ICT INFRASTRUCTURE IN EMERGING ASIA

Policy and Regulatory Roadblocks

Edited by
Rohan Samarajiva
Ayesha Zainudeen

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List of Abbreviations

3G	Third generation
ADC	Access deficit charge
ADSL	Asymmetric digital subscriber line
AGR	Adjusted gross revenue
AMPU	Average margin per user
APJII	Asosiasi Penyelenggara Jasa Internet Indonesia
APKOMINDO	Association of Computer Businesses (Indonesia)
ARPU	Average revenue per user
ASEAN	Association of Southeast Asian Nations
ASIST	American Society for Information Science and Technology
AT&T	The American Telephone and Telegraph Company
AWARI	Association of Cybercafés (Indonesia)
BCL	Bharti Cellular Limited
BDT	Bangladesh Taka
BOP	Bottom of the Pyramid
BRTI	Badan Regulasi Telekomunikasi Indonesia
BSNL	Bharat Sanchar Nigam Limited
BSO	Basic service operator
BT	British Telecom
BTTB	Bangladesh Telegraph and Telephone Board
CDMA	Code Division Multiple Access
CFA	Cease Fire agreement
CI	Confidence interval
CLI	Caller Line Identity
CoE	Communication for Empowerment
CPP	Calling party pays
DEL	Direct exchange line
DGPT/DG Postel	Direktorat Jenderal Pos dan Telekomunikasi (Indonesia)

DLN	Digital Library Network
DoT	Department of Telecom
EBITDA	Earnings before interest, taxes, depreciation, and amortization
EDR	Eastern Development Region
EMH	Emerging Markets Handset
et al.	et alii
EU	European Union
FLLRIC	Forward looking long run incremental costs
FMCG	Fast moving consumer good
FMS	First Mile Solutions
FOSS	Free and Open Source Software
GB	Grameen Bank
Gb	Gigabyte
GDP	Gross domestic product
GHz	Gigahertz
GI	Guidelines on interconnection
GIS	Geographic information system
GNI	Gross national income
GOSL	Government of Sri Lanka
GP	Grameenphone
GSM	Global System for Mobile Communications
GSMA	GSM Association
GTC	Grameen Telecom
HMG	His Majesty's Government
i2bc	Indonesia Infocom Business Community
ICT	Information and communication technology
ICT4D	Information and communication technologies-for-development
IDC	Internet Data Centre
IDR	Indonesia Rupiah
IDRC	International Development Research Centre
IEEE	Institute of Electrical and Electronic Engineers
IGOS	Indonesia Goes Open Source
ILD	International long distance
IMF	International Monetary Fund
INDOWLI	Indonesian Wireless Internet Community (Indonesia)
INR	Indian Rupee

IP	Internet protocol
IPLC	International private leased circuits
ISP	Internet service provider
IT	Information technology
ITB	Institute of Technology, Bandung
ITU	International Telecommunication Union
IUC	Interconnection usage charge
Kbps	Kilobits per second
km	Kilometer
KPPU	*Komisi Pengawas Persaingan Usaha*
LAN	Local area network
LCS	Least-cost subsidy
LIRNE	Learning Initiatives on Reforms for Network Economies
LKR	Sri Lanka Rupee
LLU	Local Loop Unbundling
LTTE	Liberation Tigers of Tamil Eelam
MARR	Multi-access radio relay
MASTEL	Masyarakat Telematika Indonesia
Mbps	Megabits per second
MFI	Microfinance institution
MOU	Minutes of use
MP3	MPEG-1 audio layer 3
MSAT	Mobile satellite
MSP	Multi-stakeholder partnership
MTNL	Mahanagar Telephone Nigam Limited
NGN	Next generation networks
NLD	National long distance
NOC	Network operator center
NPR	Nepal Rupee
NTA	Nepal Telecommunications Authority
NTC	Nepal Telecommunications Corporation
NTP	National Telecom Policy (India)
OECD	Organization for Economic Co-operation and Development
OFCOM	Office of Communications (UK)
OFTA	Office of the Telecommunications Authority (Hong Kong)
OFTEL	Office of Telecommunication (UK)

PC	Personal computer
PCM	Pulse code modulation
PCO	Public call office
PoP	Point of presence
PTT	Posts telephones and telegraphs
RCP	Rural community phone
RDEL	Rural direct exchange line
RFA	Request for applications
RPP	Receiving party pays
RTDF	Regional Telecommunications Development Fund
RTS	Rural telecom service
SAARC	South Asian Association for Regional Cooperation
SDCA	Short distance calling area
SEC	Socio-economic classification
SLTL	Sri Lanka Telecom Limited
SMS	Short message service
SSA	Secondary switching area
TCE	Transaction cost economics
TCIL	Telecommunications Consultants India Limited
TCO	Total cost of ownership
TM	Telekom Malaysia
TRAI	Telecom Regulatory Authority of India
TV	Television
UHF	Ultra high frequency
UK	United Kingdom
UP	Uttar Pradesh
USA	United States of America
USD	United States Dollar
USF	Universal service fund
USL	Universal service levy
USO	Universal service obligation
USOF	Universal service obligation fund
UTP	Unshielded twisted pair
VDC	Village Development Council
VHF	Very high frequency
VNO	Virtual network operator
VoIP	Voice over Internet protocol

VP	Village Phone
VPO	Village phone operator
VPT	Village public telephone
VSAT	Very small aperture terminal
WAP	Wireless application protocol
WDR	World Dialogue on Regulation for Networked Economies
Wi-Fi	Wireless Fidelity
WiMAX	Worldwide Interoperability for Microwave Access
WLL	Wireless local loop
WLL-F	Wireless Local Loop-Fixed
WLL-M	Wireless in local loop with limited mobility
WWII	World War II

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Introduction

What is... and What Could Have been...

This book, and the research program which it draws from, rests on the assumption that connectivity—the opportunity (but not the compulsion) to engage in electronically-mediated communication (synchronous as well as asynchronous), information retrieval in various forms, and publication—is good. This assumption is not, however, a religious belief. It rests on evidence, if not proof.

Why is Connectivity Good?

After much debate, it is now recognized that economic growth is a necessary condition for the alleviation of human misery (or for the achievement of human development). The relationship between the ability to communicate over distance using technological means and economic growth has been much discussed (Cronin et al., 1993; Cronin et al., 1991; Cronin et al., 1993; Hardy, 1980; Mansell and Wehn, 1998; Menou, 1993; Samarajiva, 1995; World Bank, 1999). Correlation is beyond dispute, but the case for causation is unlikely to be fully established. Development requires many inputs; communication and knowledge being only some of them (see Figure 1).

Establishing causation was considerably more important prior to the 1990s when public funds, domestic as well as donor, were still the main source of investment for expanding access to information and communication technologies (ICTs), defined as including, but not limited to, telecom. Access to telecom is the foundation for ICT use. In many developing countries and among the poor, telecom (and perhaps radio and TV) constitute the total experience with ICTs.

The increased private investment in telecom in the 1990s dipped as part of the overall downturn following the bursting of the IT bubble, overbidding on 3G (Third generation) mobile and overbuilding of optic fiber capacity at the turn of the century. But at least for emerging Asia, it always remained above the levels of the early 1990s. Investment is particularly robust in South and Southeast Asia, the regions covered by this book (see Figure 2), partly because a new group of investors based in the South, such as Ayala, Etisalat, Orascom, Reliance, Singapore Telecom and Telekom Malaysia (TM), have entered the semi-liberalized markets of this region in a significant way.

When public funds were being expended on telecom, it was necessary to ensure that scarce financial resources were being spent on services which give the greatest public benefit. A rupee more for telecom was a rupee less for road building. Now, the burden of proof is much less because private capital is the main (and in many cases, exclusive) source of funding for expanding telecom networks.

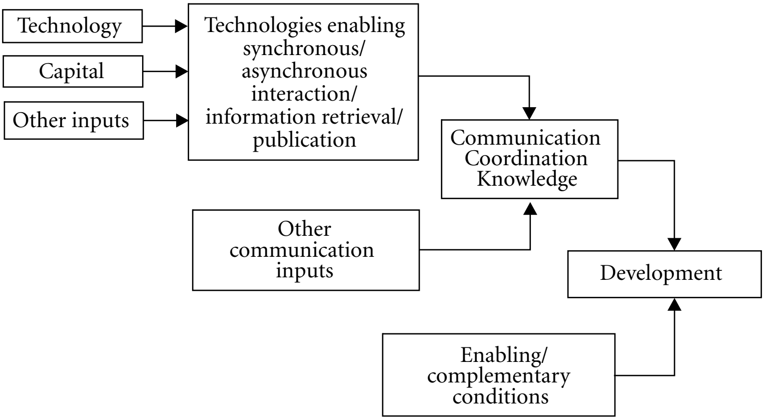


Figure 1
Communication Technologies in the Context of Inputs Contributing to Development

Source: Author.

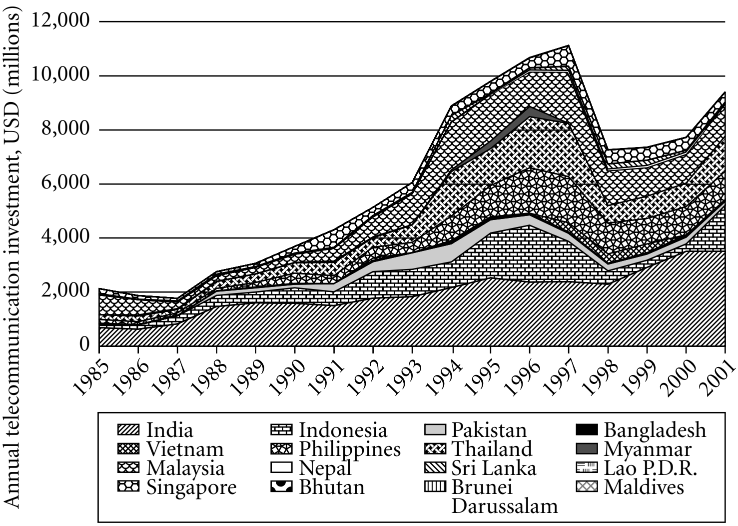


Figure 2
Annual Telecommunication Investments in South and South-east Asia (USD millions) (1985–2002)

Source: Author, based on ITU databases.

For example, telecom is one of the largest contributors to growth of Gross Domestic Product (GDP) in Sri Lanka. Yet, it draws no public funds whatsoever, contributing significantly to the exchequer. Investments in telecom do not detract from other worthwhile investments, but instead, contribute to them. This happens in two principal ways. First, the Sri Lankan government obtains substantial revenues from the sector, directly in the form of returns on its 49.5 percent investment in the incumbent and in taxes from telecom users (approximately 20 percent of every rupee spent on telecom services goes to government); with little or no leakage, telecom tax revenues are very valuable to government. Second, the availability of modern telecom facilities of reasonable quality enables improved performance in all other sectors of the economy, which, in turn, generates higher revenues for the government. Prior to liberalization, the telecom sector was a drag on the rest of the economy; now, it is a driver.

The first section of this book, “Demand at the Bottom of the Pyramid” illustrates the existence of demand at the bottom of the pyramid (BOP) at levels much higher than expected in terms of expenditure on telecom services. The always-beyond-expectations demand that has been exhibited by the unconnected when offered telecom services, most strikingly in the form of telecom riots (BBC, 2005; Nasarullah, 2004), is reason enough for private investors to step in.

The available evidence of employment and tax generation and similar benefits is adequate to justify government action to facilitate private supply (Lane et al., 2006; Waverman, Meschi, and Fuss, 2005; Zhen-Wei Qiang, and Pitt with Ayers, 2004), though not necessarily, for massive public investment. Scarce public resources are better spent on infrastructure that is less attractive to private investors such as drinking water, breakwaters in ports, and rural roads.

The dramatic shift in the composition of World Bank loans in the telecom sector, shown in Figure 3, is an example of what happens when this line of thinking is accepted. It may not be possible to attribute the massive growth in telecom worldwide during the past decade (Figure 4) to the World Bank getting out of the business of financing government-owned integrated monopolies and putting its resources behind reforms instead, but the withdrawal of World Bank assistance had no ill effects, at least!

The perennial opportunity-cost question, though, reappears in a more modest form. Given finite investment resources of governments, should they be spent on telecom as against drinking water or breakwaters in ports? Not telecom, because it does not need government investment. Given the finite resources to design and implement reforms in governments, should they be spent in reforming telecom or education, or military procurement, or electricity? Should it be telecom—because it is easier to reform, because it generates more tax revenues than the alternatives, and, because it yields greater benefits to the economy?

Why Unconnected?

Connectivity is undersupplied because of historically evolved policy, locked in by inertia, has made it so. This book is, among other things, an extended conversation about whether technology by itself can increase supply, or whether policy and regulatory pre-conditions have to be satisfied to realize the potential of technological and service innovations.

In the extreme form, the argument may be framed in terms of policy and regulatory reforms versus supply of new technologies. Assuming a fixed quantity of resources (capital,

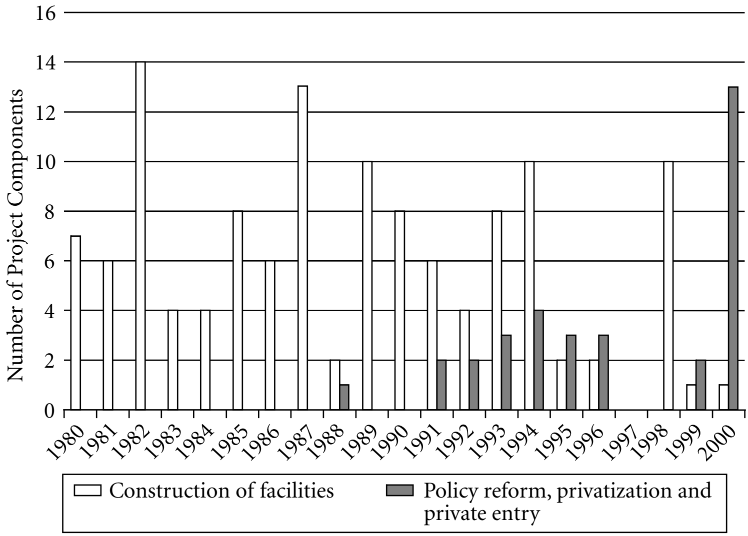


Figure 3
Composition of World Bank Loans in Telecom Sector (1980–2000)

Source: World Bank (2002, p. 22).

