a result, telecommunications is one of the fastest growing sectors in the international market, with total revenues of \$535 billion for 1992, and annual growth rates averaging between 8 and 9 percent.⁵¹

The increased flow and demand for information and services across national borders is wear-

49 Donne Pinsky, "Euro. Infrastructure Group Proposed" *Communications Week International*, May 11, 1992, p. 6.

50 As described by Goodman, et al., "Networks are often perceived by many in LDC's (the 'south') as intended to 'talk to people in the north.' There may not be much perception of the need for local-to-local communications. Furthermore, there may be little in the way of a culture for sharing information locally, nor of doing business in an impersonal way." S. E. Goodman, L. I. Press, S. R. Ruth, and A.M. Rutkowski, "The Global Diffusion of the Internet: Patterns and Problems," *Communications of the ACM*, vol. 37, No. 8, August 1994, p. 30.

51 ITU Press Release of report released in Buenos Aires at the World Telecommunication Development Conference, Mar. 21, 1994.

BOX 1-6: Education and Training In Developing Countries

The problem of education in developing countries is not simply one of providing schooling; even more significant is the difficulty of matching education to workplace needs. Thus, in many developing countries, one finds that the number of unemployed secondary school graduates is greater than those with lesser education. The situation is even greater for those with university and graduate degrees. In Bangladesh, for example, almost 40 percent of those with master's degrees are either unemployed or underemployed. Similarly, the rate of unemployment for university graduates in Thailand ranged between 20 and 30 percent from 1973 to 1983. This gap between education and jobs could be much greater in the future, given cutbacks in government recruitment.

Source: *Human Development Report 1993* (New York: NY: U.N. Development Program, 1993), p. 38.

ing away the distinctions between domestic and international communication systems and markets. Whereas national telecommunication monopolies once controlled the manufacturing, production, and provisioning of most communication products and services, today international conglomerates are being formed to meet the business demand for transparent and seamless world-wide services. Already 45 percent of the world's telephone access lines are managed by private companies.⁵²

This shift towards a global communications environment affords a number of opportunities for U.S. telecommunication companies, which are in the forefront in striking transnational mergers, alliances, and other cooperative arrangements (see chapter 4). U.S. exports of telecommunications equipment including central office switches, transceivers for radiotelephony, fiber optics, satellites and customer premises equipment grew at an average annual rate of 18 percent between 1989 and 1993, when the United States achieved a trade surplus in this area for the first time in 10 years with exports totaling \$3.2 billion.⁵³

The prospects for continued growth in U.S. trade and foreign investment are high, given technology convergence and the development of a wide array of new products and services; the growth in worldwide demand; the provision for telecommunication services within the World Trade Organization (WTO) and the North Atlantic Free Trade Association (NAFTA); and the liberalization and privatization of many telecommunication regimes. New opportunities will also abound as countries throughout the world—recognizing the strategic nature of telecommunications investments—turn to new technologies to modernize and upgrade their networks. This international growth potential is especially important for countries such as the United States, where the domestic market for many telecommunication-related products and services is rapidly becoming saturated.⁵⁴

Trade and investment opportunities are especially promising in the developing world where penetration levels are low and projected demand is high, given increased prosperity and a rising middle class.⁵⁵ China, for instance, is replete with possibilities for U.S. equipment manufac-

⁵² "What Are the Implications for Your Business of the Global Telecoms Revolution," *Management Accounting*, June 1992, p. 40.

⁵³ "Industry and Trade Summary: Telecommunications Equipment," U.S. International Trade Commission, Publication 2820, October 1994, Washington, DC, p. 31. The principal markets for U.S. telecom exports are Canada, Mexico, Japan, China, and the United Kingdom.

⁵⁴ U.S. Congress, Office of Technology Assessment, *U.S. Telecommunications Services in European Markets*, OTA-TCT-548 (Washington DC: U.S. Government Printing Office, August 1993).

⁵⁵ See Rahul Jacob, "The Big Rise: Middle Classes Explode Around the Globe, Bringing New Markets and New Prosperity," *Fortune*, May 30, 1994, vol. 129, No. 11, pp. 74–78, 82, 90; and Vivian Brownstein, "The U.S. Is Set To Be the Winner From Worldwide Expansion," *Fortune*, Nov. 28, 1994, vol. 130, No. 11, pp. 22–23.

turers, given a telephone penetration rate of 0.98 and a population totaling more than 1 billion. The prospects for U.S. companies in Latin America are equally great.⁵⁶ In Mexico alone, the market for wireline equipment now exceeds \$2 billion annually. As developing countries press to modernize their networks, the market for advanced technologies will also experience considerable growth. In 1992, for example, more than \$4.6 billion was spent on digital switching in the developing countries. Estimates are that this market will exceed \$7 billion by the year 2000.⁵⁷

Whether or not U.S. companies will be able to access these growing market opportunities will depend, to a considerable degree, on developments in the international telecommunication regulatory environment. Despite a growing trend towards liberalization and privatization of telecommunication regimes, national communication systems continue to differ considerably, depending on the extent to which they are government owned or operated, monopoly-based or liberalized, and/or regulated or not. At one end of the scale are countries such as the United States, New Zealand, Singapore, Malaysia, and Mexico, which are striving to minimize government involvement. At the other end are countries such as China, Brazil, and Uruguay, where the legacy of the traditional PTT is very strong (see box 1-7).

Aware of the growing importance of communication for economic growth, many developing countries hope that the privatization and liberalization of their telecommunication regimes will help them gain access to the foreign capital and expertise needed to develop their national communication infrastructures. Describing the moti-

uations and tensions inherent in these kinds of decisions, one observer has noted:

Perhaps for the first time communications are being recognized as the strategic underpinning of civilization, as important perhaps as the provision of clean water. The implicit fear for many countries must be that an adequate infrastructure will forever keep a national economy out of the world economic structure that is shaping up for the 21st century, in addition to the fear that government relinquishes an important tool. It is into this cauldron that telecom policy is being pushed.⁵⁸

Seeking out new strategies, Singapore Telecom, for example, recently established a joint public-private telecom venture, which many view as a first step toward total privatization.⁵⁹ Indonesia already has such a corporate arrangement. In Malaysia, the PTT is privatized, with its stock now floated in the marketplace.⁶⁰ In Latin America, Mexico serves as a model for this kind of industry restructuring, having privatized its state PTT, TELMEX, with record speed. Similar infrastructure modernization strategies are being pursued in other parts of the world. India, for example, is developing a plan to open up its telecommunication sector to private investment, as are countries in Eastern Europe. Even China, which has long opposed foreign investment, is now considering foreign bids to support its goal of providing 40 million new lines by the year 2000.⁶¹

Foreign direct investment (FDI) in the telecommunications sector has been particularly popular, generally taking the form of either joint ventures or corporatization and sale of a major or controlling equity stake in the telecommunication provider. These kinds of arrangements offer

⁵⁶ Bruce E. Beebe and Peter Kennedy Jr., "Latin America Heats Up," *Journal of Business Strategy*, vol. 15, No. 5, pp. 52-55.

⁵⁷ Robin Bromby, "Digital Switching Markets in Developing Countries Report," *Telecommunications (International Edition)*, vol. 27, October 1993, pp. 16-18.

⁵⁸ Stephen McClelland, "The International Dimensions: The PTTs," *Telecommunications*, June 1992, p. 31.

