

Chapter 26

Converging Technologies and Changing Realities: Toward Universal Access to Telecom in the Developing World

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1.0 Information and Development

This chapter begins with the premise that information is fundamental to socio-economic development, and that therefore policymakers must rethink definitions of universal service to take into consideration changes in technology as well as changes in user needs. In the past, universal service has been defined in terms of individual access. However, we need to broaden the definition to encompass access to services that telecom can deliver to individual residents – including education, health-care, access to information services for libraries, community organisations and small businesses. This chapter proposes goals for universal service, along with strategies for achieving them and monitoring progress.

2.0 The Challenge of Change

The telecom policy environment continues to change dramatically, driven by technological innovation which results in new equipment and services, but also new entrants and alliances between companies with experience in a wide range of information industries from telecom to broadcasting to computer hardware and software to publishing.

Four major trends are driving these changes:

- **Capacity:** New technologies such as optical fibre have enormous capacity to carry information. They can be used for anything from entertainment and distance education to transmission of highly detailed images for remote medical diagnosis. Satellites also offer a tremendous amount of bandwidth.
- **Digitisation:** Telecom networks are becoming totally digital, so that any type of information, including voice and video, may be sent as a stream of bits in “compressed form” and reconstructed for use at the receiving end. Compressed digital video can be used to transmit motion video over as few as two telephone circuits (128 kbps). Compressed video offers the possibility of relatively low cost video for distance education and training.
- **Ubiquity:** Advances in wireless technology such as cellular radio and rural radio subscriber systems offer affordable means of reaching less isolated rural

customers. These technologies make it possible to serve rural communities without laying cable or stringing copper wire, and to provide mobile and portable communications virtually anywhere.

- **Convergence:** The convergence of telecom, data processing, and imaging technologies is ushering in the era of multimedia, in which voice, data, and images may be combined according to the needs of users. Distinctions between traditional sectors of telecom, information processing, and broadcasting are increasingly arbitrary and perhaps irrelevant.

These changes in the telecom sector are occurring within a context of economic restructuring, with services now the most rapidly growing sector. This structural shift is mirrored in developing economies, where public and private services now are outpacing economic growth in agriculture and industry. Yet the shift to services is only part of the change. Information-based activities account for the largest part of the growth in services, and other sectors are becoming increasingly information intensive. As development sectors are drawn into the global economy, farmers and manufacturers alike need information about prices and new markets for their products. Job seekers need more education to prepare to enter the work-force, and employees need training to handle new tasks and equipment.

3.0 Access to Telecom: The Gap Remains

Although there has been a dramatic increase in telecom investment in the past decade, there are still enormous gaps between the developed and developing world in accessibility to telecom, and within the developing world, between urban and rural areas. While there are now almost 50 lines per 100 people in high income industrialised countries, there is still an average of less than one line per 100 in the poorest countries. The gaps are even greater between urban and non urban areas. There are almost three times as many telephone lines per 100 in the largest city of lower middle income countries as in their rural areas, and more than seven times as many lines per 100 in the largest city of low income countries as in their rural areas. These gaps are even more significant given the fact that more than 50 percent of the population, and as many as 80 percent in the poorest countries, live in rural areas. (See Table 1.)

Income Level	Teledensity (lines/100 pop)	Urban Density	Rest of Country
High Income Countries	48.8	51.7	48.5
Upper Middle Income Countries	12.9	21.9	10.6
Lower Middle Income Countries	8.1	19.0	6.8
Low Income Countries	0.9	5.2	0.7

Table 1 – Access to Telecommunications

Source: ITU, World Telecommunication Development Report (ITU 1995a)

4.0 Indicators of Pent-up Demand

4.1 Access to Television vs. Telephones

The lack of telephones cannot necessarily be attributed to lack of demand or purchasing power. In many developing countries, television sets are much more prevalent than telephone lines. In industrialised countries, both television sets and telephone lines are almost universally accessible. However, in lower middle income countries there are almost two and a half times as many television sets as telephone lines, and in low income countries, there are more than 13 times as many television sets as telephone lines (see Table 2). The problem appears to be a bottleneck in provision of telephone service rather than lack of sufficient disposable income to pay for telephone calls.

Put another way, it appears that where television is available, a significant percentage of families will find the money to buy television sets. These numbers indicate a potential pent-up demand for other communications services, and the availability of disposable income if the service is deemed important.

Income Level	Tel Lines /100	TV Sets /100	Ratio TV Sets/Tel Lines
High Income Countries	48.8	59.7	1.2
Upper Middle Income Countries	12.9	24.1	1.9
Lower Middle Income Countries	8.1	19.8	2.4
Low Income Countries	0.9	11.8	13.1

Table 2 – Access to Telephones and Television Sets

Derived from: ITU, World Telecommunication Development Report (ITU 1995a).