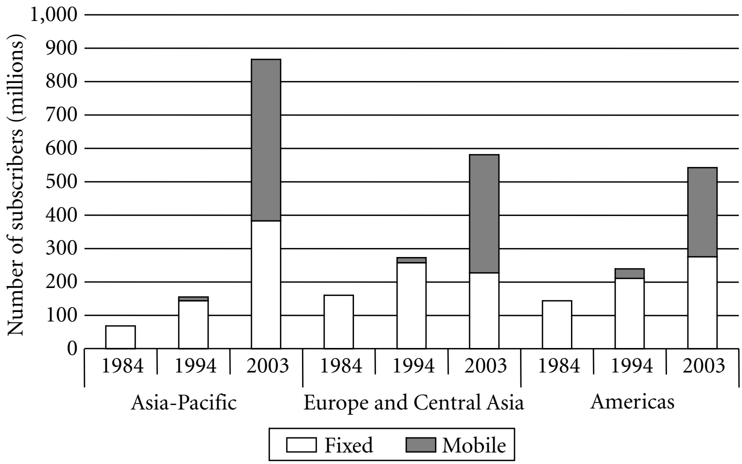


Figure 4
Growth in Fixed and Mobile Subscribers in the Asia-Pacific, Europe and Central Asia, and the Americas (1984–2003)

Source: Author, based on ITU databases.

personnel, etc.), should it be allocated solely to policy reform or to new technologies? More moderately, the debate may be framed as one between the emphasis placed on institutional reforms versus technologies; mostly on reforms with technology playing a supporting role, or, mostly on technology with reforms not being neglected?

One who looks at the explosive expansion of connectivity within the past two decades, especially in relation to the seminal 'Missing Link Report' (Independent Commission for World Wide Telecommunications Development, 1984), which serves as a good baseline, may be tempted to attribute all growth to new technologies such as wireless. There is no question that reductions in per-line costs over the past two decades have enabled more people to be connected. But what gave rise to those reductions?

The dramatic reductions in the per-line cost witnessed in the past 5–6 years were made possible by economies of scale in manufacturing and competition among manufacturers, driven primarily by massive growth in several large Asia-Pacific markets—China, India, Pakistan, Bangladesh, Indonesia, and Vietnam. Why were these conditions not present earlier?

Before multiple service providers, operating under varying forms of competition, found reason to connect the hitherto unconnected in large numbers, there was no need for large production runs—the necessary condition for realization of economies of scale. Before telecom operators started to behave like normal firms seeking to obtain the lowest-cost inputs, there was little reason for equipment manufacturers to drive down costs. In the old days, the determinant of equipment sales were not price, but the overall calculus of vertically integrated national champions, tied aid, the local-manufacturing provisions of long-term purchase agreements and bribes.

So it appears that the lowering of barriers to entry in telecom service markets and the vertical disintegration of telecom value chains served as pre-conditions for lowering of the costs of connectivity. But this was not all. The virtuous cycle of expanding connectivity, with greater demand driving down the cost inputs and lower costs of inputs causing even greater demand would not have gotten started if not for business innovations that transformed the entire business of supply of telecom services.

In the engineer-dominated PTT (Posts Telephones and Telegraphs) culture of yore, it would have been unthinkable to offer connections at the low average revenue per customer as is being done today, or to offer flexible and consumer-responsive service packages. In Indonesia, the current average revenue per prepaid customer of Excelcomindo (TM subsidiary) is USD 4.64, but the company is making profits and connecting more people.

In 1998, the regulatory commission in Sri Lanka had to coerce the reluctant incumbent, Sri Lanka Telecom Limited (SLTL), to offer a three-part installment plan to customers (Samarajiva, 2000). In 2006, the same company, now nine years after privatization, facing intense competition and having somewhat outgrown the PTT culture, offered a much more favorable, 10-part installment plan to potential customers on its own initiative.

In the old days, the first reaction of telecom operators to new technologies such as mobiles that work both in circuit-switched mode and in packet-switched mode on Wireless Fidelity (Wi-Fi) networks would have been to quash them through appeals to regulators and the courts, if not through direct pressure on manufacturers. Now, such reactions are less common, especially in the liberalized markets. For example, Cingular, an operator in the United States, is now offering such dual-mode phones, even at the risk of harming its existing markets (Richtel, 2006).

If new technology alone could extend connectivity, the offering of Internet services by Bhutan Telecom through its fully-owned DrukNet Unit in 1999 with International

Development Research Centre (IDRC) assistance should have yielded good results. Until the second mobile operator starts functioning under the license issued in 2006, Bhutan remains one of the last remaining government-owned integrated monopolies.

With donor assistance, Bhutan Telecom connected the mountain kingdom to the world in May 1999 as part of the celebration of the King's Silver Jubilee. The connection of the world's remotest country to the Internet was undoubtedly a good thing and made a few headlines. Yet, the new technology had little or no impact on extending connectivity. DrukNet simply became another service from the same lackadaisical and unimaginative monopoly, serving a few government and foreign entities, travel agencies and tourists willing to pay high prices and tolerate the poor quality of service.

The discussion of Wi-Fi innovations in Indonesia in Section 2 also illustrates the inadequacy of technology by itself. As Chapter 4 illustrates, Indonesia may have one of the highest levels of citizen activism and do-it-yourself knowledge regarding Wi-Fi as a local-access technology. But, as Chapter 6 shows, this has not translated into commensurate increases in digital opportunity because of the perverse policy and regulatory environment within which the Internet service providers and citizen activists have had to operate.

Would it have been better if the activists put all their energy into policy reforms? Or if they ignored the policy process altogether and concentrated entirely on developing workarounds to the barriers erected by misguided policy?

It is unlikely that there can be an answer to these questions that is correct for all countries and all times, or even for Indonesia at all times. The Indonesian civil society activists have a major policy success to their credit, the unlicensing of the 2.4 GHz band as one of the first acts of the Yudhoyono administration in January 2005. As Chapter 4 shows, the activists are in favor of greater policy reforms. So this suggests that they have not conceded the policy space.

The real question is whether the policy success of getting the 2.4 GHz band unlicensed could have been achieved without the previous educational and mobilization activities? Would the reform advocates have had the clout without the numbers provided by the extensive mobilization and the resources without the Internet Service Providers (ISPs) and the Warnet (Warung Internet) cybercafés? Would there have been ISPs and Warnets if technological workarounds had not been devised to circumvent the barriers erected by the incumbent monopolist?

It appears that the technology focus created the conditions for effective reform actions in the policy space. If the activists had boycotted policy process altogether, they could not have freed up the 2.4 GHz band and created the conditions for further connectivity-friendly reforms such as the lowering of leased-line prices. But had they not done the hard work of community education and mobilization, they may have been less successful in changing bad policies.

Liberalization

The lifting of policy constraints on participation in the provision of connectivity may be described as liberalization, a process that achieved critical mass in 1984 with the AT&T (American Telephone & Telegraph Company) divestiture in the United States and the reforms in the United Kingdom that included the end of the British Telecom (BT) monopoly and the establishment of the Office of the Telecommunications Regulator (OFTEL), now Office of Communications (OFCOM), as a specialized ex-ante sector regulator. Conceptually, liberalization includes the following components, ideally in sequence (Fink, Mattoo and Rathindran, 2002; Samarajiva, 2002):

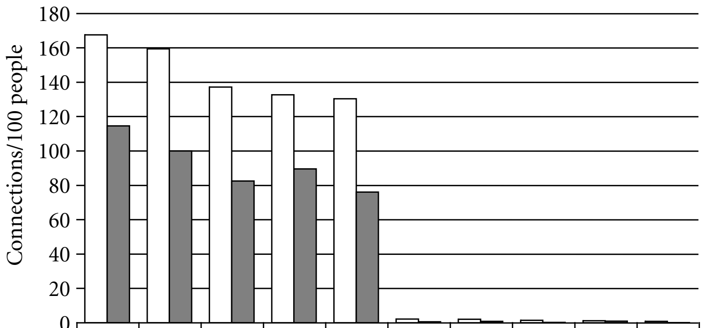
- The creation of an explicit regulatory regime, separate from the incumbent or major operator;
- The relaxation of entry controls to allow more suppliers to participate in the market and at various points in the value chain; and
- Reform of the incumbent or major operator, which in many cases includes a complete or partial change in ownership and/or management.

The wave of reforms that spread across the world since 1984 did not take long to build up momentum, as shown in Figure 4.

The Asia-Pacific has emerged as the driver of worldwide connectivity expansion, with the East Asian Tigers supplying much of the needed hardware and also reaching saturation in basic services and the world's two most populous countries, China and India, providing the numbers. Yet, the region is also home to some of the economies which offer their citizens the least connectivity, as seen in Figure 5.

It is easy to rest on the achievements that have been made. However, it is more productive to make a realistic assessment on the lines of Ashok Jhunjhunwala (2001, p. 1):

> In 1991 both India and China had about 5.5 million telephones. Today (2001), India has about 35 million telephones—a six-fold increase in a decade is by no means



	Hong Kong, China	Taiwan, China	Australia	Singapore	Korea, Republic	Nepal	Bhutan	Papua New Guinea	Afghanistan	Myanmar
Fixed+Mobile/100	167.65	159.43	137.2	132.67	130.29	2.25	2.04	1.41	1.18	0.96
Mobile/100	114.53	99.99	82.6	89.47	76.09	0.7	0.77	0.27	1	0.17

Fixed+Mobile/100 Mobile/100

Figure 5
High and Low Performers in Asia-Pacific Telecom

Source: Author, based on ITU (2005).

an achievement in the conventional sense. But in the same period the number of telephone lines in China has grown to about 200 million; and is adding about 30 million lines every year.

So the question is "what could have been?" It is clear that connectivity in the unreformed economies has not grown. But at the same time connectivity in many of the "reformed" economies has not grown as much as it could have.

Better Policies

The Section on "Demand at the Bottom of the Pyramid" provides evidence of how much unsatisfied demand there is at the BOP. Section 2, "Access, Against All Odds", dealing with the softer issues of local access networks and mechanisms, and Section 3, 'Regulation: To Stifle or Enable?', dealing with the harder issues of backbones, cross- and other subsidies and cost allocations, deal with policies—not necessarily the best policies or international best practices from idyllic lands populated by honest politicians and competent officials; but real policies that have been tried, and either failed or succeeded in the harsh terrain of some of the most poorly governed countries this side of Somalia and Liberia.

Levy and Spiller (1994) drove home the point that the optimal policy solution was not the absolute best but what fitted the environment in which they were to be applied. Our attempt here is not to describe the best policies for extending networks, but to identify the policy actions that would be most efficacious in the governance badlands of South and South-east Asia.

We do not seek to whitewash the failures or justify them. We take joy when Bangladesh connects a million new mobile users in one month and Pakistan overtakes both India and Sri Lanka in extending mobile connectivity in the space of one year. We rage when our governments talk the talk of greater connectivity and walk the walk of corrupt monopoly and proven failure.

The countries that we write about have done well in extending connectivity in the past decade, for the most part. South Asia has gone from 15 million in 1995 to over 110 million in 2005, a more than seven-fold increase in a decade. Indonesia also shows a six-fold growth over the decade like its giant counterpart, India. However, as Jhunjhunwala points out, well is not good enough. The East Asian giant, China, has grown enormously, connecting more than twice the combined number in South and South-east Asia up to 2004.

The analysis in this book suggests why Indonesia's committed ICT activists and ISPs have been driven from pillar to post simply to use the Internet, as shown in Chapters 4 and 6. They have had to devise complex workarounds that boggle the imagination and violate all languages used in Indonesia as well as the law, simply to browse the web and send e-mail. They had to engage in 'unlegal' (not illegal, as they point out) activities to be able to connect to the Internet. They had to change a President to get a band of frequencies unlicensed. If all this energy could have been used for more productive purposes, what would have been the result?

Chapter 5 documents the lessons that can be learned on business models that can be derived from the Village Phone enterprise in Bangladesh, which Nobel Laureate Muhammed Yunus made famous and which in turn made Yunus famous. These innovations do not relate to telecom per se, but are business practises that made it possible for women to make a living out of telecom, and for others to use it. Some of the innovations, the authors find, were specific to time and place and need not be replicated. For example, today's context of cheap handsets reduces the need for the provision of micro-credit to potential Village Phone operators to get their phone business started; the availability, and now the predominance of prepaid makes the continuing credit relationship less significant. Yet, other aspects such as the ability to receive as well as make calls and the higher degree of privacy afforded by a mobile phone versus a public call office can, and are, being absorbed into current adaptations of the Grameen Village Phone model.

The Grameen Village Phone program was an innovation that flowered despite the incredibly hostile telecom regulatory environment. The roll-out was delayed because of the difficulties of getting the phone service operational. Even today, full interconnection is not available for all Grameen phones. If all these barriers did not exist, what would have been the result?

The battle over backbone in India described in Chapter 7 illuminates several key issues in telecom policy and reform. Is the Government of India not treating backbone as an essential facility that should not be wastefully duplicated because of an exaggerated respect for the 'private property rights' of a fully government-owned incumbent or because of fear of the incumbent's managerial caste and powerful unions? Will 'pure infrastructure providers' who see only operators as customers enable competitors to match the stockpiled advantages of the incumbent in the rural areas, or will they also transform themselves into 'service providers' directly interacting with customers? If the answers to these questions had been clearer, would more dark fiber have been lit and more rural customers connected? What would have been the result?

Chapter 8 describes a good policy idea orphaned at birth and beset by misfortune and malgovernance in Eastern Nepal. Can least-cost subsidy auctions work when the telecom regulatory environment takes a dive and the macro political environment becomes actively hostile? Does this case study give donors and governments a better sense of when to cut and run? Would the prospects for least-cost subsidies have been better in Asia, had the World Bank retreated in the face of rapidly deteriorating security, political and regulatory environments? What would have happened if the gunpowder had been kept dry for a better day?

Chapter 9 demonstrates that the world's second largest universal service fund has for the most part been unutilized and wrongly directed, though the disbursements have been done most transparently. If all the money extracted from the capital-hungry sector had been disbursed quickly and if the changes now being implemented had been accepted at the start, what would have been the result?

It is almost surreal to read the contorted progress of the Access Deficit Charge policy in India in Chapter 10. It is perhaps the best single answer to the Jhunjhunwala question as to the causes of underperformance in the Indian telecom sector. The narrative describes the tortuous process by which the Telecom Regulatory Authority of India (TRAI) grinds down the forces protective of the incumbent, its privileged managerial castes and its multitude of unionized employees. It is almost as if it knows the right answer, but it has to work through a sequence of wrong answers to gain acceptance for the right answer. What if the vested interests were less entrenched and TRAI could have implemented the right answer at the beginning? What would have been the result?

In Conclusion

The book itself is an introduction, not a conclusion. It is an introduction to a new way of governing, especially in areas that rest on specialized, yet incomplete, knowledge such as infrastructure. The basic idea is that policy requires knowledge, but that the knowledge is necessarily incomplete. Decisions must be made with the best available evidence. The imperfections of the available evidence should be remedied by subjecting them to the test of argumentation (Melody and Mansell, 1983).

Accordingly, the book contains multiple points of view and contestations. LIRNE*asia*, the organization that generated the research which forms the basis of the chapters, is not the most sympathetic to incumbents; yet the head of regulatory affairs at an incumbent phone company has been invited to respond to the authors, within the book itself. Generally, the authors favor market forces and see regulation as a necessary evil. However, a leading regulatory professional has been asked to make his comments within the covers of the book itself. The authors are, for the most part, immersed in telecom and ICTs and see the world from vantage points that privilege those technologies and associated practices; yet the last of the responding authors comes from outside the ICT field.