⁵⁹ "Singapore Starts Telecom Selloff," *Telecom Highlights International*, vol. 15, No. 34, Aug. 25, 1993, p. 5.

⁶⁰ "World Bank Paper Urges Telecom Liberalization," *Telecom Highlights International*, vol. 16, No. 8, Sept. 8, 1993.

⁶¹ "World Bank Sets Telecom Aid Rules," *Telecom Highlights International*, vol. 16, No. 11, Mar. 16, 1994, p. 4.

BOX 1-7: The Post, Telephone, and Telegraph (PTT) Model

In many countries, the government has historically assumed direct ownership and control over the country's telecommunication networks. The typical organizational pattern to emerge was that of the PTTs—the government administrations of post, telephone, and telegraph. This model evolved in Europe over a century and a half, during which time national governments, coveting the lucrative postal revenues, finally, and after intense struggles, assumed control over their respective postal systems. Eventually, however, it was the telephone that provided revenues to subsidize the PTTs' activities.

As developing countries gained their independence, the PTT model was retained. This model appealed to many Third World leaders, not only because it gave them control over the national communication infrastructure, but also because it generated a major source of government revenue. In fact, in many developing countries, the PTT's role in generating revenues has always had top priority. Instead of reinvesting substantial amounts of the telecommunication administration's operational surplus, funds have been siphoned off by governments for other purposes. In Syria, for example, the state imposed an 80 percent tax on the state-owned telephone company from 1985 to 1991. The demand for telecommunications has also been dampened by artificially high prices, which are based on tariff structures that are designed to generate general revenue. These policies have resulted in very poor service and a tremendous backlog in demand. Thus, for example, in more than 61 countries, call completion rates are lower than 40 percent.

SOURCE: Office of Technology Assessment, 1995.

a number of advantages to developing and developed countries alike.⁶²

Developing countries can benefit in a number of ways from the foreign purchase of either all, or a portion of, their telecommunications operations. Often, investors are obligated to expend a considerable amount of money to extend and upgrade service in exchange for control over the enterprise and certain guaranteed exclusive rights. Such arrangements allow developing countries to reduce their foreign debt while upgrading their national infrastructure.⁶³ At the same time, they can gain greater access to advanced technology, markets in developed countries, as well as hard currency. Foreign direct investments are also more secure than other types of foreign investment, being less vol-

atile and subject to interest rate fluctuations. FDI agreements can, moreover, be customized to meet a developing country's specific needs and concerns. Flexibility and appropriate timing are critical for success.⁶⁴

For investors and businesses in developed countries, there are similar gains to be made. Above all, these partnering arrangements allow foreign vendors to obtain a foothold—and often a major competitive advantage—in some of the most profitable and rapidly growing telecommunication markets. Given the tremendous backlog of demand in developing countries, these investments can be made with minimal risk. By accelerating technology deployment in the Third World, FDI in telecommunications also paves the way for related service industries—such as

⁶² Robert R. Bruce, Jeffery P. Cunard, and Lothar A. Kneifel, "Exploring New Ways to Attract Capital for Privatization," in Bjorn Welleinius and Peter A. Stern (eds.), *Implementing Reforms in the Telecommunications Sector: Lessons From Experience* (Washington, DC: The World Bank, 1994), chap. 28, pp. 463–499.

⁶³ Aileen A. Pisciotta, "Telecommunications Reforms: Options, Models, and Global Challenges," *IEEE Communications Magazine*, November 1994, p. 29. See also T. H. Chowdary, "Telecommunications Restructuring in Developing Countries," *Telecommunications Policy*, September/October 1992, pp. 591–611.

⁶⁴ Peter L. Smith and Gregory C. Staple, "Telecommunications Sector Reform," *IEEE Communications Magazine*, Nov. 1994, p. 51; and Clive Cook, "Third World Finance: New Ways To Grow," *The Economist*, Sept. 25, 1993, pp. SS5–SS7.

banking, insurance, and tourism—as well as for multinational corporations, which depend on networking technologies for their survival and growth. In the long run, investments linked to telecommunications privatization may also enhance the overall economic climate in developing countries in favor of open markets and greater economic reforms (see chapter 4).

For U.S. companies to achieve full market access in foreign countries, privatization of telecommunication systems will not be enough. Developing countries will also need to liberalize their regulatory systems to allow for competition, establishing pricing structures that mirror true costs and rules of interconnection that are consistent, transparent, and comparable for all parties. It is these rules that establish how alternate providers can access the public network, and determine the prices charged for such access. Interconnection rules are required not only for providers from different countries but also for different kinds of providers within each country. For example, there need to be common rules governing the relationship between public and private networks, between value-added data services and public networks, and between providers of public voice services whether they are fixed or mobile (see box 1-8).⁶⁵

Although the global market is driving the deployment of advanced communication technologies and channeling investments in telecommunications to developing countries, its impact is uneven. As has historically been the case for all networked technologies, diffusion is following a sequential pattern, starting in centers of economic activities and areas with major populations and working outward, from major cities, to smaller towns, and eventually to rural villages and remote areas.

In the past, most governments were able to speed up, and smooth out, this diffusion pattern,

using cross subsidies and price averaging. Subsidies, however, are no longer a tenable option in a global economy in which developing countries must compete to attract worldwide business. Already, those countries that are slow to dismantle their traditional regulatory regimes run the risk of being bypassed.⁶⁶

In this interdependent global environment, the United States has an interest—both from a trade as well as from a foreign policy perspective—to help assure that these underserved areas are not left far behind. Networks are not only subject to economies of scale and scope; they also exhibit positive externalities. The value of networks and the resulting demand for networking technologies will likely increase—at least in the early stages of deployment—when networks, users, and applications are extended and linked together.⁶⁷ Thus, support for networking in underserved areas will not compete with, but instead will complement and add value to, the information networks that are presently being deployed in high-density areas. As an added benefit, given more even deployment, Third World governments will probably be under less pressure to use subsidies from local or international calls to promote access, and hence be more willing to promote regulatory reforms and open their markets to U.S. equipment and service providers.

CRITERIA FOR MAKING POLICY CHOICES

Telecommunication-based aid programs are likely to have a high payoff. Because communication and information networking technologies have a dual nature, which allows them to serve both as an infrastructure and a commodity, they are uniquely suited to support flexible and holistic development programs within the context of competitive, open markets. By targeting poor and underserved areas, telecommunication-based aid programs can enhance U.S. trade opportuni-

⁶⁵ Graham Finnie, "Interconnect: New Operators Plug In," *CommunicationsWeek International*, Mar. 16, 1992, p. 18.

⁶⁶ Johannes M. Bauer, "The Emergence of Global Networks in Telecommunications: Transcending National Regulations and Market Constraints," *Journal of Economic Issues*, vol. 28, No. 2, June 1994, pp. 391–402.

⁶⁷ Cristiano Antonnelli, "The Economic Theory of Information Networks," in Cristiano Antonnelli (ed.), *The Economics of Information Networks* (The Netherlands: North Holland, 1992), chap. 1.

BOX 1-8: Pricing Disparities and International Accounts

The impact that pricing disparities can have on trade is particularly apparent when trying to reconcile international accounts. Because international calls entail the use of facilities in two countries, revenues and costs need to be shared between them. To settle accounts, the provider in the country in which a call originates pays the facility owner in the country where the call is completed a sum based on a bilaterally negotiated “accounting rate” (the agreed upon cost of the call) and “settlement rate” (the agreed upon percentage split of the revenues, which customarily is 50 percent).