4.2 Indicators of Entrepreneurship

Another approach to determining whether current strategies for telecom investment are somehow missing the mark is to examine indicators of communications entrepreneurship. While comparative data are not available, the following activities in a country would indicate that there are entrepreneurs willing to offer communications services, and customers to support them:

- **Video shops:** shops that rent video cassettes and/or video recorders and players. These are found in even relatively poor developing countries where there would appear to be very little disposable income for most families.
- **Cable television systems:** cable television systems (government authorised or otherwise) that have been installed to provide access to television channels (e.g. as from a satellite) for a fee. The most striking current example is India, where cable television systems have sprung up in urban neighbourhoods to deliver programming from AsiaSat. Cable and MMDS (microwave multipoint distribution systems, also known as “wireless cable”) are expanding rapidly in other developing Asian countries such as Thailand and the Philippines.
- **Kiosks and copy shops:** entrepreneurs who offer communications facilities such as telephones and facsimile services. Some countries such as Indonesia have introduced this model for payphone service, while retaining government control over operation of the public switched network. Entrepreneurs typically retain a percentage of the toll revenues.

5.0 The Need for Vision: A Developmental Approach

Telecom can be used for a wide range of applications – in education, health-care and social services, in small businesses, in community development and other economic activities. The operative word is can – whether these applications will be widely implemented may depend on the vision of policymakers.

To begin, we need a vision of the future which includes both social and economic goals for development, and which recognises that information – access, sharing, and

dissemination – will contribute to achieving these goals. The next step is to ensure that people throughout the developing world have telecom facilities and services available to meet their information needs.

Four fundamental criteria are critical in implementing this vision:

- **Accessibility:** We should strive to ensure that the widest range of telecom facilities and services is available throughout the each country, and that everyone has access to basic services.
- **Equity:** We need to ensure that there are not major disparities in availability and price of telecom technologies and services. That is, in addition to maintaining universal access to basic services (however they are to be defined), we need to ensure that people are not penalised because of where they live or which companies offer services to them. For example, information services need to be available in rural as well as metropolitan areas, in inner cities as well as suburbs. And rates for access to these services should not vary significantly throughout the country even if they are provided by different companies or use different technologies.
- **Connectivity:** In an era of new technologies and competing providers, we need to ensure that there is universal connectivity, so that people can communicate with each other and with information sources regardless of who provides their services or what technology links them to networks.
- **Flexibility:** We must recognise that changing technologies and the introduction of new services mean that we will have to be flexible in setting targets and adjusting to change.

6.0 Universal Service: A Moving Target

With the almost daily announcements of new products and new industry alliances, it is obvious that both the technology and the industry itself are changing dramatically, and that policymakers and regulators must expect change to be the norm in telecom. Universal service must therefore be a moving target. Goals should not be stated in terms of a specific technology or service provider (such as optical fibre to the home provided by the local telephone company) but rather in terms of functions and capabilities (such as ability to transmit voice and data and possibly video in some cases, and ability to access information services).

Because of the importance of information access to socio-economic development, the goals should apply not only to residential customers but to facilities such as schools, clinics, libraries, and community centres. Therefore, the unit of analysis used to measure universality needs to be rethought. In the past, universal service was defined in terms of individual access, typically using the household as the unit of analysis. However, this definition needs to be broadened to encompass access to services that telecom can deliver to individual residents through community or institutional access. Thus, we might have a multi-leveled definition of access, identifying requirements within households, within communities and for education social service providers. For example:

- **Level One:** household access;

- **Level Two:** community access (e.g. libraries, post offices, community centres);
- **Level Three:** institutional access (schools, hospitals, clinics, etc.).

The following near-term universal service goals are proposed for developing countries. Planners will need to modify these goals to take unmet demand and resource constraints into consideration. Goals might include:

- **Universal access to basic communications:** Access may be defined using a variety of criteria such as:
 - ◊ population: a telephone for every permanent settlement with a specified minimum population;
 - ◊ distance: a telephone within ‘x’ kilometres of all rural residents;
 - ◊ time: a telephone within a five minute walk in cities; within an hour’s walk or bicycle ride of all rural residents.
- **Reliability:** Standards for reliable operation and availability; quality sufficient for voice and facsimile.
- **Emergency Services:** A simple way to reach help immediately, so that anyone, including children and illiterate adults, would be able to call a hospital, police, etc.
- **Pricing:** Pricing based on communities of interest; for example, to regional centres where stores and government offices are located; to other locations where most relatives are located (surrounding villages, regional towns, etc.).