'What could have been' is an interesting question, but, on the face, it addresses the past. 'What is to be done' is the question that focuses attention to the present and the future. The workarounds described in this book are not simply the equivalents of the two-headed goats in formaldehyde in the museum of South Asian reforms; they contain within them valuable lessons for the way forward. Wish as we may, we cannot conjure up effective and clean governments for our region overnight. Future reforms must also take place within the dysfunctional contexts described in the chapters.

The reforms in the ICT sectors have so far resulted in the improvement of governance in this sector, if not yet in the larger polity. The point is not to perpetuate the vested interests and dysfunctional governance arrangements, but to challenge the vested interests and improve governance. We believe and hope that the research presented in this book will contribute to that process.

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Section 1
Demand at the Bottom of the Pyramid

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Introduction

In the time of integrated government owned monopoly or in the 'bad old days', the picture regarding demand was very clear: it was there; it was unsatisfied. People waited for longer than 10 years for a fixed phone; they had to seek the intervention of politicians and officials to obtain a connection; in many cases, bribes had to be paid to multiple parties.

Tremendous progress has been made in meeting unsatisfied demand. Figure S1.1 illustrates the growth in the total number of telephone subscribers in South Asia between 1995 and 2004.

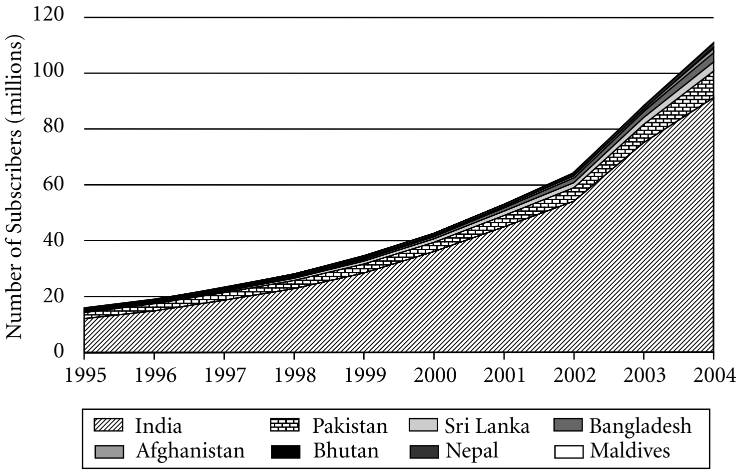

Figure S1.1
Total Telephone Subscribers: South Asia (1995–2004)

Source: ITU (2005).

In the first instance, emphasis had to be on removing the artificial constraints preventing demand from being met. With manifest demand being met in some areas, particularly in urban areas, the question of the nature of the remaining unmet demand becomes important. Do the dimensions of the existing service offerings correspond to what the remaining unconnected actually want?

Conventional thinking would focus on the price of getting connected and staying connected. Without question, price is important; but price is not everything. The success of prepaid telephony, first in mobile and now even in fixed, is evidence that what people want is not simply lower prices. Even when prepaid call charges were higher than post-paid, the demand for prepaid was higher. Basket calculations for monthly expenditure on telecoms for lower-end users indicate that prepaid is now the cheaper option in many countries, as illustrated in Figure S1.2. Perhaps the ability to control or minimize expenditure on telecom allowed through prepaid connections, also evidenced by the lower Average Revenue per User (ARPU) generally found among prepaid subscribers, contributed to its popularity.

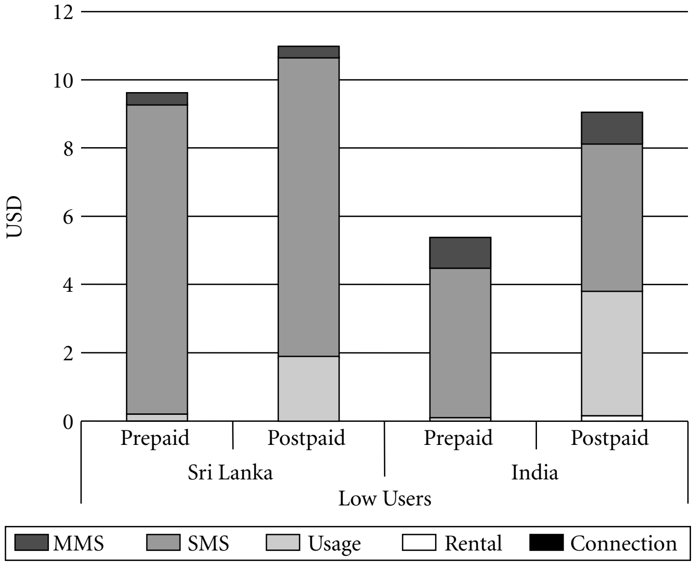

Figure S1.2
Comparison of Sri Lankan Prepaid and Post-paid User Baskets, Calculated on a Monthly Basis for Lower-end Users (September 2006)[1]

Source: Tahani Iqbal at LIRNE*asia*.

Telecom policies and regulations assume that demand is known. This is understandable because demand, especially for new products and services, is extremely difficult to determine.

Economics has a simple solution. Whatever succeeds in the market is in demand; what does not succeed is not. The market is the best discovery process. There is no reason for anyone other than a supplier to expend resources on researching demand.

In public policy, not all goods and services are created equal. Some are merit goods. Some have significant positive externalities. For these or other less justifiable reasons, public policy may seek to expand supply of certain goods and services.

The focus of the first two chapters is on the strategies used by those at the bottom of the pyramid (BOP). In Chapter 1, the choices made by BOP users among fixed, mobile and public access modes are discussed. Chapter 3 presents a case-study of the Jaffna district of Sri Lanka, a unique 'between-conflict' society (at the time of the survey).

Chapter 1 shows that significant use of telephones exists in the 11 locations studied, despite official numbers of subscribers per hundred inhabitants in India and Sri Lanka being less than 25 percent of the population at end of 2005. In the Sri Lankan locations, only 0.3 percent of those approached were excluded because they had not used a telephone in the previous three months; in the Indian locations, the corresponding percentage was 12. Within the samples, 77 percent of those who were in the lower income group (less than US Dollars [USD] 50 per month) used phones but did not own them. Among those in the relatively higher income group within the locations (USD 50–100 per month), 49 percent did not own the phone that they used.

The results also show that most of the owner-respondents or subscriber-respondents are 'newbies'; in India, 31 percent of the owners/subscribers in the seven locations had a mobile connection for less than six months; in Sri Lanka, the corresponding percentage was 16. In the Jaffna district of Sri Lanka, as Chapter 3 reports, 100 percent of the overwhelmingly large number of mobile customers had their connections for less than three years.

In effect, the BOP research is a study of people who have recently joined the market for telecom services as direct customers and those who are about to join. In the new world of low ARPU and high profit mobile telephony in South Asia, this is a critical market segment which is likely to drive revenue growth and market share. For example, In India, as in March 2006, blended ARPUs for Global System for Mobile Communications (GSM) and Code Division Multiple Access (CDMA) (both mobile) were USD 7.82 and USD 5.47, respectively, and Earnings before interest, taxes, depreciation and amortization (EBITDA) per subscriber was approximately USD 45, according to TRAI (2006). Dialog Telekom, Sri Lanka's largest mobile operator's blended APRU for the first quarter of 2006 was USD 6.85, while its EBITDA per subscriber was approximately USD 9.93 in 2005.

It is reasonable to assume that the factors that influence the choice of mode (Chapter 1) as well as the strategies used, after getting connected, in the course of using the service (Chapter 2) are broadly the same for those who are about to join the market in similar circumstances'. Operators can design better services for this market segment using the knowledge generated by the BOP research. Equipment manufacturers can profit from this knowledge to improve the designs of their starter and low-cost handsets (GSMA, 2005).

The key finding of Chapter 2 is that those at the BOP do not use as many economizing 'strategies' as one would expect, observing the behavior of middle-class teenagers, for example. The authors suggest that this is caused less by ignorance, than by the constraints within which they communicate. The fact that most of the users communicate through other people's phones—for financial considerations or otherwise—is an obvious constraint. That they are most probably calling people in similar circumstances, for example a relative who is also dependent on the use of someone else's phone, limits the strategies that can be employed. The authors also point to the fact that only 31 percent of the study group had access to multiple modes of communication, contributing to the low use of strategies. The modes that the majority of this group have access to—(private) fixed and public phones—only exacerbates the situation. Public phones come with several additional constraints, for example, difficulties in accessing them at night.

People like to save money if it can be done without too much inconvenience. As phones continue to spread through the populace, it is likely that the constraints, especially those related to ownership and access to phones by the called parties, will become less significant. Therefore, the findings of Chapter 2 should not be interpreted as suggesting that cost-saving strategies are irrelevant. Rather, they should be understood as showing the constraints within which those at the BOP operate, not only in terms of communication, but even in terms of strategies.

In liberalized environments, policy makers and regulators need not get involved in the nitty-gritty of service design. That is the province of operators. The introduction of 'lifetime' prepaid mobile connections in India, albeit not uncontroversial,[2] is one response by operators to the inconveniences experienced by prepaid customers when their credit balance reach zero—evidenced by the difficulties cited by prepaid users in the BOP study. However, because telecom markets are far from perfect and extant public policy assumes that greater access to telecom is desirable, policy makers and regulators may wish to pay attention to the barriers faced and difficulties experienced by subscribers in obtaining services and using them, as described in Chapters 1 and 2. Although a significant proportion of users within the localities studied appeared to be using brand new handsets, a well-functioning second hand market could assist as much as the GSM Association's low-cost handset initiative (Khan, 2006). The financing of new connections did not seem to be a large barrier to owners, with few making use of installment schemes. The higher entry barriers to consumers in the fixed telephony market, especially in Sri Lanka, seem worthy of the policy maker's and regulator's attention. Even here, the introduction of low per-line cost CDMA technology and competition have already lowered connection charges from USD 200 to around USD 100 for the new entrants. How the Sri Lankan incumbent manages to attract customers despite connection charges that are almost double that of competitors is a question that the research reported in these chapters does not answer. This is so despite a larger number of complaints about the process of getting connected as well as complaints about the service, as compared to mobile services. Hopefully, the follow-up research being conducted by LIRNE*asia* will shed light on this counter-intuitive outcome.

The barriers faced and difficulties experienced in the shared use of private phones were considerable, given that almost two thirds of those studied relied on other peoples' phones. Phone owners complain about the inconvenience caused by others using their phone, even when they receive a fee for providing the service. Those who use others' phones complain of the distance that they have to travel to the nearest phone as well as the amount they have to pay for a phone call. These problems can only be eliminated when every household has access to its own phone. However, in the meantime, policies that promote public access points can be implemented, as in India, where 'public call offices' or PCOs (which can even be free-standing roadside desks equipped with a telephone and a signboard) are given discounted call rates to provide telecom services; leaving room for a small profit to be made by the reseller. In 2006, India had over four million public access points throughout the country (TRAI, 2006, p.11), also evidenced by the relatively higher reliance on public access points in the Indian localities, seen in Chapter 1. However, if reliable and cost-effective infrastructure is not available, policies to promote public access to telecom will be less than effective.

Notes

1. Price baskets were developed from Organization for Economic Co-operation and Development (OECD) methodology, to compare the relative affordability of mobile telecom access for *low*, *medium* and *high* users (only *low* users are reported here). The OECD methodology was adapted for the actual minutes of use (MOU) as reported by the largest operator (operator average outgoing plus incoming MOU) for Sri Lanka and by TRAI (average outgoing MOU) for India and, applying *average* minutes of use for the 'medium user', while applying the ratio of low:medium:high used in OECD methodology to obtain the respective baskets; baskets were

also adapted for prepaid connections, taking into account incoming call charges (applicable in Sri Lanka) and SMS usage.

2. http://www.lirneasia.net/2006/03/lifetime-free-prepaid/

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1

What Do Users at the Bottom of the Pyramid Want?

AYESHA ZAINUDEEN

INTRODUCTION

At the bottom of the pyramid (BOP) extravagant spending, especially when it comes to non-essential goods or services, is out of the question. This chapter looks at the use of telecom by the user at the bottom of the pyramid. It looks at how these users communicate and what considerations and constraints shape their communication; it looks at what people use phones for, and tries to assess the value that people place on communication, based on the amounts that they spend, and how much they are willing to spend on communication.

This chapter is the first of three chapters based on the findings of a quantitative study of users at the BOP in South Asia. One would expect to see a usage pattern that would reflect the given financial constraints, that is, minimal use and a very careful consideration of cost factors. This chapter finds that despite perceptions that telecom prices are high, those at the BOP are willing to spend significant amounts of their monthly household income on these services, especially on mobiles. They value these services for the convenience afforded in terms of time as well as money saved in travel, etc.

BRIEF BACKGROUND TO THE STUDY

This chapter is based on a survey that was conducted among 3,199 users of telecom services at the BOP (defined in this case as people who had used a phone at least once in the preceding three months) in a total of 11 localities in India and Sri Lanka in April and May, 2005.

The localities are given in Table A1 of Appendix 1. The localities were selected to capture the diversity that exists between the markets in each country. The data does not represent India and Sri Lanka as wholes, but only the financially constrained, or BOP within the enumerated localities.

Tele-users at the BOP were defined by two parameters: a monthly household income of approximately less than US Dollars (USD) 100 per month; and socio-economic classification (SEC)— SEC groups B, C, D and E (that is, excluding SEC group A, the highest ranking group). Further details on the methodology are provided in Appendix 1 of this book.

What Do Users at the BOP Want?

This section looks at how BOP users communicate, what access modes they use, and what difficulties they face in using those modes. It also looks at what BOP users consider as priorities in communication, in terms of why they choose to use particular access modes and for what purposes they use them. The section finally explores the value that users at the BOP place on telecommunication.

How Do Users at the BOP Communicate?

There is a growing body of research that suggests that demand for telecom services in developing countries is larger than generally thought, especially among lower-income groups. Research is beginning to show that low-income earners are willing to spend a substantial share of their monthly income on telecom services. Estimates of the share of monthly income spent by financially constrained groups on telecom services in developing countries are in the range of 10 percent (Gillwald, 2005; Intelecon, 2005; Souter et al., 2005)—far higher than the two to three percent rule-of-thumb regularly used in the telecom sector in developed countries (Intven, 2000). A study among rural phone users in Bangladesh found that more than half of those studied were willing to spend approximately USD 2 to 6 (or approximately two to 6 percent of the monthly household income) on a three minute call to a relative overseas, if they 'needed money badly[1]. There was even a group who would be willing to spend up to 12 percent of their monthly household income for that same phone call (Richardson, Ramirez and Haq, 2000).