If there is a large gap in the prices charged in each country, problems will likely arise, as is happening in the United States today. When possible, users initiate calls in the United States because the rates, which are subject to competitive pressures, are lowest there. This is not necessarily beneficial, however. Because American providers initiate more calls than they receive, they must pay out an excess of funds, which take the form of a trade deficit. Moreover, because international accounting rates are generally inconsistent with true costs, it may be difficult for American service providers to cover their total costs. In fact, depending on the accounting and settlement rates, they may actually subsidize a foreign vendor’s service.

Within the international telecommunications community, there is increasing pressure to revise the system of international accounting rates. The pressure is coming from a number of directions. Settlement payments provide an important and growing form of hard currency to a number of developing countries, which if transferred to the operator, could be used to cross subsidize network development. Developing countries would, therefore, like to see the 50-50 basis for sharing revenues shifted in their favor perhaps to 55-45. They contend that the cost of providing infrastructure and, therefore, the cost of terminating a call is much higher in some developing countries than in the advanced industrialized nations. On the other hand, most developed countries strongly believe that accounting rates should be reduced in line with technical improvements so as to more closely approximate costs. Efforts within the International Telecommunications Union (ITU) Study Group III to define the cost of providing international telecommunications services, however, have hit methodological and political snags. As a result, some countries would prefer to replace the whole system of accounting rates with one that provides genuine incentives for price cutting and offers more flexibility to establish innovative international services.

SOURCE: Office of Technology Assessment, 1995.

ties in developing countries, promote competition and telecommunications regulatory reform, while at the same time providing for the communities and people that are most in need.

As experience suggests, designing U.S. foreign assistance programs to meet the multiple goals of promoting democracy, economic development, political stability, and U.S. trade opportunities is no easy task. How communication technologies will affect Third World countries will depend on a broad range of technical, economic, social, and political factors. To lay the groundwork for developing an effective telecommunications-related aid strategy, OTA has identified a number of criteria that such a strategy

must meet to enhance its chances of success. These criteria comprise an interdependent and total package. To the extent that policy measures fail to address all these criteria, the chances for success, and the likelihood that technology will be deployed to the benefit of the United States and the developing world, will be diminished.

■ A Technology Strategy That Supports Development Goals

Many people look to information and communication technologies to help developing countries overcome their problems and adapt to their rapidly changing environment. Experience to date,

however, demonstrates that technology alone will not be enough. In cases where technology has made a critical difference, it has been employed in conjunction with successful social, economic, and organizational change. Similarly, most obstacles to success have had to do with people and institutionalized behavior rather than with technology.⁶⁸ To develop appropriate technology-based development strategies, care must be taken to reassure that technology deployment patterns and network architectures reinforce, and do not drive, development policies and goals. For example, if communication technologies are to have a democratizing effect, they need to be widely available, easily accessible, and capable of supporting two-way interactions. On the other hand, communication technologies that are intended to reinforce a sense of community, or to support activities internal to a particular business or firm, may need to be more restrictive both with respect to content as well as access.

■ A Multidimensional, Integrated Notion of Economic Development

Experience suggests that if foreign aid policies are to serve the multiple goals of promoting sustainable economic development, democracy, and political stability, aid policies and programs must themselves be conceived of in a multidimensional, integrated fashion that accounts for social, economic, and political change. Because communication and information technologies are common to all these activities, they can help support a holistic development approach. As an added benefit, if communication technologies are used to serve mutual development goals, their cost will be lower because of the associated economies of scale and scope.

■ Minimum Cost and the Effective Use of Existing Resources

Given current national budget constraints and questions about the benefits to be derived from foreign assistance, any telecommunications

related aid project will need to be financed at minimum cost. Ideally, such programs should leverage existing resources—both public as well as private—be incentive based, and self-sustaining over the long run. Moreover, given recent disagreements within the aid community about where limited aid monies might best be spent (i.e., structural reforms, environmental sustainability, poverty alleviation), a convincing case must be made to show that investments in telecommunications are not only cost effective; they can also support all these alternative spending targets.

■ Technology Neutrality

Advances in communication and information technologies provide developing countries the opportunity not only to “leapfrog” to high-performance technologies. They also offer much greater variety and flexibility of use. If developing countries are to maximize these advantages to design and deploy networks that are well matched to their unique situations, telecommunications-related aid policies must be neutral with respect to technology choices. Moreover, to the extent that developing countries are free to make use of a wide variety of technologies, competition and a liberalized regulatory environment will probably be advanced. The prospects for democratic participation will also be greater, given a variety of communication channels and outlets. A policy of technology neutrality is also in keeping with U.S. goals of promoting free trade and liberalization of telecommunication regimes. Equally important, it is unlikely to favor some U.S. stakeholders over others.

■ Flexibility to Experiment, and to Deal With the Variety of Situations and Settings Found in Developing Countries

Approaches to foreign aid have fluctuated rather significantly over the past 50 years, depending on the political climate and prevailing school of economic development thought. Given the diver-

⁶⁸ See *Electronic Enterprises*, op. cit., footnote 4.

sity of outcomes in developing countries, policy-makers have, more recently, come to appreciate that no single policy approach is equally applicable under all circumstances. Our knowledge of the development process continues to be imperfect, and conditions in developing countries vary increasingly, both within and among countries. Thus, development policies must be flexible enough both to experiment with different types of approaches and to address the unique needs and strengths of each community. Communication systems will go unused, if they fail to serve developing countries' needs as they themselves perceive them.

■ Policies That Build On and Take Advantage of Local Competence

All too often, infrastructure projects in developing countries have deteriorated over the long run for lack of maintenance and operational funding. If telecommunication related aid projects are to be self sustaining and to promote effective use of technology, they must incorporate both a technology-transfer and an "entrepreneurial" component. Moreover, if such systems are to be truly useful, they must take advantage of, and build on, "local knowledge."

Although technology advance and network unbundling permits much greater flexibility in network design, it can, at the same time, increase the knowledge requirements and transaction costs of putting systems together. Development policies must therefore provide technical assistance to familiarize users with communication technologies and assist them in planning and devising appropriate deployment strategies. Business training and support will also be required; many economic-oriented development projects have failed for lack of sound business plans and practices and incentives and market signals that correspond to real costs.⁶⁹ To be successfully integrated into local practices, such support will need to be provided as a comple-

ment to, rather than substitute for, existing local knowledge.

■ Reconciliation of Trade and Economic Development Goals

In the past, foreign aid policies and U.S. trade policies have often come into conflict, thereby undermining both sets of goals (see box 1-9). In a highly competitive—but increasingly interdependent—global economy, greater efforts must be made to reconcile trade and aid goals, and to develop policies that have win-win outcomes for all.

In the specific case of telecommunications, policies should not only be consistent with free trade principles; they should also be designed to encourage the liberalization of telecommunication regimes. To this end, they should promote rather than substitute for private sector activities. Meeting these criteria should not be excessively difficult. By all accounts, the demand for telecommunication services in developing countries far exceeds the supply. The inadequate response to this demand results from regulatory barriers and the failure of the market—especially in rural areas—to effectively aggregate potential demand.