7.0 The Danger of Electronic Islands and Ghettos

National goals of interoperability and openness will be critically important to ensure that users are not left on “electronic islands” because their service provider is not interconnected with other networks. An analogy would be the early stages of commercial e-mail. Each commercial e-mail service was autonomous, so that communication between subscribers to different services was impossible or at least very cumbersome, although the Internet now links many of these e-mail islands.

Even if networks are connected, there is still the danger of electronic ghettos, in low profit regions such as inner cities and rural areas, that carriers and service providers may have little incentive to serve or upgrade. There is already evidence of rural ghettos in the US: rural areas served by the Bell Operating Companies and large independents have generally been the last to be upgraded to digital switching, and to have switches equipped with Signalling System 7 (SS7) and ISDN. Ironically, customers of some rural telephone companies that have modernised are still effectively isolated if connecting carriers do not offer similar services.

Pricing can also result in electronic ghettos, even where services are available. Fibre links will not bring promised benefits for health and education if health services and schools cannot afford to use them. Similarly, consumers in rural areas and inner cities will not benefit from communication and information services priced beyond their reach.

The goal should therefore be universal access to a wide range of services at comparable (not necessarily identical) prices across the country.

8.0 Equity Issues: Beyond the Marketplace

Access to telecom includes affordability as well as proximity. For example, lack of telephone service across the US is generally related more to income than to other factors such as isolation or ethnicity. Therefore, it appears that there will continue to be a need to subsidise services for some customers who are unable to afford connection to the network or basic monthly charges. However, internal cross-subsidies can no longer be the solution in competitive environments. Strategies that should be examined include:

- **Targeted subsidies:** In a competitive era, rather than internal cross-subsidies, regulators need to use targeted subsidies such as reduced monthly rates for low income subscribers (known as Lifeline in the US) and reduced installation charges (known as Linkup in the US). As the definition of universal changes (the “moving target”) it may be necessary to extend these models for targeted subsidies to cover basic access to information services.
- **Contributions from all providers:** All providers of interactive telecom services, including local exchange carriers, interexchange carriers, and others such as interactive cable or satellite telecom service providers should be included in any scheme to fund targeted universal service subsidies.
- **High cost areas:** There may be some isolated locations where the cost of installing telecom facilities is prohibitive to all but wealthy residents. Solutions may include subsidies to the carriers along the model of the US industry-administered High Cost Fund, interest-free loans or extended payments schedules for subscribers, and/or incentives to carriers to use lower cost wireless rather than wireline transmission links.

9.0 Using Incentives

Today, a majority of developing countries are running their telecom administrations as autonomous government-owned enterprises, and many are in the process of privatising these operations. Yet, a more entrepreneurial national monopoly may not have adequate incentives to invest in facilities to accomplish the goals outlined above, given the unmet demands of business and upper middle class residential customers in the cities. The following are some strategies that can create incentives to invest in rural and less profitable areas:

- **Incentive Regulation:** Some countries and US states have introduced changes in regulation that allow carriers considerable pricing flexibility in return for meeting certain conditions (e.g. price caps). An alternative to financial incentives would be a management by objectives approach where policymakers and/or regulators would set objectives and carriers would be rewarded for achieving them. These objectives could include service upgrades such as extension of service to rural areas or meeting quality of service targets. For example, the Philippines is

requiring new franchisees for international gateways and cellular systems to install a specified number of lines in currently unserved rural areas.

- **Investment Incentives:** Several countries including Indonesia and Thailand have encouraged investors to build new facilities through schemes known as Build Operate Transfer (BOT) in which the investors build the network, operate it and receive a percentage of the revenues for a specified period, and then turn it over to the government. Joint ventures may also include incentives for investment in rural areas.
- **Service Incentives:** Some countries have encouraged private entrepreneurs to offer telecom services. For example, in Indonesia and Rwanda, entrepreneurs may install telephones in kiosks that also sell soft drinks and newspapers. The entrepreneurs receive a percentage of the revenue, and typically stay open for longer hours than post offices, and provide a secure location for the telephone.
- **Limiting Exclusivity:** While investors may require a stable industry environment to commit capital, countries must resist pressure to issue indefinite or very long-term licenses. The technology and the industry is changing too fast for countries to assume that what seems adequate investment and performance today will be adequate five years, let alone ten years from now.
- **Local Companies:** Although in most countries there is a single carrier that provides both local and long distance services, it may make sense to delineate territories that can be served by local entities. In the US, the model of rural cooperatives fostered through the Rural Electrification Administration (REA) has been used to bring telephone service to areas ignored by the large carriers. Local enterprises are likely to be more responsive to local needs, whether they be urban or rural. An example of this approach in urban areas is India's Metropolitan Telephone Corporation established to serve Bombay and Delhi. Local companies also, for example, provide telephone service in Colombia, and cooperatives have been introduced in Hungary. A disadvantage of this approach is the need for local expertise to operate the system, which is likely to be in particularly short supply in many developing countries.
- **Resale:** Third parties may be permitted to lease capacity in bulk and resell it in units of bandwidth and/or time appropriate for business customers and other major users. This approach may be suitable where some excess network capacity exists (e.g. between major cities or on domestic or regional satellites). Resale is one of the simplest ways to introduce some competition and lower rates for users, but is not legal in most developing countries, even where some excess capacity exists in backbone networks.