These findings highlight the importance that users at the BOP place on such services. This, in line with Prahalad's (2004) notion of 'fortune at the bottom of the pyramid', has led the world's biggest GSM handset manufacturers to embark on initiatives to lower the cost of a mobile handset to below USD 30, effectively creating 'a new low cost market segment' (GSM Association, 2005, p. 4).

The socio-economic benefits that low income users gain from the use of telecom services have been well documented (Bayes, von Braun and Akhter, 1999; Lane et al., 2006; Vodafone, 2005; World Bank, 1999). Some benefits can be gained without ownership. Many users of telephones do not own a phone, and rely heavily on public telephones, as seen in the findings of this study, among others. In Africa, there is still a great reliance on public payphones, even in countries with relatively high per capita incomes (Gillwald, 2005). Nevertheless, Souter, et al. (2005), in a study of the impact of telecom on rural livelihoods and poverty in India, Mozambique and Tanzania, reported that almost half of those who owned a phone had acquired it within the preceding year, and a third of those without a phone indicated that they 'wanted to acquire one within the next year'. Similarly, in the present study, 22 percent of fixed phone owners obtained their connection within the preceding year, while the corresponding figure for mobile owners was 59 percent.

There is a great reliance on public and shared facilities at this level of the market; this includes public call offices, public payphones and post offices. Almost two thirds of respondents in the current study on an average relied either solely on public access phones[2] (37 percent of respondents), or public phones along with fixed and/or mobile (29 percent of all respondents). Public access use was much higher in the Indian samples (73 percent of respondents on average) than in the Sri Lankan ones (52 percent). This could be a result of two factors, first, the high density of public call offices (or PCOs) found in India: as at the end March 2005, there were 2,771,132 PCOs across India—this number had nearly doubled by the end of March 2006. Furthermore, of the 607,491 villages in the country, there were village public phones in

548,843 of them by end of March 2006 (TRAI, 2006). Second, this could be because more than 50 percent of the Indian sample had monthly incomes below USD 50 per month, compared to 20 percent in the Sri Lankan samples. Mobile use was almost three times as high among the Sri Lankan respondents, possibly a feature of the higher income levels of the respondents, and the Sri Lankan mobile market being the oldest in South Asia (operating since 1989 while mobile service in India commenced in 1994.)

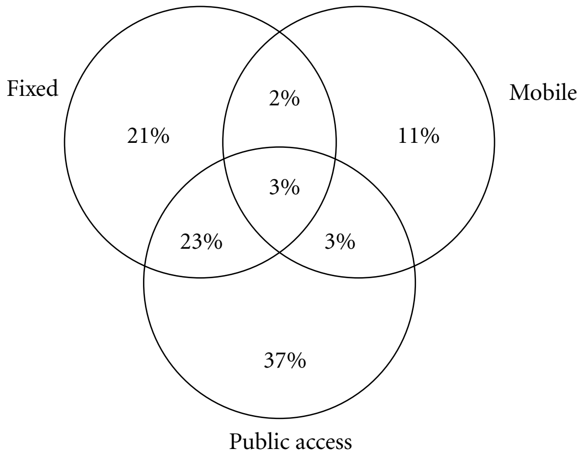


Figure 1.1
Mode of Access Used at the BOP in Sri Lankan and Indian Samples

Fixed use in the Indian localities increased from urban to rural areas, reflecting the relatively well developed telecom infrastructure in rural India; public access, while still the most popular form of access, did not differ significantly between urban and rural areas in the Indian localities studied, but the mobile use in India (12 percent of Indian samples on an average) dropped dramatically when rural areas were considered alone. In the Sri Lankan samples, people tended to rely more on public access in rural areas.

Fixed phone use tended to be higher among SEC groups B and C, those above 35 years of age, and among females. Mobile use was higher among the young (below 35) segments, especially males, and skewed toward urban areas. Public access users were of the less affluent, lowest SEC groups (D and E) and mostly rural; Indian public access users were of a lower income category than their Sri Lankan counterparts. Younger age groups (below 35) were also heavier users of public access facilities.

Among owners of fixed phones in the samples studied, close to a third allow other people (non-household members) to use their phones to make and receive calls and transmit messages on their behalf. From the perspective of the non-owner users, the most common place to receive calls was at neighbors', relatives' and friends' houses (about two thirds of non-owners); when it came to making calls, non-owners seemed to be more comfortable using a public phone of some sort (about three-quarters of non-owners), where they pay for such use. Normally owners allowed one to four other people to use their phones mostly for incoming calls; however, they did not charge them for this use, stating that they allowed this for social reasons, or as a public service, but perhaps this may be because such (incoming) calls do not cost the owner anything financially.

Mobiles on the other hand were found to be used more as a personal device, with just seven percent of owners allowing non-household members to use their mobile phones.

On an average, 2 percent of those sampled reported that they use the Internet, while four percent reported that they use telegrams.

Difficulties Experienced in the Use of Telecom Services

This sub-section examines the difficulties that BOP users—both owners as well as non-owners—face in their use of telecommunication in obtaining, using and sharing phones.

Difficulties in Getting Connected

Generally, respondents did not face too many difficulties in obtaining a phone, with 68 percent of mobile owners and 49 percent of fixed phone owners in the samples studied stating that they had faced 'no difficulties' in obtaining a phone.

Getting connected to a fixed phone clearly involved greater difficulty than getting connected to a mobile. The fact that 83 percent of mobile owners used prepaid connections substantiates this, as obtaining a prepaid connection is usually 'over the counter', requiring only some proof of identification and some relatively small payment, whereas, obtaining a fixed phone connection can involve, in addition to large initial connection charges, a waiting period which may run into years. Incidentally, this was the biggest complaint among fixed phone owners, with 20 percent complaining of more than one year of waiting (Figure 1.2). That 56 percent of mobile owners stated that the reason for investing in a mobile was because of the 'no waiting time' also supports this claim.

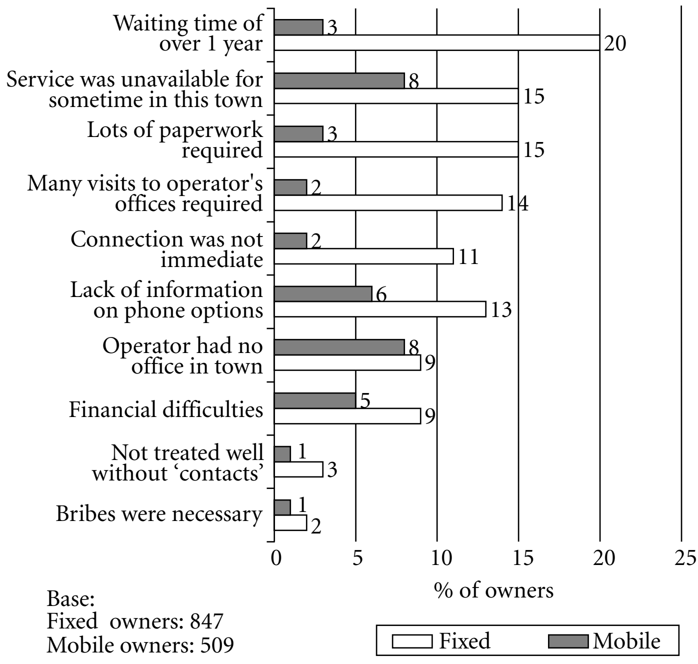


Figure 1.2
Difficulties Faced by Fixed and Mobile Phone Owners in Getting Connected at the BOP

Other complaints of fixed phone owners included having to wait for the service to become available, as well as the 'bureaucracy' of getting a connection (paper work, having to make many visits to the service provider's office, etc.), especially among Indian respondents. Thirteen percent stated that information was lacking on fixed phone services.

Constraints on access seemed to be the biggest difficulty faced by mobile owners in getting connected, having to wait until the service became available in their area and having to go to another town to get connected.

Few people complained of difficulties in financing the connection, with nine percent of fixed owners and five percent of mobile owners stating difficulty. Of the fixed phone owners in the Sri Lankan samples, 17 percent had used installment plans to get connected, while in the Indian samples, this number was only 4 percent. The difference in these two numbers reflects the large difference in the cost of getting connected (at the time of the survey)—in Sri Lanka the cost of getting a fixed line ranged from approximately USD 120 (new entrant) to USD 180 (incumbent), while in India, at that time, one could get connected to a fixed phone for approximately USD 16. Yet, the use of installment plans for fixed phones in the Sri Lankan case is low, a surprising finding, given the monthly household incomes of below approximately USD 100.

Perhaps people save up for a few months to finance the connection from their own income or use other sources of finance (loans from family members) which were not reported.

Between rural and urban localities, there were few significant differences (at a 95 percent confidence interval) in the difficulties in obtaining a connection of both fixed and mobile phones; there were significantly more complaints among rural fixed phone owners in the Southern Indian samples about waiting time—having to wait for the service to become available as well as having to go to another town to get connected. Among mobile owners, the only significant differences between the complaints of rural and urban respondents were to be found in Sri Lanka, with fewer complaints of difficulties among rural respondents.

Difficulties Experienced During the Period of Ownership

When phone owners were asked about problems faced during the period of ownership, mobile owners had relatively fewer complaints, with 61 percent stating that they experienced no difficulties; some mobile users complained of not getting what they paid for (Figure 1.3). There were many more complaints from fixed phone owners, with 71 percent of them complaining of problems such as the phone often being disconnected (a particularly big problem among the Sri Lankan samples), problems relating to billing (inaccurate billing, bills not reader-friendly, having to travel far to pay bills), and repair time.

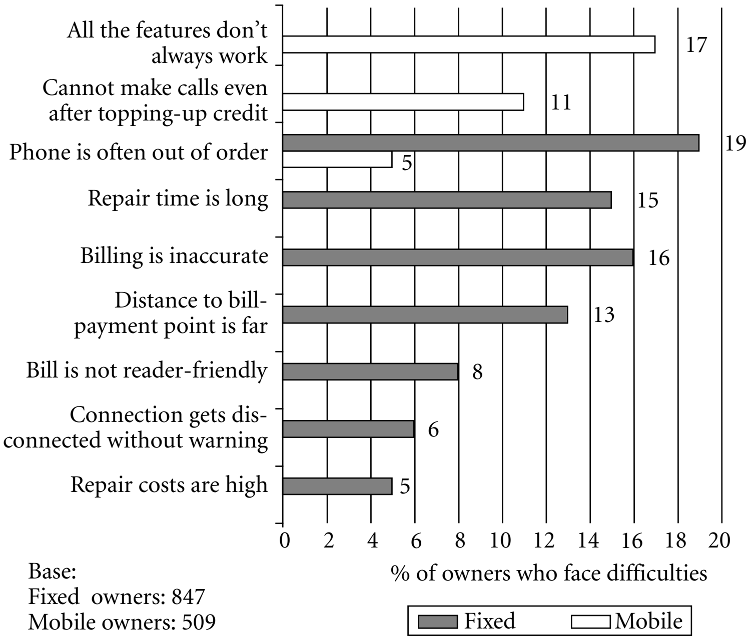


Figure 1.3
Difficulties Faced by Fixed and Mobile Phone Owners at the BOP During Period of Ownership

While prepaid was the connection of choice for 83 percent of mobile owners, there was also some unhappiness regarding it. Among Sri Lankan respondents, almost half of prepaid mobile owners complained of the hassle of having to add credit to their account, as well as service and/or calls being disconnected when the credit balance reached zero. Some complained of prepaid cards expiring if not used within a given timeframe, and some Indian respondents complained of having to change their phone number if their account was not credited within a given period. Market solutions have evolved to address some of these concerns, an example being the prepaid mobile packages recently introduced in the Indian market, whereby 'lifetime' prepaid connections can be obtained through a (relatively large) upfront lump-sum payment for a mobile connection which need not be topped up again, ensuring free incoming calls for life. Many owners of prepaid packages also complained of high per-minute rates in comparison to post-paid packages.

Having to pay for incoming calls (that is, a Receiving Party Pays [RPP] regime) can add to the difficulties faced by prepaid owners like those studied in this research; once a subscriber's account balance approaches zero, not only are the outgoing services cut off, but also the incoming services. The user is forced to re-credit her account immediately even if she just wants to receive calls. This can cause a user great inconvenience, as evidenced by a larger number of Sri Lankan respondents citing disconnection of service, calls being cut off, and the inconvenience of having to re-credit their prepaid account balance as the problems faced, in comparison to their Indian counterparts (Figure 1.4).

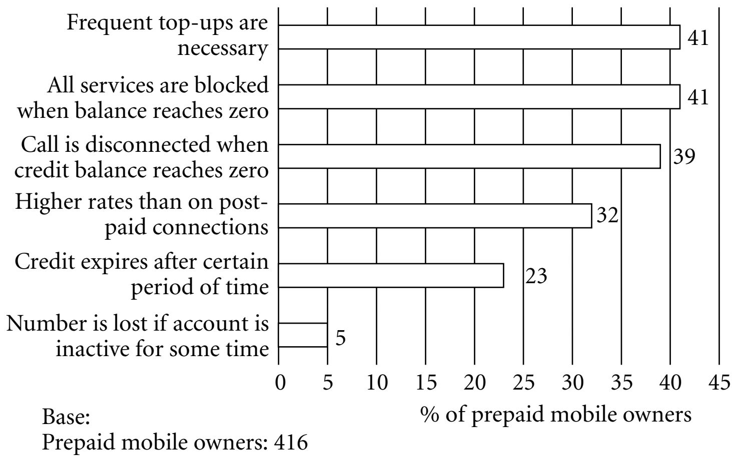
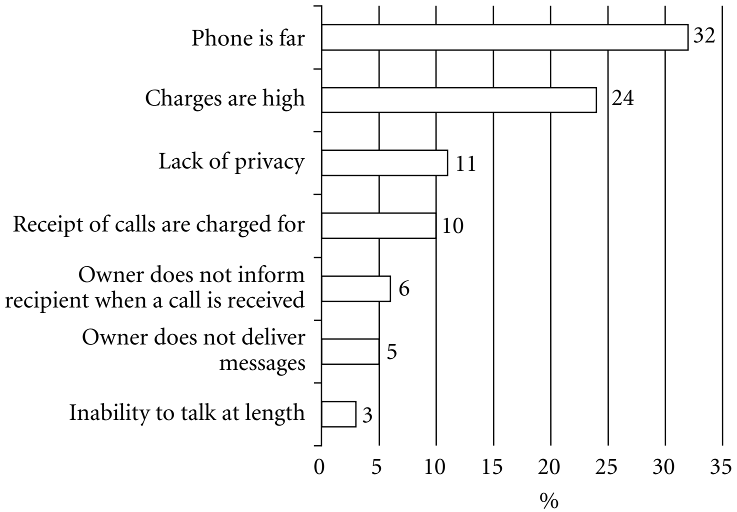


Figure 1.4
Difficulties Faced by Prepaid Mobile Owners at the BOP

Difficulties Experienced in Sharing Phones

As seen in Figure 1.5, users at the BOP rely heavily on shared access; many do not have their own phones. While most owners allowed other people to use their fixed phones (there were few instances of mobile owners allowing others to use their phones), there were many complaints. Only 41 percent of fixed phone owners stated that they did not experience any problems as a result of others using their phone. The key complaints related to the inconvenience of having to find people when calls for them are received, or having to deliver messages to them. There were also some complaints of people abusing the service (not paying for use, over-using the phone, damaging the instrument, tying up the line, etc.). Most interestingly (and also puzzling), out of the respondents in the Sri Lankan samples, 42 percent charged others for outgoing calls (compared to 19 percent of those in the Indian samples), yet, the Sri Lankan respondents had the most number of complaints! Sri Lankan owners stated that they usually charged below cost, so perhaps they feel that they are not compensated enough for their difficulties.