FOREIGN AID STRATEGIES TO MEET THESE CRITERIA

■ Targeting Rural Areas for Integrated Development Programs

Bounded by their geography, history, and culture, rural communities in the Third World constitute the focal point of events and social forces that interact to determine the fates of their inhabitants. In such close-knit environments, problems in one area of life spill over and feed on those in others. The result is a vicious circle that spirals downwards.

To reverse this pattern requires a concerted and integrated effort that addresses all these

⁶⁹ Dwight H. Perkins and Michael Roemer (eds.), *Reforming Economic Systems in Developing Countries* (Cambridge, MA: Harvard Institution for International Development, 1991); and Karla Hoff et. al., *The Economics of Rural Organization*, op. cit., footnote 30.

BOX 1-9: United States Aid and Trade Policy

As a long-term advocate of freer trade, the United States has consistently sought to establish a formal mechanism within the Organization for Economic Cooperation and Development (OECD) that would restrict the practice of tying aid donations to the purchase of donor products and services. In 1987, OECD nations agreed to provide at least 35 percent of all tied aid in the form of an outright grant. Many countries often found ways to circumvent this decision, however. In August 1992, OECD members reached a more restrictive agreement known as the Helsinki Accord. According to the Helsinki package, tied aid is limited to those countries and projects that are unlikely to qualify for commercial financing. Moreover, 80 percent of a project's costs must be covered by concessional aid, unless the OECD agrees otherwise. OECD members meet at monthly intervals to review tied aid project proposals. Tied aid credits have decreased since 1992 from \$15.4 billion to \$6.95 billion in 1993. Two-thirds of all untied aid is in key sectors such as telecommunications, transportation, and electric power, much of which is concentrated in Asian markets.

To further counter tied aid, the United States established a Tied Aid Capital Projects Fund within the Ex-Im Bank. The Ex-Im Bank uses this fund of \$150 million to counter potential tied aid offers made by U.S. competitors.

SOURCE: "Tightening Up on Tied Aid," *The China Business Review*, May-June 1993, pp. 36-40.

problems at once. Only by adopting a multifaceted approach will the solutions be mutually reinforcing as well (see box 1-10).⁷⁰ Improvement will also be more likely to the extent that development programs are community based. Insofar as they are the source of many developing countries' problems, rural communities are similarly the place where solutions can most readily be found.⁷¹

The need for an integrated, community-based approach to rural development problems has been reiterated by many international development experts and emphasized in the 1992 Rio Declaration on Environment and Development, which was adopted by the United Nations. Encompassing all of the activities taking place in rural environments, this approach calls for the simultaneous development of all areas including agriculture, education, communication, and health care, among others (see chapter 2).

This emphasis on rural areas has been reinforced, of late, by the growing realization that a healthy agricultural sector is critical for successful development. Having seriously underestimated agriculture's role, leaders in developing countries (as well as many development economists) have typically fostered policies that discriminate against agriculture and rural areas and promote urban industrialization. Such policies have greatly depressed investment in agriculture and reduced farmers' purchasing power significantly. In those countries exhibiting an urban bias, for example, the income transferred out of agriculture totaled—on average—46 percent of GNP for the years 1960 to 1984. In a recent study of 18 developing countries, the World Bank found, for example, that industrial protection and exchange rate overvaluation depressed agriculture's domestic terms of trade by about 22 percent.⁷² Having recently come to recognize that agricultural production generates significant

⁷⁰ Partha S. Dasgupta, "Population, Poverty and the Local Environment," *Scientific American*, vol. 272, No. 2., February 1995, p. 45.

⁷¹ "People and Governance," *Human Development Report 1993*, op. cit., chap. 2, footnote 13.

⁷² Maurice Shiff and Albert Valdesm, "The Plundering of Agriculture in Developing Countries," *Finance and Development*, March 1995, pp. 44-47.

BOX 1-10: Controlling Population Growth in Developing Countries

To appreciate the need for an integrated development approach, one has but to consider the intricate linkages among rural problems. Population control is a case in point. Most population studies now show that in Third World communities, pregnancy decisions both are determined by, and have an impact on, a number of other interrelated social, economic, and environmental factors.

The correlation between fertility rates and education is particularly strong, for example.¹ According to the World Bank, women in developing countries who have no secondary education generally bear up to seven children in their lifetimes. In contrast, those who have attended secondary school average only three births.

Levels of education as they affect birth rates are related, in turn, to the health of both women and children. In developing countries, pregnancy is, for example, the primary cause of death for women of child-bearing age. In fact, in some parts of sub-Saharan Africa, it is not unusual to find one maternal death per 50 live births.² Of equal note, when mothers are educated and have fewer children, they provide better care for their children, whose health and prospects of survival are greatly enhanced as a result. In addition, girls born in such families are more likely to be educated and thus less likely to marry early, have multiple pregnancies, and thus repeat the cycle.³

Education by itself is not enough, however. To discourage multiple births, women must also use their education to increase their families' incomes, raising them above subsistence levels. When rural families are totally dependent on the land, women are prized primarily for the abilities to reproduce. In subsistence households, children are needed to carry out simple, but nonetheless essential, chores, such as fetching water and fuel, cultivating crops, caring for livestock, cooking food, and producing simple marketable products. In these circumstances, having a large family is perceived not as a social or even individual cost but rather as an economic benefit.⁴

¹ "Battle of the Bulge," *The Economist*, vol. 332, No. 7879, Sept. 3, 1994, p. 23.

² Partha S. Dasgupta, "Population, Poverty and the Local Environment," *Scientific American*, vol. 272, No. 2., February 1995, p. 42.

³ "Battle of the Bulge," *op.cit.*, footnote 1.

⁴ Dasgupta, *op.cit.*, footnote 2.

SOURCE: Office of Technology Assessment, 1995.

rural household demand, which in turn stimulates industrialization, many people now consider agriculture-based rural communities to be prime targets for economic development efforts.⁷³

Rural communities are also gaining greater priority among development experts because of their potential to reinforce democracy at the local level. Community-based actions can help reinforce a spirit of cooperation and the development

of the type of civil society upon which democracy ultimately depends. At the same time, the mobilization of a community and/or community-based organizations can help to build local competence, thus providing a powerful counterweight to authoritarian governments and other vested interests that oppose social and economic change in developing countries (see box 1-11). As described in the *Human Development Report 1993*:

⁷³ Yves Bourdet, "Rural Reforms and Agricultural Productivity in Laos," *Journal of Developing Areas*, vol. 29, No. 2, January 1995, pp. 161–182; and Earl P. Scott, "Home-Based Industries: An Alternative Strategy for Household Security in Rural Zimbabwe," *Journal of Development Areas*, vol. 29, No. 2, January 1995, pp. 183–212.

BOX 1-11: The Internews Network

Local broadcasters in the Soviet Union have played a critical role in providing an independent political perspective despite strong pressure from the Kremlin to support government policies such as the war in Chechnya. To support such independent broadcast efforts, Internews Network—a voluntary organization supported by U.S. Agency for International Development and the private financier, George Soros—is reaching out to independent television stations in Russia's regions, providing seminars in journalism, business planning, advertising and technical issues. Equally important, Internews Network has established a center in Moscow where these independent stations can get together to share news and other experiences. Most people agree that these stations provide the most independent and balanced news coverage in the Soviet Union.¹

¹ Fred Hiatt and Daniel Southerland, "Grass-Roots Aid Works Best in Russia," *Washington Post*, Feb. 12, 1995, p. A1
SOURCE: Office of Technology Assessment, 1995.