It should be noted that wireless technologies could change the economics of providing rural services, making rural franchises much more attractive to investors. For example, while companies such as GTE and US West are selling rural franchises, other companies with a more optimistic assessment of rural profitability are buying them.

10.0 Monitoring Progress

It is likely that the marketplace will be the best mechanism for bringing innovative and affordable services to most developing regions. However, policymakers will need to monitor progress to determine whether there are disparities in access, quality of services, or pricing that need to be addressed. The following are proposed indicators for a “National Universal Service Report Card.” The intent is to develop some simple ongoing way to measure progress, especially when staff and funding resources for extensive data collection are limited.

Proposed indicators to monitor for the report card include:

10.1 Availability of Service

- **National teledensity:** While imperfect, these data are routinely available from telecom administrations. To provide a better estimate of urban/rural access without thrashing out a universal definition of rural (rural India and China are very different from rural Papua New Guinea or Mongolia), these data could be disaggregated to show:
 - ◇ Teledensity in cities over ‘x’ million population (or largest city where there is only one major urban centre in the country);
 - ◇ Teledensity in the rest of the country (while this figure will overestimate rural teledensity, because it will include major towns, its advantage is that data are likely to be available to make this calculation. The ITU’s *World Telecommunication Development Report*, for example, only includes data on the largest city and rest of country. These data are themselves quite striking in revealing disparities in access, but it would be useful to remove cities completely to get a better estimate of rural communications, particularly in countries which have many large cities.).

10.2 Quality of Service

- average length of time to obtain service (urban and non-urban);
- average time to repair service (urban and non-urban);
- percentage of lines connected to digital switches;
- percentage of lines with direct dial service, subscriber trunk dialling (national and international); and
- percentage of multi-party lines (urban and non-urban).

10.3 Price

Here the relevant variable is not absolute cost of access, but the cost relative to the income of the users. For example, if a line costs more to install than a family’s annual income, telecom cannot really be considered accessible.

- *price of installation:* as percentage of annual average per capita income;

- *monthly connection charge*: as percentage of monthly average per capita income;
- *price of three minute, 100 km., domestic daytime call*: as percentage of monthly average per capita income;
- *price of three minute, 500 km., domestic daytime call*: as percentage of monthly average per capita income.

10.4 Internet Access

- number of Internet gateways, per million population;
- percentage of universities with Internet connection; and
- percentage of secondary schools with Internet connection.

10.5 Mobile Communications

- *percentage of land area* covered by mobile services; and
- *percentage of population* in areas covered by mobile services.

National governments would set targets for each of these benchmarks, perhaps following guidelines adopted by the ITU or other organisations for countries at various stages of development. These data could be collected and published annually by the ITU and/or by regional organisations. The data could be useful for numerous purposes, e.g.:

- for the countries themselves, to determine how they rate compared to other countries in their region or with similar economic profiles;
- for use in setting national goals for telecom access;
- for use in monitoring the effects of restructuring of their telecom sectors: What changes have there been in availability of service? Pricing of service? Introduction of new services? And so forth;
- for international development organisations such as the World Bank, regional development banks and bilateral aid agencies to prioritise needs for financial and technical assistance;
- for investors: financial institutions, entrepreneurs, carriers, etc., to determine where there are opportunities to invest in provision of facilities or services.

11.0 Implementing the Vision

The above approach, which may be termed a “development-based approach to universal service” is based on the assumption that telecom planners must consider the socio-economic implications of telecom policies. This approach assumes a broadening of the definition of “public interest” beyond the simple assessment of connection to the network and pricing of basic services. It involves an analysis of the potential benefits of access to education and social services; the impact of geographical as well as income-related

disparities; the potential economic benefits of affordable access to information for both individual and collective activities.

Many of the steps in implementing the vision will need to come from other entities: the communications industries themselves; government agencies that can fund pilot projects; and users who can identify needs and develop strategies to aggregate demand and share costs. Yet policymakers must take a prominent role, both in the agenda-setting process and devising strategies to ensure that telecom technologies and services are accessible, and are available to all to meet the challenges of social and economic development in the Information Age.