Taking a look at difficulties faced by the non-owner, only 48 percent of users stated that they had no difficulty in using other people's fixed phones. The biggest problems were the distance to the phone and the high cost of using the phone (Figure 1.5). There were more complaints of cost among Sri Lankan respondents than Indian respondents, possibly as a result of the culture of charging for calls in the country. Some were concerned about the lack of privacy, whilst some stated that the owners do not inform them when a call or message for them is received.



Base: 1,794
(those who use other peoples' fixed phones)

Figure 1.5
Difficulties Faced at the BOP in Using Other Peoples' Fixed Phones

What Do Users at the BOP Consider Priorities?

To answer this question, one first needs to examine the factors which influence a user's choice of the mode of communication—that is, by fixed, mobile or public access. Given limited financial resources, do such financially constrained users only consider the cost of each option when deciding which mode to use, or is the decision made up of a set of factors, including cost? Second, one can look at what users actually use phones for; what benefits, in terms of maintenance of social relations or facilitation of business transactions, for example, accrue to the users from the use of a phone.

When asked about the reasons for the choice of mode, the responses indicated a concern for convenience, as well as cost, as indicated in Figure 1.6. Given the monthly incomes of less than USD 100, this is surprising; one would expect a heavier emphasis on cost factors. The

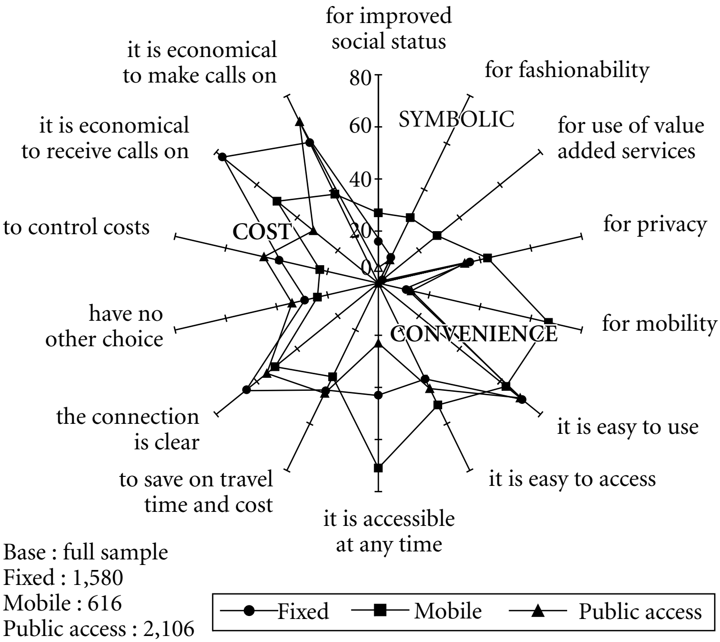


Figure 1.6
Why Fixed, Mobile, and Public Access Users at the BOP Use Respective Mode(s)

ability to use the phone at any time (71 percent) and while on the move (67 percent), were key factors among mobile users, despite a majority in the samples indicating that the cost of mobile services was high.

Even more surprising is the relatively important role that 'symbolic' factors (such as 'fashion' or 'improved social status') play in the user's choice of the mode of access. This has been found in more developed markets, especially among the youth, in the use of mobile phones, for example, in Taiwan, especially among the newer adaptors of mobile phones (Wei and Lo, 2006). Similarly, among the Indian and Sri Lankan respondents interviewed, the former displayed a strong concern for symbolic factors (with up to 50 percent of respondents citing such factors) in comparison to the latter. This could be tied to the fact that mobile phone use in Sri Lanka is more common on an average (with penetration rates of 17 per hundred inhabitants by the end of 2005,[2] compared to about seven in India by the end of 2005, according to TRAI, 2006). Chapter 3 shows that these symbolic factors were more prominent in the Jaffna sample, where mobile service is a very recent phenomenon, as compared to the other three samples in Sri Lanka.

The reasons for selecting fixed access and public access phones are similar, except the reasons that 'it is the most economical way to receive calls', and that 'it can be used at any time'. These two reasons might play a greater role among fixed phone users since the use of public access phones usually involves travel to a location outside the home, and at a particular time if it is to receive a call; these factors impose a cost and/or inconvenience on the users, and hence will not be the reasons for users to select public access phones.

The top two reasons given by fixed phone users were the economy of receiving calls (77 percent of fixed users) and the clarity of the connection (65 percent). Among public access users, the top two reasons were ease of use (70 percent of public access users) and the economy of making calls (69 percent).

When actual uses of the phone are examined, it becomes clear that relationship maintenance or social purpose are the most important (Figure 1.7). Such uses include keeping in touch with friends and family (locally and abroad) as well as sending news and messages. What is striking is that instrumental uses, for example, for undertaking business transactions or making logistical arrangements (travel and food) are very low, except with a small percentage of mobile users.

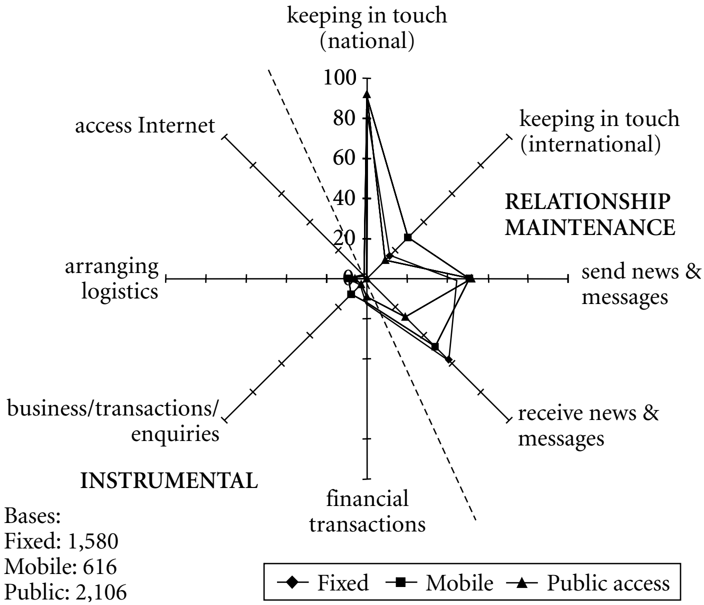


Figure 1.7
What Fixed, Mobile, and Public Access Users at the BOP Use the Phone for

This corresponds with the findings of other recent studies of telecom use in the developing world. Research in India, Mozambique and Tanzania found that the second most important use of telephones in the three countries was for 'social purposes', such as maintaining contact with family, after 'communicating in emergencies', which was the first. Social use of the phone was particularly high in India (Souter et al., 2005). A separate study conducted in South Africa and Tanzania found that the benefits from mobile phones to communities include 'improved relationships', according to almost four fifths of those studied (Vodafone, 2005). As cited in Wei and Lo (2006, p. 56), early research carried out by Keller in 1977 and Noble in 1987 into the 'uses and gratifications' of conventional telephone use had also found social or relationship maintenance uses to be more prevalent than instrumental uses.

There is little evidence to support the many anecdotes of rural farmers using their mobiles to check on the best prices for their products at the nearest market; or the use of phones to facilitate remittances from relatives abroad, even in post-conflict Jaffna (Sri Lanka). It is well known that people in Jaffna rely on remittances from relatives dispersed around the globe, and that one of the primary means of soliciting those remittances is the telephone. However, while 75 percent of mobile users sampled in Jaffna stated that they use mobiles to keep in touch with relatives abroad, none stated explicitly that they use the phone to arrange financial transactions.

The somewhat unexpected high use of telephones for social purposes may be explained by two factors. First, it could be the case that what the respondents broadly categorizes as 'keeping in touch' might well have instrumental aspects; perhaps the value or purpose of a single phone call cannot be pinned down to one category—a phone call to relatives living abroad to enquire about their well-being may also serve to elicit a remittance. Furthermore, at this level of the society, the barter economy predominates; hence a phone call to one's brother might also serve the purpose of arranging the purchase of supplies from him for one's business. Thus, any instrumental use is probably masked as relationship maintenance.

Alternatively, as found by Souter et al. (2005), different communication methods and different information sources are valued for meeting different needs. Souter et al. (2005) found that telephones are the preferred mode of communication for emergencies and family networking, especially in India; mass media (television, broadcast radio, and newspapers) are preferred for general information while face-to-face communication is 'overwhelmingly' the preferred mode for specific information relating to farming, business, education, and political or government matters.

Similarly, among users of SMS, or short message service, the key purpose of this service is 'personal communication' (88 percent), followed by 'emergency communication' (37 percent); SMS is used for 'business communication' by a mere 7 percent of the mobile users that were sampled. This further reinforces the findings of Souter et al. (2005).

Some of the responses to an open-ended question where users were asked to describe an 'instance where having access to a phone allowed you to do something very important and had it not been for the phone, you may not have been able to do it' revealed the value placed on immediate communication, especially in emergency situations, particularly found among respondents from the Hambantota district (Sri Lanka), which was one of the areas worst hit by the Indian Ocean tsunami less than six months before the survey was conducted. Some respondents cited instances where they were able to save both time and money by using the phone rather than having to make a physical journey to communicate a message. Other situations which have been related pertain to conveying news, such as marriage, birth, as well as employment, and in general for keeping in touch with close relatives, particularly in the Kasargod and Sivaganga districts in India, where temporary migration is a significant feature.

Another open-ended question, where respondents were asked to name an 'instance where the absence/lack of access to a phone prevented you from doing something important' yielded somewhat comparable results, with concern for not being able to get important messages regarding illness among family and friends, job opportunities, exam results, etc., on time, or contacting someone in an emergency, expressed in the answers. Difficulties in keeping in touch with relatives seemed to be a concern among some of the respondents. In the Sivaganga district there was marked concern for the time and money involved in communicating in the absence of a phone.

What Value is Placed on Telecom Services

In order to ascertain the kind of value BOP users place on telecom services, it is useful to examine how much of their limited resources they allocate to these expenditures. Those interviewed in this study reported average monthly household incomes of below USD 100, approximately. The findings of this research demonstrate that the amounts that financially constrained users in India and Sri Lanka spend on telecom services are somewhat in line with the estimates of Gillwald (2005), Intelecon (2005) and Souter et al. (2005)—5 to 10 percent. Figure 1.8 illustrates the monthly average expenditure patterns of the respondents on fixed phones, together with public access phones, as well as mobile phones.

Expenditures on fixed phones and public access phones are lower than on mobiles; expenditure on mobile phones is generally higher (on an average, USD 4 to 8 per month) than on fixed phones (on an average, up to USD 4 per month). Expenditure figures, however, were

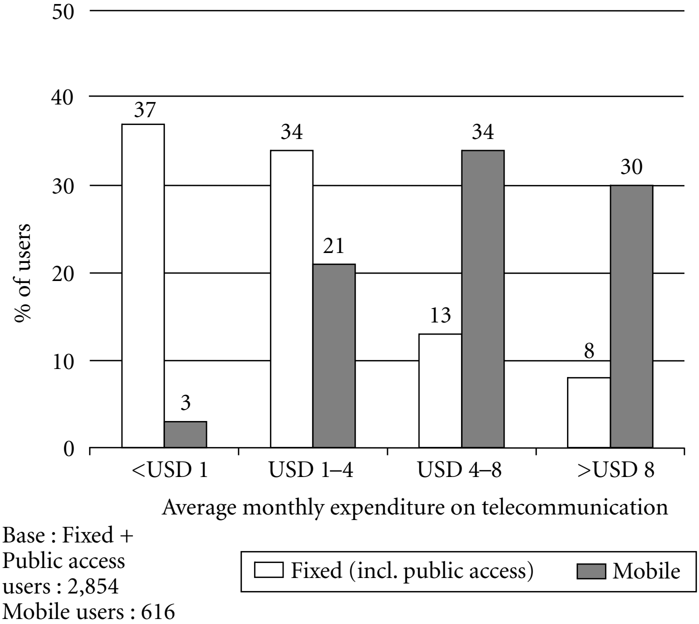


Figure 1.8
Average Monthly Expenditure on Telecom Services at the BOP

based on the respondents' ability to recall their monthly phone costs, and, therefore, should be treated with caution. Additionally, in the case of fixed and mobile owners, monthly expenditure may include the use by other people within the household, more so in the case of fixed phones (which tend to be used collectively; furthermore, monthly expenditure reported is likely to be the average monthly bill). In the case of public access users, expenditure reported is more likely to be on an individual basis.

A low-end estimate of the share of monthly household income spent on telecoms based on these figures (assuming a maximum income of USD 100 per month) is in the range of 1 to 4 percent on fixed, and 4 to 8 percent on mobile. In the lower income segment, a greater percentage of people were spending over USD 4 a month in comparison to the higher income segment, which would imply the household as a whole spending more than 8 percent of its income on telecom services. Sri Lankan samples revealed that the latter had slightly higher expenditure patterns than the Indian, perhaps because of the overall higher incomes of the Sri Lankan sample. This percentage estimate was seen to be as large as 12 percent among a third of mobile users sampled in the Jaffna district of Sri Lanka, where the demand for international communication is particularly high (see Chapter 3). Nevertheless these numbers are indicative only, given the complexities of identifying 'real' income and the difficulty in relating individual expenditure to household income.

Users at the BOP spend on telecom services even when they find the cost of these services to be high. While fixed and public access users considered the cost of telecom services to be affordable on the whole, the majority of mobile users perceived the cost to be either 'high,' 'very high' or 'extremely high' (Figure 1.9), especially the Sri Lankan respondents. Only 23 percent of mobile users said mobiles were affordable, compared with the 56 percent and 59 percent for fixed and public access phones, respectively.