Decentralizing governance—from capital cities to regions, towns and villages—can be one of the best means of promoting participation and efficiency. Local officials and politicians can be much more open to public scrutiny than national governments—and more accountable to the communities and individuals they are supposed to serve. And public projects—be they dams, roads, schools, or health programmes—all become more relevant and effective if the communities have a real say in their planning and implementation.⁷⁴

Targeting rural areas for integrated development programs also ranks high based on the criteria for telecommunications-related aid laid out in this report. By focusing on rural areas, aid policies can be designed to be both comprehensive and cost-contained. It is in rural communities, for example, that small scale pilot projects can be undertaken, and that aid policies can be most easily adapted to, and brought into line with, actual social, economic, and political conditions. By focusing at the community level, aid programs can also be customized to tap into local entrepreneurship and growth potential, which is increasingly to be found in Third World rural areas.

Many rural problems are, moreover, amenable to telecommunications-related interventions, so they can be dealt with jointly on a local, geographic basis, allowing for significant economies of scale and scope.⁷⁵ In fact, research shows benefits from telecommunication investments are greater when accompanied by investments in social services and other types of physical infrastructure. Rural areas are, moreover, unlikely to be served by the global market, so aid to support telecommunication will support rather than undermine telecommunications related trade.⁷⁶

■ Promoting Local, Bottom-Up Deployment Strategies

The demand for communication services in Third World rural communities is, according to most assessments, far greater than available supply. The market's failure to adequately meet this demand is due to at least four basic factors: 1) high fixed costs entailed in deployment; 2) national regulatory policies that discourage telecommunications investment and maintain artificially high prices; 3) problems entailed in aggregating demand among geographically dis-

⁷⁴ *Human Development Report 1993*, op.cit., footnote 13, p. 66. See also Michael Keren and Rur Ofer (eds.), *Trials of Transition: Economic Reform in the Former Communist Bloc* (Boulder, CO: Westview Press, 1992); and A. S. Bhalla, *Uneven Development in the Third World: A Study of China and India* (New York, NY: St. Martin's Press, 1992).

⁷⁵ The International Space University, *Global Access Tele-Health and Education System*, Final Report (Barcelona, Spain: The International Space University, summer 1994).

⁷⁶ Ruby Roy Dholakia and Bari Harlam, "Telecommunications and Economic Development: Econometric Analysis of the U.S. Experience," *Telecommunications Policy*, vol. 18, No. 6, August 1994, pp. 470–477.

persed users; and 4) the excessive information costs and institutional imperfections found in rural markets (see chapter 4). One way of promoting network deployment under such circumstances would be to lend support and provide incentives for local, bottom-up deployment initiatives. Efforts focusing at the local level can yield a number of benefits, far above and beyond the actual deployment of technology itself.

Bottom-up approaches to technology deployment are not without considerable precedent. In the United States, for example, a rash of independent telephone companies, community cooperatives, and mutual societies sprang up from the midwest to California to provide service once the Bell patents expired in 1894. Using local capital and labor, and assembling much of their equipment themselves—purchased in some cases through mail order catalogs such as Sears Roebuck and Montgomery Ward—rural communities in the United States were able to have telephone service long before it would otherwise have been made available to them (see box 1-12).⁷⁷

The United States experience is not unique. Similar efforts took place in a number of European countries, including Norway, Sweden, Finland and the Netherlands. As in the United States, these efforts served to speed the deployment of telecommunication services to rural and remote areas. Organizational approaches varied depending on local circumstances and political culture. In Finland, for example, telephone service was introduced by private individuals in 1877, before Finland had become a nation state. Absent government intervention, most telephone entities were organized as cooperatives, with subscribers exercising democratic control over

local telephone operations, services, and tariffs.⁷⁸

Using a decentralized approach was not a real option in many other countries because telephone systems belonged to national PTTs.⁷⁹ Today, however, this type of strategy is increasingly viable. Given global pressures for telecommunications privatization, as well as technology advances and network unbundling, it is again feasible to deploy communication technologies on an ad hoc and customized basis. In developed countries, large businesses were the first to pursue this strategy by setting up private networks to meet their own, specialized needs. Developing countries can similarly employ such an approach to serve users in small communities and rural areas.

Taking advantage of technology advance and the wider range of choices now available, many developing countries are already deploying less costly communication systems. In Asia-Pacific and Latin America, for example, countries are increasingly using very small aperture terminals (VSATs) to provide both public and private services (see figure 1-5).⁸⁰ In Tibet and other areas of the Pacific, the cost of providing VSAT is being reduced by using mesh networks that do not require the use of a central hub because the switching function is incorporated into each earth station.⁸¹ Systems such as these can support voice traffic, facsimile, and low-rate data transmission. Moreover, between four and 40 channels can be provided at each site, depending on a community's demographics. Using an international gateway in Shanghai, calls made on such phones in Asia can be routed via undersea cable to Hawaii, and from there to any place in the world.⁸²

⁷⁷ Malcolm Willey and Stuart Rice, *Communication Agents and Social Life* (New York, NY: McGraw Hill, 1935).

⁷⁸ Andrew Davis, *Telecommunications and Politics: The Decentralized Alternative* (New York, NY: St. Martin's Press, 1994).

⁷⁹ Ibid.

⁸⁰ "Satellite Communications in Developing Countries," *Satellite Communications*, September 1994, p. 18; see also Elsa Savedra, "The Rise of Solidaridad: A System 25 Years in the Making," *Satellite Communications*, December 1994, pp. 20–21; and Ray Markets, "In Support of Latin American Economies," *Satellite Communications*, July 1994, p. 30.

⁸¹ "The Tibetan Connection," *Satellite Communications*, January 1994; and Carol A. Politi, "Pacific Communications: Voice and Data Networking Via VSAT," *Satellite Communications*, February 1994, pp. 31–32.

⁸² Ibid.

BOX 1-12: The Deployment of Telephony in the Rural United States

When the Bell patents expired in 1894, American farmers and local entrepreneurs took it upon themselves to provide telephone services to their communities, relying almost exclusively on local capital and labor. These “independent” companies took a variety of forms. In local villages, for example, they were often established by doctors or other local professionals. In rural areas, such lines were generally set up by farmers who depended, almost exclusively, on subscriber contributions.¹ Expenses were kept to a minimum because local farmers built these networks using their own materials and tools. When necessary, they purchased equipment from independent manufacturers and through mail order catalogs distributed by such firms as Sears and Roebuck and Montgomery Ward. Having built their own networks, these farmers had little trouble maintaining them. Problems did arise, however, when farmers resorted to low-quality equipment and poles, which sometimes included barbed wire and fence posts.² Nevertheless, these bottom-up efforts were a great success. By 1917, for example, the state of Iowa had more phones on farms and rural residences than any other state in the union.³

These local telephone companies were organized in a variety of fashions. Systems that were set up to provide private service generally consisted of a single line owned and shared by a small group of people, and operated on an intercom basis. Privately owned commercial systems and commercial stock companies, although owned locally, were set up on a profit seeking basis. Mutual stock companies, which limited the sale of shares to users, were organized informally, their members paying a prorated share of capital expenditures, maintenance, and improvement fees. Farmer lines were typically organized as purely private or mutually owned systems. To join the Liberty Telephone Company in 1910, for example, one had to pay an upfront fee of \$25; provide a telephone, a pole, and some labor; as well as pay a flat annual fee of \$7 for service.⁴

¹ Dale Hatfield, “Speeding Telephone Service to Rural Areas: Lessons From the Experience in the United States,” occasional paper (Washington, DC: The Annenberg Washington Program, Communication Policy Studies, Northwestern University, May 1994). See also David Joshua Gabel, *The Evolution of a Market: The Emergence of Regulation in the Telephone Industry of Wisconsin* (Madison, WI: University of Wisconsin. 1987).