Even where the cost of investing in a fixed phone is over USD 100, 88 percent in the Sri Lankan samples had the money available to obtain the connection. Less than a fifth of fixed phone owners made use of installment plans to obtain the connection. Added to this, 70 percent

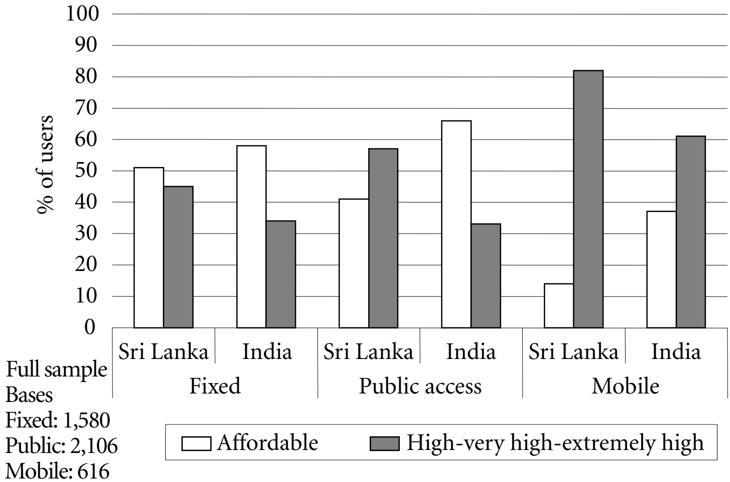


Figure 1.9
Perceptions of Cost of Services at the BOP: Fixed, Public Access, and Mobile

of mobile owners bought their handsets brand new. The use of second-hand handsets was higher among Indian respondents, with close to a third using secondhand handsets, contrasting sharply with the Sri Lankan 4 percent. Interestingly in the Jaffna sample in Sri Lanka, where phone use and expenditure was particularly high (especially on international calls), few (6 percent) relied on second-hand handsets. However, a significant percentage of respondents (16 percent, compared to 1, 0 and 3 percent in the other three Sri Lankan localities studied) stated that they got their handsets 'free'. This appears to be a result of a practice of expatriate Jaffnaites leaving behind their handsets with relatives when they visit Jaffna. Hence, there may be an underestimation of the use of second-hand handsets in the data.

More telling are the responses to how users would change their use of telecom services should the prices come down by half, especially in the case of Sri Lanka, on all modes, particularly on mobile. While respondents in India seem to be on the whole more satisfied with the prices, and perhaps closer to their desired level of use, Sri Lankan respondents indicated a stronger likelihood of increasing use if prices come down. This indicates that there could be a larger degree of unsatisfied demand for telecom services among Sri Lankan respondents (Figure 1.10).

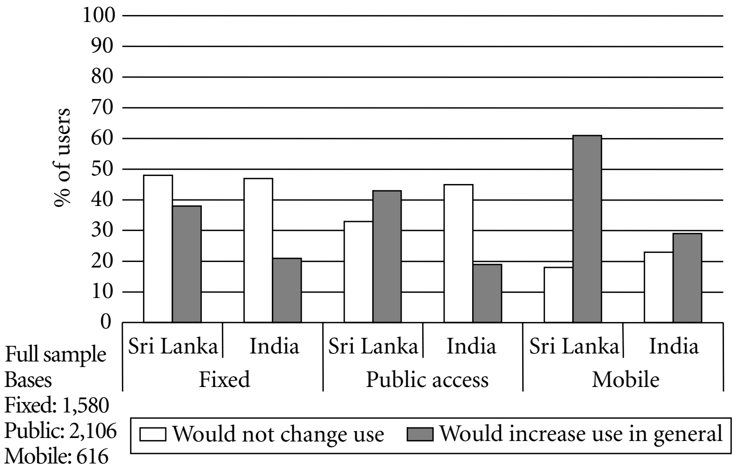


Figure 1.10
Changes in Use at the BOP, Should Cost be Halved: Fixed, Public Access, and Mobile

A closer look at rural respondents, vis-à-vis their urban counterparts, reveals that rural users seem to be, on the whole, more satisfied with costs. This suggests that rural phone users may be more willing to absorb higher per minute call charges, given the alternative of having to communicate in person, where they would have to leave their home to make a call, thereby incurring time and transport costs. In the case of India, at the time of the survey, the presence of an access deficit charge which lowered the costs of rural telephone calls would have further enhanced the perceptions of affordability (Malik and de Silva, 2005; see also Chapter 10).

Concluding Remarks

There is a greater demand for telecom services among low income earners; much of this demand has still not been met, probably due to the misperception that they are not a profitable segment. However, the research shows that these people are not simply looking for the cheapest mode of access. They are also looking for what is more convenient, which mode they can access while on the move, or which will give them more privacy. Many of those who have obtained their own phone connection (fixed or mobile) cite difficulties other than financial ones when asked about their experience of getting connected.

Although many choose not to invest in their own phone for various reasons, people find ways to get connected, whether through a neighbor or a local public call office. Value is placed on the immediate communication permitted through a telephone, especially in emergencies. They are willing to spend relatively large portions of their monthly income on telecom services, to obtain some benefit, like remittances from relatives abroad, or to facilitate a business transaction, or simply to keep in touch.

Notes

1. Defined in this case as people who had used a phone at least once in the preceding three months, at the time of the study.
2. Data sources: Samarasinghe (January 19, 2006) for mobile subscriber data & Central Bank of Sri Lanka (CBSL) (2005, Special Statistical Appendix: Table 1) for population (provisional).

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2

Strategies on a Shoestring

Ayesha Zainudeen and Tahani Iqbal

Introduction

This chapter builds on the previous chapter, taking a closer look at how telephones are used at the bottom of the pyramid (BOP) in what are termed as 'strategic' ways intended to reduce costs of communication.[1] One would expect 'strategies'—such as giving 'missed calls' on a called party's mobile as a signal to call back, or using different modes for originating and receiving calls—to be used a great deal by people whose incomes are constrained. However, this study shows low use of such strategies.

This highlights three key issues. First, people have little discretion in the calls that they make, because they make relatively few calls. Second, most of these people do not own a telephone, and, therefore, have little opportunity to use 'strategies', as they have to make and receive their calls whenever and wherever they have access. Third, most of these users have only one mode of access; they do not have the freedom to alternate between modes strategically.

The nature of the strategies used at the BOP should be recognized and understood, because future growth will come from this market segment.

Are Users at the BOP Strategic?

For the purpose of this study the 'strategic' use of telecom services includes the set of conscious decisions made about the use of these services in ways that minimize costs or improve utility. Such strategies may include placing calls at that time of the day when call rates are discounted, or the use of short message services (SMS), or 'text messaging'. These types of decisions are normally termed as strategies in common parlance, but may be more accurately described as 'tactics' because of their short-term nature.[2] This chapter looks at the use of such decisions or 'strategies' by telecom users.

There is limited empirical evidence on the use of strategies in telecom use. Judging by the income levels of the people in this study (those with monthly income below US Dollars [USD] 100), it is reasonable to assume that they might engage in strategic behavior in the use of not only telecom services, but also in the consumption of many other goods and services. As elucidated in an issue of the Nokia quarterly newsletter, 'Prospective mobile users in new growth markets…earn less, their income is irregular and they do not have much spending power. As such, they need to be very careful with their money' (Nokia, 2005, p. 3).

Various marketing strategies have been developed to serve the lower-end of the market in ways that take into account fluctuations in spending patterns over the month. A good example is the use of the prepaid mobile connection, where the user pays upfront for his or her use, after having purchased a phone connection for a one time fee. The user does not pay a monthly subscription, and does not have to deal with bill payments.[3] Although per minute calling rates on prepaid packages may be higher than those on post-paid or monthly subscription connections, prepaid is more popular in many developing countries. Eighty three percent of mobile users in this study used prepaid connections.

Another facility which can help serve financially constrained users is the electronic credit refill facility on prepaid mobiles. In this system, a user can top-up his/her account by any desired amount (usually above a threshold), rather than a fixed denomination in a card. According to Nokia (2005):

> Lower income consumers need low value top-ups of USD 1 or less and the opportunity to buy them anywhere. Electronic refill solutions (e-refill) meet both these needs. By replacing paper vouchers with text messages, operators can reduce the cost of the prepaid process by up to 70 percent.

Although cost per unit may in some cases be higher, this is the price that users pay for being able to buy small amounts. This logic is not limited to the telecom sector; it is commonly seen in fast moving consumer goods (FMCG) markets in the developing world. For example, in India and Sri Lanka, where it is not uncommon to find shampoo, toothpaste, hair gel and many other items being sold in single-use sachets at local shops; it is easier for a low-income consumer to buy a small sachet of shampoo, than to buy a larger bottle that is lower in price by volume, but higher in absolute terms (Kishore, 2003).

This survey reveals that 56 percent of the prepaid mobile owners at the BOP tended to purchase cards in the value range of USD 2 to 5. However, a significant percentage (41 percent in India and 24 percent in Sri Lanka) purchased cards of value greater than approximately USD 5. Surprisingly, and in contrast to Nokia's notions, a high proportion of the Sri Lankan prepaid mobile owners (69 percent) reported that they maintained 'plenty' of credit in their prepaid balance at any given time. This figure was 22 percent among Indian respondents.

Among prepaid mobile owners, 57 percent stated that one of the reasons that they decided to obtain a mobile phone was because of the immediate connection, while 37 percent stated that it was easier to obtain (for example, less paper work) than other kinds of phones; the absence of rental charges or deposits involved also played a role. The barrier of proving creditworthiness to operators, therefore, may be more significant than the connection charge for these low-end users. This suggests that the choice of prepaid packages by users may not be driven by the ability to pay upfront for the connection, but perhaps other reasons, such as the convenience of being able to get connected relatively easily, without having to produce proof of one's place of residence, for example. The drop in new prepaid connections in Bangladesh in 2006, following the introduction of legislation requiring new subscribers to provide personal details upon registration, is testament to this (Telegeography, March 22, 2006).

Donner (2005) documents a widespread phenomenon in Uganda, known as 'beeping', where the caller dials a mobile number and disconnects before the recipient picks up. The caller's number is recognized by the recipient's phone if it has been previously stored in it, and the recipient knows that the caller has sent a signal of some kind. The most common signals identified by Donner are requesting the recipient to call back, to convey a 'pre-negotiated instrumental message' such as 'pick me up now' or perhaps to simply convey that the beeper is thinking of the recipient. This system ensures communication without speaking or typing a single word, and most importantly, it costs nothing. One of the 'rules of beeping' is that 'the rich guy pays'.

The beeping phenomenon has become widespread in some African countries. For example, Mobitel Tanzania facilitates a free 'call-back beeping' service on its network, having realized that increasing number of users were going off the network as a result of high priced airtime.[4] According to Donner, two key factors drive this beeping culture—first, a 'pervasive' prepaid environment, wherein people lack the credit to make a phone call, and second, a calling party pays (CPP) system that encourages the making of shorter calls and receiving longer ones.

Chakraborty (2004) also reports a 'missed call' culture in Sitakund, Bangladesh, resulting from the high cost of calls from mobiles, where users have devised systems where the number of times the caller allows the phone to ring before disconnection has a specific meaning (for example, one ring = 'I am at home, where are you?', two rings = 'I am at your house, where are you?', etc.). *The Times of India* Online (March 16, 2006) also reports of the growing popularity of a similar culture in India in an attempt to save money, despite call rates already being very low. This survey did not question the use of the 'missed call facility' as described above, where the call is not returned. However, the survey did look at some other similar strategies, as described ahead.

In an environment where incoming calls are charged (an RPP, or receiving party pays, environment like Sri Lanka), one may expect to see a lot of people seeking to control costs by finding ways to minimize incoming calls on their mobiles. People may do this by keeping incoming calls on a mobile short and calling back on a fixed phone, if the user has access to a fixed phone. Another way is by choosing to receive calls on fixed lines only, as they are free. This survey shows that of these kinds of 'multiple mode strategies', only returning calls received on a mobile through a fixed phone is being used by users at the BOP.[5]

Returning calls through a fixed line in response to messages received on a mobile was used by 19 percent of mobile users who have access to more than one mode. However, this relatively high number is due to the Sri Lankan samples, with 38 percent of eligible respondents using it, compared to only 4 percent in the Indian samples—perhaps a result of the differential between mobile and fixed call rates in

Sri Lanka (the former being higher). It must be emphasized however, that this strategy is available only to those who have access to mobiles as well as one or more other modes. Such users constitute only 8 percent of the total sample.

The strategies, except for receiving a call on a mobile and returning it on a fixed phone, were more common in the Indian samples; this is peculiar, because in India RPP was replaced by CPP in 2003 (Malik, 2004). This kind of behavior is more appropriate for Sri Lanka, where most mobile users are on prepaid plans and face relatively high incoming call charges. At the time of the survey, a prepaid customer on Dialog Telekom (the largest mobile operator) faced charges of up to approximately USD 0.06 per minute on calls from other networks during peak hours, with only the first 30 seconds of the incoming calls free; this is in contrast to a post-paid customer who may get the first three minutes on an incoming call free.

Another strategy that may be expected in an RPP regime is the switching off of mobiles to avoid incoming calls. The phone is used more as a calling device, as opposed to a calling and receiving device. If widespread, this will reduce the efficiency of the network, where call attempts to switched-off phones cause costs but yield no revenue. Obviously, this degrades the utility of the service to the user and will, in addition, reduce the lifetime of the handset. Switching off to avoid incoming calls is seen as a negative feature of RPP (COAI, 2006; Dewenter and Kruse, 2005).

Of all mobile owners interviewed, 43 percent said that they switch their mobiles off at certain times, interestingly with no significant difference between respondents in Sri Lanka (RPP) and India (CPP). The key reasons for switching off, contrary to expectation, were mostly to conserve the battery of the mobile, according to 62 percent of mobile owners, as well as to avoid being disturbed (43 percent), rather than to minimize cost. Cost concerns appear to be secondary (29 percent).

Controlling communication costs was of greater concern in Sri Lankan localities than in Indian ones. However, interestingly, the incidence of switching off mobiles specifically to avoid incoming calls was larger in the Indian localities. This inverts what one may expect in a CPP/RPP comparison. One may speculate that the short experience with CPP has not been enough for Indian customers to shed behaviors associated with RPP.

The use of SMS, considered to be a cheaper substitute for a phone call, was also examined as a strategy to reduce costs. This was confirmed in the survey results: of those who use SMS (40 percent of mobile users), 88 percent described their use of SMS as a means to 'minimize communication expenditure', as seen in Figure 2.1.

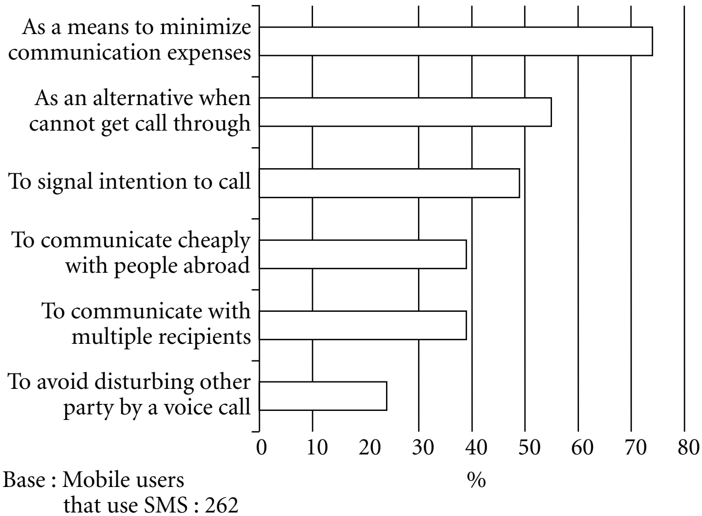

Figure 2.1
Instances Where SMS is Used at the BOP

Respondents did not appear to be making a significant use of the calling rate differentials between 'peak' and 'off-peak' time bands (available in Sri Lanka on both fixed and mobile phones, but not on Indian mobiles) to economize. Respondents were asked about the time of day, as well as the days of the week that they typically make their calls on. Of the fixed users sampled, 81 percent indicated that they do not make their calls on any special day (weekends or public holidays rather than weekdays), while 77 percent indicated that they do not pay attention to the time of the day when making calls.