² Roy Alden Atwood, *Telephony and Its Cultural Meanings in Southeastern Iowa*, (Iowa City: University of Iowa, 1984).

³ Hatfield, op.cit., footnote 1, p.4

⁴ C. W. Meyer, “How We Built a Home-Owned Farmers Telephone Line,” *Telephony*, Nov. 16, 1912, as cited in Hatfield, op.cit. footnote 1.

SOURCE: Office of Technology Assessment, 1995.

In other countries, such as India, fixed cellular radio systems are often used.⁸³ These radio-based systems are easier to deploy than wireline services, and they have lower up-front investment costs, which can be shared among subscribers. They can, moreover, be deployed on a step-by-step basis, with new cells added in response

to growing demand. Because radio technology is more reliable, such systems also have lower maintenance costs.⁸⁴ To send data alone, digital radio can be used in conjunction with low earth orbiting satellites.⁸⁵ And, in a somewhat more novel fashion, rural telephone service can be provided by using telepoint technology in conjunc-

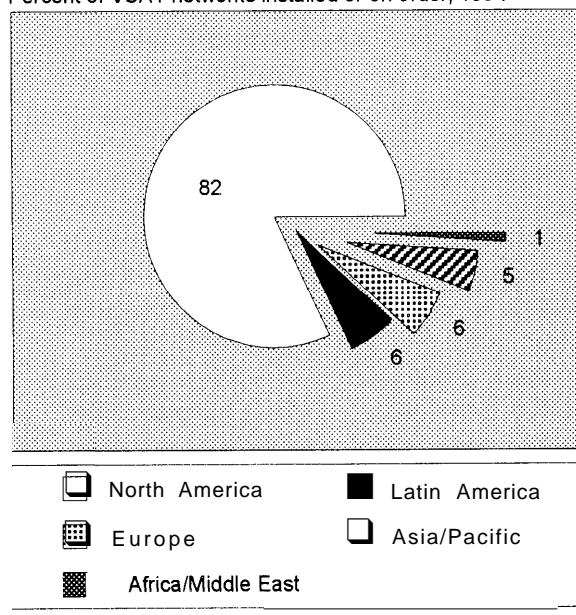
⁸³ Fixed cellular access systems have now been deployed in over 40 countries. Unlike mobile cellular systems, fixed cellular does not require the complex tracking and switching needed to trade and hand off conversations as users move from one cell to the next. Jean-Philippe Haag, “Fixed Cellular Solutions for Wireless Access,” *Telecommunications*, December 1994, pp. 57–61; see also Neil Weinstock, “Leap-frog,” *World Trade*, vol. 6, No. 19, November 1993, pp. 61–63.

⁸⁴ Rudi Westerveld and Ramjee Prasad, “Rural Communications in India: Using Fixed Cellular Radio Systems,” *IEEE Communications Magazine*, October 1994, pp. 70–74.

⁸⁵ Joe Sedlack, “Connecting Africa to the Rest of the World,” *Satellite Communications*, September 1994, p. 26.

FIGURE 1-5: International Distribution of VSAT Networks

Percent of VSAT networks installed or on order, 1994



SOURCE: "Satellite Communications, April 1994.

tion with handsets and paging equipment to notify users of incoming calls.⁸⁶

Communication costs can also be contained by serving individuals on a joint basis. Public phones, for example, can be set up at some strategic location within a community. Or, alternatively, a local business equipped with a phone might be willing to share access, given some concession from the community or the provider.⁸⁷ A telephone located in a shop or school will probably be within walking distance of most inhabitants because rural homesteads are generally located within or close to the center of a village.⁸⁸ These shared phone centers need not be limited to providing voice alone. Some, for example, now provide multimedia media applications such as remote learning (see box 1-13).

For delivering more costly or sophisticated services, networks might be terminated in communication centers where they can jointly support small and medium sized local enterprises, teleworking, long distance learning, public administration, remote access to health care, etc. For individual phone service, inexpensive public telephone booths might also be provided. Delivering services to a community center can produce a number of synergisms, stimulating both local enterprise as well as the demand for telecommunications services. This "telecottage" approach has a long history in Norway and Sweden, and it has been used more recently in countries such as Japan, Australia, and South Africa with considerable success.

In the future, national governments will no longer be the sole network and service providers in Third World rural communities. Increasingly they are being joined and/or bypassed by businesses, research organizations, and nonprofit groups, which are extending their networks to all corners of the earth. In Africa, for example, the nonprofit organization SatelLife uses UoSat 3 in conjunction with HealthNet to provide information to African medical schools and medical centers. To support this system, SatelLife has established ground stations in Eritrea, Ethiopia, Kenya, Mali, Mozambique, Niger, Tanzania, Uganda, Zimbabwe, and Zambia.⁸⁹ Similarly, Volunteers in Technical Assistance (VITA), a nonprofit organization founded in 1959, uses communication technologies to promote sustainable economic and human development in developing countries (see box 1-14).

Efforts by national governments, businesses, and nonprofit groups are playing an important role in advancing the deployment of technology and services to Third World rural communities. The impact of their networking efforts on economic development and rural life may be some-

⁸⁶ Bruce, et al, op. cit., footnote 54.

⁸⁷ M.L. Morris and S.E. Stavrou, "Telecommunication Needs and Provision to Underdeveloped Black Areas in South Africa," *Telecommunications Policy*, September/October 1993, p. 53.

⁸⁸ Ibid.

⁸⁹ Sedlack, op. cit., footnote 77.

BOX 1-13: The Taos Community Network

Founded in Taos, New Mexico, La Plaza Telecommunity was recently recognized by the National Information Infrastructure Task Force as one of the top six community projects in the United States. La Plaza provides residents of the Taos area with free dial-in access to a centralized UNIX server connected to a 28.8K modem bank. The La Plaza server is in turn linked to two computer labs and a Telecommunity Center where users without personal computers and modems may access the Internet via a T1, or 1.5 Mbit/sec, connection.¹

Currently, 15 percent of the local calling area population use La Plaza to access such information as a community calendar with the activities of local civic, religious and recreational groups, information on adult education, employment opportunities from the New Mexico Department of Labor and other sources, tourist attractions, local government initiatives and local health and business resources. The widespread availability of such information opens new opportunities for participation in local government, greater cooperation among public and private organizations and the stimulation of new businesses. Employees and volunteers of La Plaza are also providing local residents with valuable training in the use of the network and in the use of the Internet. La Plaza was founded through the cooperation of several individuals and organizations including the University of New Mexico-Taos Education Center, Los Alamos National Laboratory, the Fielding Institute, Apple Computer, and several other corporate sponsors.

¹ Patrick J. Finn and Cyd Strickland, "Community Networking: Bringing Communications On-line," La Plaza Telecommunity Foundation, Inc., Taos, New Mexico.

SOURCE: Office of Technology Assessment, 1995.

what limited, however, to the extent that they are "external" to the community and that users are relatively passive in relationship to them.⁹⁰

An alternative approach to network deployment in Third World rural communities, which would probably have a much broader social and economic impact, is to develop local systems, from the bottom up, much like those developed in the rural United States and Northern Europe at the turn of the century.⁹¹ Although such networks may require initial support and assistance, they would offer a number of benefits from the standpoint of foreign aid goals and the policy criteria identified above.

Supporting such networks, for example, would not be excessively costly, especially if the

technologies used could be deployed in stages as demand increased. Any support, moreover, would be temporary, since demand will probably cover costs over the long run. World Bank studies show that the demand for such service is relatively inelastic; consumers have been shown to be willing to pay for basic services, even when prices exceed those found elsewhere.⁹² Even greater demand can be anticipated if rural residents participate in network development, familiarizing themselves with the opportunities afforded and customizing systems to meet their needs.

Taking advantage of local labor and capital, the promotion of bottom-up networks can also foster entrepreneurship, which is essential for economic growth, as well as facilitate the trans-

⁹⁰ S.E. Goodman, L.I. Press, S.R. Ruth and A.M. Rutkowski, "The Global Diffusion of the Internet: Patterns and Problems," *Communication of the ACM*, vol. 37, No. 8, August 1994, p. 30.

⁹¹ Dale Hatfield, "Speeding Telephone Service to Rural Areas: Lessons From the Experience in the United States," occasional paper (Washington DC: The Annenberg Washington Program, Communication Policy Studies, Northwestern University, May 1994).

⁹² "Investing in Development," *The Economist*, June 25, 1994, p. 70.

BOX 1-14: Volunteers in Technical Assistance (VITA)

VITA's global communication system VITACOMM is composed of three different communication systems that provide communication and data to areas not served by traditional telecommunication infrastructures: VitaSAT, a low earth-orbiting satellite system; VitaPac, a terrestrial digital radio system; and VitaNet, a personal computer-based bulletin board mailing system. These three systems provide the foundation for much of VITA's development activities. For example, the Kibidula Farm Institute, an agricultural training center in the remote southern highlands of Tanzania, is two hours away from the nearest phone. Since August 1993, however, the Institute has been able to transmit data on a daily basis to its offices in the United States using a solar-powered earth station and VITA's low earth-orbiting satellite system. PLAN International, a nongovernmental organization that provides tutoring and financial assistance to 1,400 children in Sierra Leone, also uses VitaSat for data communication with its home office in Rhode Island.

SOURCE: Office of Technology Assessment, 1995.

fer of technology expertise.⁹³ In some cases, where appropriate technology is used, the local production of some network components may even be encouraged. Absent such technology transfer, infrastructure projects will probably fail over the long term owing to lack of maintenance and neglect.⁹⁴

Building local networks can also serve to strengthen local administrative and political competence, thereby fostering greater decentralization of governmental authority. In many developing countries, the authority to tax and to distribute social services has traditionally been concentrated at the national level.⁹⁵ As a result, local governments, as well as community organizations, have lacked the financial resources and political capital required to establish countervailing bases of political power. Cooperating to build local communication networks, community residents may not only develop the skills necessary for political participation, even more important, they can generate the type of "social capital" that

leads to cooperation in other areas of community life (see chapter 2).

Given this potential to strengthen local communities, one problem that may arise in establishing bottom-up networks is a political one. If, for example, governments in developing countries continue to jealously guard their monopolies, community networks may lack the means for interconnection with the public switched network. This possibility may be less likely in the future, however, because of the trends towards liberalization and privatization. But if rural communities are faced with such situations, some mutually advantageous arrangements will need to be worked out. National providers might agree, for example, to franchise the development of portions of the network to rural communities. And, if necessary, agreements might be made to allow national providers or privatized monopolies to subsequently acquire rural networks in exchange for some form of equity ownership.⁹⁶ Aid policies might be designed to encourage such arrangements.

⁹³ As described in *Human Development Report 1993*, "Some of the most effective contributions as a result of decentralization come from local labor and materials. In the Baglung district of Nepal, local committees working under the auspices of village councils built 62 bridges with little outside help, covering the whole district in five years. They used local materials and artisans, and no one was paid. Each bridge cost only a quarter of what the central government would have spent, and was built three to four times faster." *op. cit.*, footnote 13, p. 75.

⁹⁴ According to the United Nations Development Program, the local involvement and training in 34 village water projects was significant in accounting for their long-term success. *Ibid.*

⁹⁵ *Ibid.*, pp. 65–73.

⁹⁶ Bruce, et al., *op. cit.*, footnote 54, p. 465.

■ Targeting and Leveraging All Available Resources

Reflecting the growing appreciation of the role communication technology can play in fostering economic development, there are today a number of forces promoting its greater diffusion. These activities are both public and private, national and multinational, trade-related and aid related. Telecommunications-related aid policies that are designed to leverage all these complementary forces are bound to be the most cost effective. Equally important, they will probably have a synergistic effect resulting from many positive externalities. Communications and economic development serve not only to foster one another, they also feed on themselves.

Alluding to these possibilities, Vice President Gore—speaking to the International Trade Union (ITU) World Development Conference held in Buenos Aires in March 1994—noted that the time was right “to bring all the communities of the world together via a planetary information network.” Calling on legislators, regulators, and business executives to cooperate in building and operating this global information infrastructure (GII), he urged conference delegates to promote policies in support of private investment, competition, and flexible regulations promulgated by independent regulators.⁹⁷

Vice President Gore’s vision of bringing all of these forces together in support of a global information infrastructure is very apt. It comes at a time when all major donor countries—struggling with trade and budget deficit problems—are being called on to reduce foreign aid.⁹⁸ Such pressures are particularly intense in the United

States, which accounts for one-fifth of all government foreign aid.⁹⁹ Gore’s announcement reflects, moreover, the growth of private investment in Third World countries, which is now three times greater than the aid provided by foreign governments, totaling \$179.9 billion in 1994.¹⁰⁰

Speaking to the United Nation’s social summit held in Copenhagen, Vice President Gore reemphasized the need to move beyond the present institutional framework for providing aid. Noting that foreign assistance has not always been used in accordance with the purposes for which it was provided, Gore posited that, within five years, nearly half of all aid provided by the U.S. Agency for International Development would be channeled to organizations instead of Third World governments.

Other major donors agree that steps must be taken to assure that foreign assistance is used more effectively. Many have suggested that new institutional methods and criteria such as targeting, decentralization, appraisal, evaluation and monitoring may need to be adopted. The targeting of women in allocating assistance is considered to be essential by all.¹⁰¹

The prospect for developing new types of cooperative arrangements is especially promising in the case of telecommunication-related aid. Most, if not all, of the potential participants have something to gain by working together. Not surprisingly, therefore, there are already a growing number of telecommunications-related cooperative efforts underway that, drawing on a broad range of institutional resources, seek to achieve

⁹⁷ “Gore Backs Global Infrastructure at ITU Meeting,” *Telecommunication Reports*, Mar. 28, 1994, p. 24.