A similar trend was seen among mobile users in the Sri Lankan samples (there are no rate differentials on mobiles in India), but on a lower scale. Seventy-three percent of Sri Lankan respondents reported that they do not make their calls on any special day and 58 percent make no distinction in the time of the day when making their calls.

There was greater attention to the time of the day among the respondents in some of the Indian localities (Mumbai, Sivagangas, and Gorakhpur), as well as two of the Sri Lankan localities (Jaffna and Colombo), possibly as a result of greater international communication taking place in some of these regions (Mumbai, Sivaganga, Jaffna, and Colombo), in addition to other factors; care is perhaps taken to make calls to different time zones at more convenient times. There appeared to be more 'instrumental' use of phones in Gorakhpur, for example, 32 percent of public access users were undertaking and/or arranging financial transactions through the phone, significantly higher than all the other localities (at a 95 percent confidence interval); perhaps such activities can only be done during working hours, hence greater attention paid to the time of the day when making calls. Additionally, both Gorakhpur and Jaffna had a much higher public access use than the other localities studied; users need to ensure that calls are placed during the operational hours of such establishments.

Some other strategies that were explored included capping telecom use at a certain level of expenditure or call duration, restricting calls to a defined group of contacts, making calls to request another party to call back, and making calls only within the same network, among others. Among fixed phone and public-access owners, the most commonly used strategy was simply keeping calls short. There appears to be greater use of strategies in the use of mobile communication by owners, with similar concern for keeping calls short, as well as disconnecting the phone if a certain amount of call charges or time is exceeded. These cost saving strategies are the most straight forward ways to reduce costs.

Overall, the use of 'strategies' is considerably lower than one might expect, given the levels of income. Even among the lowest income users,[6] significantly higher levels of strategic use are not displayed (at a 95 percent confidence interval). This is surprising, considering the relatively high levels of expenditure on telecommunications by these users, as seen in the previous chapter.

Why are Users at the BOP not Strategic in Their Use?

Even among the lowest income group, where the incentives to cut down on communications costs could be higher, strategic use is low. Such low use of strategies can be driven by several factors. To begin with, over half of those studied do not even own a phone, and, thus, have constrained access to any mode of communication. In addition, these users have little discretion in the few calls that they make. These factors collectively inhibit strategic behavior with regard to the use of telephones.

The Majority of Users at the BOP Do not Own Their Own Phones

Financially constrained people are willing to spend significant amounts on telecom and gain many benefits from such use (Bayes, von Braun and Akhter, 1999; Vodafone, 2005; World Bank, 1999). Many users of telephones do not own a phone, and rely heavily on public telephones, as seen in the findings of this study. Gillwald (2005) finds that in Africa, even in countries that have relatively high per capita incomes, there is still a great reliance on public phones. As indicated by the South African 2001 census figures, of just over 11 million households, only 12 percent of African-headed households had a fixed telephone in the home, as against the national total of 24 percent, while twice as many households had mobile phones (25 percent) as had fixed telephones; overall, only 42 percent of households had access to a telephone (fixed or mobile). In 2003, this figure had increased to 46.9 percent (Statistics South Africa, 2003).

Chapter 1 showed the heavy reliance on shared phones, either through public access phones or other people's phones, mostly fixed. Figure 2.2 shows the patterns of ownership found among users at the BOP in the Indian and Sri Lankan locations; on the whole, a total of 58 percent of all respondents surveyed in both countries did not own the phone that they used, hindering their ability to behave strategically. Those in this group have very limited opportunities to make strategic decisions with regard to telecom use, because non-owners cannot choose the time or the place from which to make a call. This is evident in the relatively higher levels of concern for the day of the week and the time of day of calls found among fixed phone owners; non-owners (fixed) were less likely to make their calls on a specific day of the week or time of the day. Those who have access to the phone all the time (that is, owners) have greater flexibility in deciding when to make a call, whereas those who do not own the phone do not have that luxury; whenever they can access a phone (for example, when they go to the town center to run other errands or when a visit to the neighbor is possible), they must make the call. Not owning a telephone gives them little flexibility when it comes to when, where and how to make or receive calls. The situation is even worse for lowest income respondents (monthly incomes below approximately USD 50), where phone ownership dropped to 23 and 24 percent in the Indian and Sri Lankan locations, respectively.

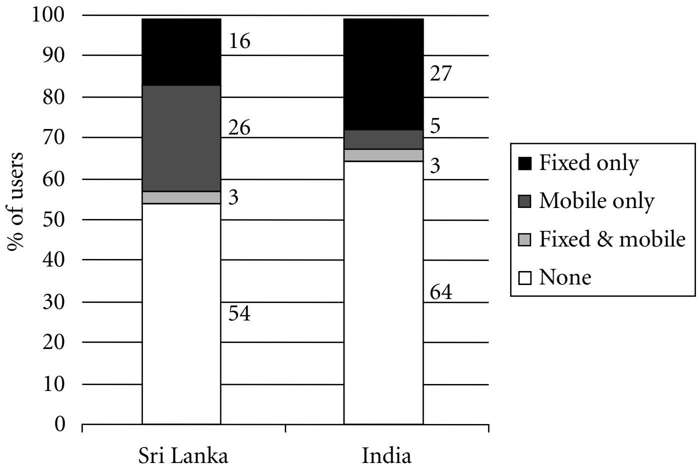

Figure 2.2
Phone Ownership at the BOP

Another factor that compounds the problem relates to constraints on the people who are being called. It is likely that the people who they call or are called by also do not own phones. For example, when one needs to talk to a relative who only has access to a phone while at work, then one can only do so during working hours, which generally coincide with peak calling times. So even if the caller has access to a phone during off-peak hours, he/she cannot call, because the recipient has limited or no access to a telephone during such time. In the same way, if the call is being made to a neighbor's house, it is unlikely that it will be made at night when the call is cheap because of the inconvenience caused to the phone-owner whose kindness is relied upon to complete the communication.

Most Users have Limited Options for Communication

Many telecom users do not have the opportunity to use strategies to benefit from differential rates or options available through different modes of access, as they only have one option to choose from, as seen by the size of non-intersecting areas of Figure 1.1 in the previous chapter. Only 31 percent (given by the intersecting areas) of those sampled had access to more than one mode. This immediately restricts the user's ability to use 'multiple mode' strategies as described in this chapter. Even among this group, only those with access to either fixed or public (assuming the public phone is a fixed phone itself) together with mobile will be able to make use of such strategies. The fixed location of fixed and public access phones prevents its strategic use. Mobile ownership is essential for strategic use, but is available only to 25 percent of multi-mode users.

Similarly, SMS—generally a cheaper alternative to a phone call—is only accessible to a subset of a subset; that is among those who have access to a mobile, those who are familiar with the Roman script. Though local language SMS is being gradually introduced,[7] its use is not widespread as shown by the data, with only 3 percent stating that they used SMS in their local language. SMS use is higher in countries like the Philippines or Indonesia where the national languages use the Roman script.

Low Levels of Use Mean Low Levels of Discretion in the Calls that are Made

Financially constrained users make relatively few calls, many or all of which may be non-discretionary or unavoidable.[8] This is evident in the larger use of strategies found among respondents in the South Indian samples, where usage patterns were found to be higher. South Indians were found to make a high number of calls and receive almost as many calls on an average per month, while the people in the North Indian and Sri Lankan samples made and received only half as many calls. South Indians make use of a variety of strategies, such as watching call duration, disconnecting the phone, restricting numbers that they can call or that can call them, or only using it at home or when traveling. On the other hand, North Indians and Sri Lankans use very limited strategies to curb their communication expenses. In general, higher use of a set of strategies was found among the 'heavier' users of telecom services (those who make and receive a total of more than 20 calls per month) on an average, in both Indian and Sri Lankan samples.

Overall, financially constrained users make and receive relatively fewer calls. When they do make calls, it is out of necessity; at this point they have very little opportunity to implement and exercise the many strategies that will help them control their communication expenses. However, if their use increases to include more discretionary calls, they may adopt cost-saving strategies like the South Indian respondents.

Concluding Remarks

Users at the BOP spend a relatively large proportion of their monthly income on telecom services and find them to be generally expensive. However, they do not appear to be making concerted efforts to economize. But the real issue is whether these people have the opportunity to be 'strategic' in their use. If callers (as well as the people they wish to call) only have access to a phone for a limited part of the day, and only at specific places, then they do not have the freedom to choose what kind of phone to use, where to use it and how to use it, nor do they have the freedom to 'mix and match' modes. The commonly talked about strategies are available to those who are already well endowed in terms of telecom access: to those who 'have', more options have been given.

It is possible that users at the BOP are in fact strategic in their behavior, but from a different angle, in terms of what could be defined as 'long-term' strategies, such as the choice to invest in a phone at all (versus use one's neighbor's) in order to curb communication costs. In this regard, a great number of those surveyed are in fact strategic in their long-term decision on how to communicate. Similarly, that a majority of mobile owners choose prepaid connections is also indicative. While the cost of mobile service was on the whole perceived as expensive by respondents in this study, Oestmann (2003) finds that mobile access is actually more affordable than fixed access, based on a minimal package for the marginal users with few outgoing calls. When the start-up costs and monthly recurring costs to stay connected are considered, mobile services were undoubtedly found to be more affordable than fixed services in many of the selected countries that were examined by Oestmann. The ability to control expenditure through a prepaid connection may be a key factor for low income users, despite higher airtime charges.

Therefore, the low use of strategies as discussed in this chapter may be a result of constrained opportunities, not a lack of cost consciousness; users at the BOP are cost conscious when it comes to longer term decisions, where they are able to exert some degree of strategy.

NOTES

1. Further details on the study can be found in Appendix 1 of this book.
2. Those strategies which could be classified as 'long-term' strategies (for example, relating to the overall decision to invest in a phone or not, and which mode to use) as defined in Zainudeen, Samarajiva and Abeysuriya (2006) are not looked at in this chapter. For a deeper analysis of such issues, see '*Telecom Use on a Shoestring: Strategic Use of Telecom Services by the Financially Constrained in South Asia*,' A. Zainudeen, R. Samarajiva and A. Abeysuriya. Draft version 2.1 (February 2006) available at: http://www.lirneasia.net/projects/completed-projects/strategies-of-the-poor-telephone-usage/
3. It should be noted here that the advent of the prepaid phone has not only helped overcome problems related to affordability from the user's perspective, but has also alleviated the pervasive problem of high transaction costs of dealing with low-income and low-revenue consumers. This has contributed a great deal to the extension of telecom services to such marginal consumers. Chapter 5 deals with the transaction cost problem in more detail.
4. See http://www.mobitel.co.tz/Pages/faq's.html (retrieved September 2005).
5. 'Use' of a strategy is considered if the user states that he/she uses it more than 50 percent of the time.
6. 'Low income' being the groups of respondents with monthly household incomes below approximately USD 50 (that is, INR 2,500 for Indian respondents and LKR 5,000 for Sri Lankan respondents) and 'High income' being the groups of respondents with incomes between approximately USD 50 and USD 100 (that is, INR 2,500 to 5,000 for Indian respondents and LKR 5,000 to 10,000 for Sri Lankan respondents).
7. See, for example, http://www.lirneasia.net/2006/05/tamilnadu-adopts-tamil-sms-solution-developed-in-sri-lanka/
8. Based on the data collected; although the calling patterns recorded were based on recall of the respondent, the data can be treated as indicative.

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3

I Just Called to Say: Teleuse under a Ceasefire

ROHAN SAMARAJIVA, MARIAM HAMEED, AND AYESHA ZAINUDEEN

INTRODUCTION

It is well known that infrastructure is one of the principal casualties of war. It is targeted and destroyed by combatants in pursuit of strategic objectives. It is not possible to maintain it because of war. New infrastructure cannot be built in times of conflict, either because the combatants prohibit it, or because the risks to investment and personnel militate against it. Even after cessation of hostilities, major risks remain, in the form of the possibility of conflict reoccurring and/or inadequate maintenance of law and order. Costs of building and maintaining infrastructure and providing services in post-conflict areas tend to be higher because other infrastructure is lacking (for example, electricity may not be available to power base stations and roads may be in poor condition) and because of the need to provide extra security or pay former combatants for protection. Crocker (2004) noted the commonplace sabotage of infrastructure projects in post-war Iraq, to the extent that successful projects had to be kept hidden to prevent a similar fate. Crocker also reports of the delays in, and in some cases cessation of, reconstruction projects due to sabotage. High insurance costs can pose further challenges in the reconstruction process.

Yet, the greatest need for infrastructure is also in post-conflict areas. The war-weary survivors cannot put their lives back together if they are deprived of basic necessities such as roads, transport, safe drinking water, electricity, and telecom. Without some kind of peace dividend in the form of improved life conditions, the risks of slipping back into war are that much higher. The best peace dividend is restoration of infrastructure. Furthermore, as a survey of Afghanistan's private sector showed access to infrastructure will be a key determinant in drawing investment back into the affected area (World Bank, 2005).

Post-conflict countries have the opportunity to leapfrog into the mobile age, rather than reconstruct what was originally there: often an incumbent owned fixed network. Countries like Lebanon have chosen to do this, encouraging private participation in the process (Jamali, 2003). This can enable the sector to pick up quickly, given the relatively short time needed for wireless communication infrastructure deployment. Afghanistan's fast growing mobile sector is evidence to this. Schwart and Halkyard (2006, p. 3) note that private sector infrastructure investment in post-conflict countries follows a particular sequence, with the mobile sector usually being the only sector to attract 'significant investment' immediately after a conflict because of the 'rapid cost recovery allowed by the sector's economics'. This is partially attributable to high demand, caused possibly by the uncertainties engendered by the conflict itself.

Sri Lanka has suffered from two decades of civil war. Separatist forces of the LTTE (Liberation Tigers of Tamil Eelam) have been pursuing an independent state in the North and East of the island for several decades. The economic cost of Sri Lanka's civil war has been estimated to have been as high as US Dollars (USD) 20.6 billion up to 1996, 169 percent of that year's GDP. The component relating to the cost of infrastructure loss is LKR 90 billion or 13 percent of the country's 1996 GDP, including loss of public infrastructure and damages to houses (Arunatilake, Jayasuriya and Kelegama, 2001).