⁹⁸ In 1994, aid to developing countries dropped by 1.8 percent, after falling 5 percent the year before. These declines reflect in part the cut in U.S. aid. “Aid to Developing Nations Shrinks,” *The Wall Street Journal*, June 29, 1995, p. A12.

⁹⁹ U.S. foreign aid totals approximately \$13 billion a year, about half of which is devoted to programs relating to health, family planning and economic development and administered by the U.S. Agency for International Development. Viewed in terms of per capita gross domestic product, the US devotes only .15 percent of GDP to foreign aid, far less than all other industrial countries, and this amount has continued to decline over the past several years. Barbara Crossette, “Foreign Aid Budget: Quick, How Much? Wrong,” *The New York Times*, Feb. 27, 1995, p. A6.

¹⁰⁰ “Private Investment to Poor Nations Hits a Record High at World Bank,” *The Washington Post*, Associated Press, Jan. 23, 1995, p. A14.

¹⁰¹ “Governments Agree That Targeting and Monitoring of DOA Could Increase Benefits to the Poor,” UNCTAD Press Release TAD/INF/2554, June 16, 1995.

complementary national, international, and private sector goals.

One such initiative, for example, is WorldTel, an innovative investment venture that was recently launched by the International Telecommunications Union (ITU). Organized entirely around business principles, WorldTel was set up to help businesses identify and execute profitable telecommunications investment opportunities in developing countries. Private sector support for the plan spans the globe, including companies such as AT&T, Ameritech, Sprint, Cable and Wireless (United Kingdom), NEC (Japan), Nokia (Finland), Teleglobe (Canada), Telekom Malaysia, and Telstra (Australia). A number of banks have also expressed interest in WorldTel, which—initially capitalized at \$30 million to \$50 million—expects to realize real rates of return on equity of up to 25 percent or more. By safeguarding investor interests, WorldTel seeks to attract funds to high-risk countries where telecommunications investment would otherwise be unlikely. Prime clients will be those Third World countries that have regulatory and business environments conducive to commercially viable partnerships. As venture partners, investors will contribute information and expertise as well as funds. Focusing on wireless technology, most projects will be carried out on a build, operate, and transfer basis. If successful, these joint ventures will generate new markets, thus benefiting both First and Third World nations alike.¹⁰²

Nonprofits are similarly working with governments and businesses to promote development goals through networking. For example, the Caribbean/Latin American Action (CLAA), a nonprofit organization operating in Latin America and the Caribbean, is setting up a Telecommunication Task Force intended to improve access to health care throughout Latin America and the Caribbean. The task force's first initiative is a pilot telemedicine project that will examine how better communication among rural health clinics and six hospitals throughout Costa Rica might

improve rural health care. AT&T has supported this project by donating several of its Picasso Still-Image Phone systems, which allow doctors to transmit images, records, and x-rays over ordinary telephone lines. CLAA is also working with the U.S. Chamber of Commerce's Western Hemisphere Telecommunications Committee, the Pan American Health Organization, the Inter American Telecommunications Commission (CITEL), the World Bank, and other organizations to expand the pilot project into an "Americas HealthNet" that would connect rural health centers throughout the region to the Internet, thus allowing health professionals to access medical databases and other health resources throughout the world.

The CLAA has also helped to form AgroAmericas, Inc., a nonprofit association of agricultural and information technology companies, which was established to increase agricultural trade in the Western Hemisphere through data networking. AgroAmericas seeks to stimulate growth and productivity in this important sector by first establishing a Hemispheric Electronic Network, AgriNet Americas, that provides accurate and timely trade information to agricultural companies of all sizes and from all sectors. Sprint Corp. and the Inter-American Institute for Cooperation on Agriculture are important contributors to the initiative, which will eventually provide member companies access to trade databases from the Organization of American States and the U.S. Department of Agriculture, as well as historical trade statistics, tariff schedules, current prices, and information on individual import/export companies.

A number of projects supported by USAID are similarly designed to promote cooperation among public and private sector telecommunication stakeholders. With grants from USAID, for example, the National Telephone Cooperative Association (NTCA) has launched an international program to promote rural telephony in countries such as Hungary, the Philippines,

¹⁰² *Telecom Highlights International*, Feb. 15, 1995, p. 6; and Karen Lynch, "Telcoms Funding Body Set," *Communications Week International*, Feb. 6, 1995, p. 3.

Micronesia, Bolivia, Poland, the People's Republic of China (non-USAID funded), and Tanzania.

In promoting rural networks, NTCA generally works in three stages beginning with the education of appropriate government leaders and policy makers about the benefits of local networks. Government champions are needed to assure that local groups can reach an appropriate and timely interconnection agreement with national regulators. Secondly, NTCA identifies local institutions and community leaders who want to participate. Key supporters must garner community support and build a consensus for the cooperative's ownership structure and operational guidelines. NTCA provides training and assistance in all aspects of network development—the preparation of financial and technical feasibility studies, telecommunications management, engineering, and actual equipment installation. Then, after performing a detailed country assessment of the financial, regulatory, political and social environment, and the status of existing communication and other infrastructure, NTCA works to foster additional cooperatives throughout the country.

There are a number of benefits to be gained from collaborative efforts such as these. By working with, and gaining the support of all relevant players, it is possible to circumvent many potential and unforeseen road blocks. With First World businesses and Third World government organizations and local institutions cooperating as partners in joint ventures, the potential for technology transfer and the sharing of business expertise is great. At the same time, the need for monitoring and evaluation is likely to be less relevant because projects will be held more accountable to the conventional business standard—the bottom line. Moreover, by substituting business personnel, researchers, and members of nonprofit organizations for traditional aid field workers, the costs of projects can be more easily contained.

By collaborating to promote information networking for development purposes even greater gains can be made. Network deployment encour-

ages social, economic, and political interaction, which in turn stimulates network development and deployment. When networks are subsequently linked to other networks, the benefits grow proportionately. The key is to plant the seeds and foster their germination.

These network seedlings can take the simple form of an Internet host, or a regional e-mail network such as that set up by CERPOD—the Center for Applied Research on Demography and Development—in Bamako, Mali, to communicate with colleagues in other Sahelian countries.¹⁰³ It was, in fact, this type of “demand pull” pattern of deployment that characterized the evolution of Costa Rica's network, which has now become a regional hub providing services to other Central American countries. Grants and other donations were sought to build the infrastructure on an incremental basis, in response to growing demand. Similarly, in Zambia, the network that was originally built by the deputy minister of health to connect to the provincial hospitals was gradually extended to other users, so that today it is one of the most successful networking efforts in subequatorial Africa.¹⁰⁴

One way to foster such kinds of collaborative efforts would be to require aid applicants to include specific plans for collaboration, developed jointly with all the participants, as part of their project proposals. Because the transaction costs entailed in identifying, matching, and negotiating such collaborative agreements will probably be prohibitive for small and/or local groups seeking assistance, aid officials might focus greater attention on brokering such relationships. One useful tool would be an electronic networked database—routinely updated and incorporating feedback from previous aid and telecommunications projects—that could help development groups to identify and communicate with collaborators, working together in much the same fashion as those engaged in electronic commerce.

¹⁰³ *Telecommunications of the ACM*, August 1994, vol. 37, No. 8, p. 28.

¹⁰⁴ *Ibid.*