The cessation of hostilities between 2002 to 2005 provided a unique opportunity to seek to understand what telecom meant to the population of a post-conflict region. Analysis of the findings of a unique government survey conducted in 2004 and a sample survey of telecom users at the bottom of the pyramid (BOP) in the Jaffna District conducted in early 2005[1] can shed light on connectivity in post-conflict conditions.

Jaffna

Jaffna is the historical and cultural center of the Northern Province of Sri Lanka. Along with the rest of the North and East of the island, it has suffered from two decades of civil war. The armed struggle since 1983 has severely affected the economy of the North and East. There has been no infrastructure development; instead, a significant deterioration has occurred. Loss of human life has amounted to over 65,000. Over 800,000 internally displaced persons have lost their homes and livelihoods (CCIY, 2005, February). Many people have emigrated to countries such as Australia, France, Canada and the United Kingdom. It is estimated that as many as 80 percent of the families in Jaffna district have at least one family member living abroad or in the southern part of the country that has been shielded from the war for the most part, except for periodic terrorist actions by the LTTE.

Before the conflict, the Jaffna District (one of 25 major administrative units within Sri Lanka) was well endowed with infrastructure. It had one of the highest densities of roads in the country as a result of high population density and flat topography. The daily express train serving Jaffna, the 'Yal Devi', was the highest revenue earner for the Ceylon Government Railway. The Department of Posts and Telecommunications considered the Jaffna district one of its highest sources of revenue. This was because Jaffna, with its educated populace, was heavily represented in the government and private sectors in the southern part of the country. Generally families remained in the peninsula while the wage earner worked in the south. The resultant 'remittance economy', taking an intranational form in this first instance, created a strong demand for transport and communication.

The war led to the systematic destruction of the connecting infrastructure, exemplified by the ripping up of the rail track beyond Vavuniya and the use of the railroad ties to build bunkers by the LTTE. The principal highway connecting Jaffna to the rest of the country became one of the bloodiest battlefields of the war and the port and airport located in the Jaffna peninsula became the most valued and heavily guarded strategic assets of the government.

The area was further affected by a partial economic embargo which the Government of Sri Lanka (GOSL) imposed from 1990 to January 2002. This, along with a lack of power supply, severely hampered productive activities in the region (Sarvananthan, 2003). These negative forces have been reflected in the area's per capita income. The Northern Province (with Jaffna as the largest district within it) had the lowest per capita income in 2000, approximately USD 384 (LKR 37,206), slightly more than half the national per capita income of USD 651 (LKR 63,000), according to unpublished data from the Department of Census and Statistics (as cited in Sarvananthan, 2003).

Historically, Jaffna's education, health and income levels had been higher than other districts within the Northern Province. Jaffna is one of the most urbanized districts in the country. It was estimated to have had a total population of 596,000 (approximately 3 percent of the country's population) in 2004 (CBSL, 2005; Statistical Appendix, Table 55), and the highest population density within the Northern Province in 1981, 2001 and 2003 (see Table 3.1). The civil war hit Jaffna the hardest, in terms of physical, material and human losses (CCIY, 2005, February).

Table 3.1
Area and Population of Jaffna, (1981–2003)

	Land Area (km^2)	Population			Population Density (per km^2)		
	2001	1981 ('000)	2001 ('000)	2003 ('000)	1981	2001	2003
Jaffna district	1,023	739	491	589	795	480	576
Sri Lanka (Total)	65,610	14,847	18,732	19,252	226	286	293

Source: CCIY (2005).

In a rare statistical snapshot taken in 2004, just before the conflict restarted, the Consumer Finance Survey of the Central Bank of Sri Lanka captured household access to services and amenities in the two districts that were under government control in the Northern Province (and which held most of the population), Jaffna and Vavuniya. The relative positions of these two districts in relation to the provinces with the highest and lowest levels of access to the different amenities are given in Figure 3.1.

Jaffna and Vavuniya are lowest in a few categories, but in not as many as one would expect after 20 years of war. They are highest in the use of bicycles, an artifact which suits the flat topography and the resilience of this mode of transport under war conditions. While lowest in TVs and second lowest in radios, the two districts are surprisingly good

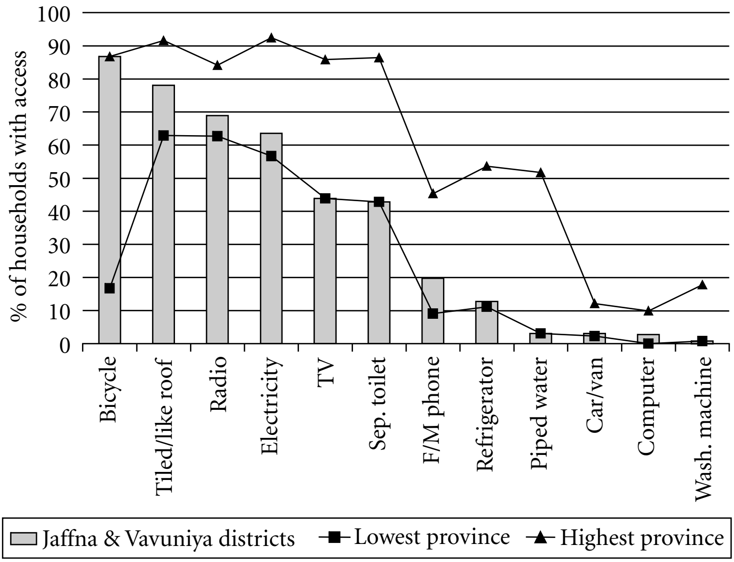


Figure 3.1
Access to Amenities in Jaffna and Vavuniya Districts of Sri Lanka, Relative to Highest/Lowest Provinces

Source: Central Bank Consumer Finance Survey (CFS), CBS 2005.

performers in access to telephones (fixed and mobile) and computers. From the last position before the cessation of hostilities in January 2002, the two districts had leaped to third place by 2004, still below the national average, but considerably higher at 19.7 and 2.8 percent of households having a telephone (fixed or mobile) and a computer, respectively, than the lowest province which had 9.1 percent households with a telephone and 0.5 percent households with a computer.

The high interest shown in interactive Information and Communication Technologies (ICTs) in the war torn regions is understandable, given the high levels of emigration and family fragmentation. Prior to the Cease Fire Agreement (CFA) of January 2002, provision of telecom service (fixed or mobile) was prohibited in the Northern and Eastern province to all operators other than the incumbent, so in effect these areas were artificially excluded from the telecom revolution unleashed by liberalization (Samarajiva, 2004).

The leading mobile operator, Dialog Telekom (then MTN Networks), started work on extending the network to the government controlled areas in the Northern Province within weeks of the cessation of hostilities, offering connections within 90 days of the CFA. Over 150,000 new connections were given in the North and East alone in 2003, according to Dialog Telekom (August 2005). The rapid uptake illustrates the large unmet demand that existed in the North and East. By the time the networks were again made non-operational by the armed forces in August 2006, Dialog Telekom was serving 220,000 customers in the North and 200,000 in the East (Dialog Telekom, 2006). Mobile use dwarfed fixed use, which had risen to 22,127 by mid-2006 for the entire Northern Province (TRC, 2006) with a significant proportion being in the southernmost part of the Province, Vavuniya.

Telecom Use at the BOP in Jaffna

This section looks at telecom use at the BOP in the Jaffna district in Sri Lanka, at some of the unique features not seen in the other districts of Sri Lanka surveyed.

What Modes of Access do People at the BOP in Jaffna Use?

People at the BOP in Jaffna primarily use mobile and public access (public call offices, payphones and phones in post offices) phones, as shown in Table 3.2.

Table 3.2
Modes of Telecom Access Used at the BOP in Sri Lankan Localities

	Jaffna (%)	Badulla (%)	Colombo (%)	Hambantota (%)	Average of Sri Lankan Samples (%)
Public access phone	51	58	37	55	52
Fixed phone	7	40	50	53	37
Mobile phone	44	23	35	35	34

Note: Respondents may use more than one mode.

Compared to the other areas, fixed phone use in Jaffna was low, just 7 percent. This reflects the low number of fixed phones available in the Jaffna district, and the Northern Province as a whole, which had 8,021 fixed lines at the end of 2001 (TRC, 2002).

Table 3.3 shows the distribution of service providers used by people at the BOP in Jaffna, compared with the other Sri Lankan samples. On the mobile side, Dialog GSM (now Dialog Telekom) was the main service provider, given their early entry into the Northern Province. On the fixed side, incumbent Sri Lanka Telecom Limited (SLTL) was the main provider, although it is quite possible that the SLTL figure is overstated by respondents who assume that the established partially government-owned operator is the supplier to all public communication bureaus. This pattern contrasts with the other localities studied in Sri Lanka, where other service providers have a significant presence. Mobitel and Suntel, who subsequently commenced operation in Jaffna, appeared to have a limited presence among respondents at the time of survey.

Table 3.3
Service Provider to Phone Owners at the BOP in Sri Lankan Localities

		Jaffna	Badulla	Colombo	Hambantota
Operator	Type	% of All Respondents			
Sri Lanka Telecom Limited (SLTL)	Fixed	56	42	56	60
Lanka Bell	Wireless local loop	0	0	1	0
Suntel	Wireless local loop	1	0	4	1
Celltel	Mobile	0	14	10	3
Dialog GSM	Mobile	43	6	19	26
Hutch	Mobile	0	3	3	5
Mobitel	Mobile	1	2	3	3
Tritel	Payphone	0	2	2	1
Don't know		1	35	14	15

Note: Respondents may be using more than one operator's services.

After the implementation of the CFA, the restrictions on mobile service provision in the North and East were lifted. Dialog Telekom (then MTN Networks) was able to capture the market, giving 150,000 new connections in the North and East within two years (Dialog Telekom, 2005). Consequently, Dialog GSM was used by 43 percent of teleusers at the BOP in Jaffna, a much higher percentage than in the other locations.

Although only 7 percent of respondents in Jaffna stated that their mode of access was ‘fixed’, many of those who use communication bureaus may have given ‘Sri Lanka Telecom’ as their service provider, as this is the kind of phone that is assumed to be used in many of the communication bureaus. SLTL was the only operator present in the area until 2002.

Mobiles not only offer quick connection, but in the case of Jaffna, they are far more economical. A new SLTL fixed line can cost up to LKR 50,000 (approximately USD 500) in Jaffna compared to LKR 20,000 (approximately USD 200) in Colombo. This is because this company charges for installation based on the distance from the customer’s premises to the nearest distribution point.[2]

In the first year that Dialog GSM entered the North and East, it gave 150,000 new connections in this area alone, 32 percent of the new connections in the entire country (PIPU, 2004). Prior to 2002, there was no cellular coverage in the North and East of Sri Lanka as found by the survey, with zero respondents having owned a mobile for more than three years (in contrast to 22 percent in Badulla, 7 percent in Colombo and 10 percent in Hambantota[3]).

The principal reason given by 80 percent of respondents for choosing mobile in rural Jaffna was ‘that there is no waiting time involved’. This was similar to the response in the remote locations, Hambantota and Badulla, and quite different from urban Jaffna and Colombo, suggesting that waiting time for fixed phones was a greater problem in rural areas (Table 3.4).

Another reason why teleusers at the BOP in Jaffna obtained mobile phones was so that other family members could use it; this indicates that the mobile was obtained more as a household phone, possibly because of the difficulty in obtaining a fixed phone. However, the ‘community’ use of mobile phones was limited to family members, with no BOP mobile owners in Jaffna allowing people outside their family to use their mobile. This contrasts with the other locations, where some mobile owners allow non-family members to use their phone to make and receive calls (10 percent in Badulla, 1 percent in Colombo, 16 percent in Hambantota and 10 percent on an average in the Indian samples). However, a significantly greater proportion of mobile users in Jaffna send and receive messages for other people on their mobiles ‘most of the time’, compared with the rest of the country (Table 3.5).

Table 3.4
Reasons Why the Respondent Obtained a Mobile Phone at the BOP in Sri Lankan Localities

		Jaffna Urban (%)	Jaffna Rural (%)	Badulla (%)	Colombo (%)	Hambantota (%)
Economic factors	No rental charges	11	54	70	11	33
	No deposit required	8	10	43	3	23
	No connection charges	2	0	33	1	10
	Lower call charges	4	1	6	0	16
	Affordable rental	0	1	6	21	28
	Close contacts are on the same network	11	10	1	18	5
Convenience factors	Immediate connection	28	80	87	37	72
	It is easier to obtain	8	17	55	45	61
	Ability to use it at anytime	70	87	64	68	74
	Other members in family can use it also	40	39	28	6	34
	Better network and connectivity	17	37	51	18	56

Table 3.5
Sending and Receiving Messages for Other People through Mobiles at the BOP in Sri Lankan Localities

		Jaffna (% of Mobile Users)	Badulla (% of Mobile Users)	Colombo (% of Mobile Users)	Hambantota (% of Mobile Users)
Send messages for other people	Most of the time/always	34	3	3	13
	Occasionally	15	46	24	25
Receive messages for other people	Most of the time/always	34	3	11	13
	Occasionally	15	42	39	24

Interestingly, fewer mobile users in Jaffna (compared with the rest of Sri Lanka) cited the reason for obtaining a mobile as it being 'easier than any other kind of phone'. This could be evidence that there really was not much choice in terms of the mode of access, that is, that obtaining a mobile was the only option. Concern for financial factors did not feature, except for 'no rental charges' in rural Jaffna.

Convenience appears to weigh most when obtaining a mobile phone in Jaffna. The ability to carry the phone around and the ability to use it at any time were very important in both urban and rural Jaffna; this could be perhaps because many people work in other areas of the island, probably Colombo. Having a mobile allows them to be contactable, and to be able to call home at any time. The importance of mobility and the ability to use the phone at any time may be related to the lack of security in the everyday lives of its inhabitants.

About 50 percent of rural respondents in Jaffna use public access telephones. The reason they give is that there is no other choice.

Affordability of Telecom

A larger proportion of teleusers at the BOP in Jaffna stated that mobile communication was less affordable than in the other Sri Lankan locations. No one in Jaffna found the cost of mobile communication to be 'affordable', unlike in the other localities; this could indicate a lack of other options.

Rural Jaffnaites were unhappier about the cost of communicating, shown by the large percentage stating the cost as 'extremely high'.

Users in Jaffna were the least 'happy' group in the Sri Lankan sample with regard to mobile costs. Table 3.6 provides the mean value of the perceived cost; a higher mean indicates that the users find it more affordable, and vice versa. As Figure 3.2 illustrates, users in the other Sri Lankan localities find the cost of mobile communication more affordable than those in Jaffna. Using mobiles in urban Jaffna was perceived to be slightly more affordable than in rural Jaffna at a 95 percent confidence interval.

Table 3.6
Mean Value of Perceived Cost of Using Mobiles at the BOP in Sri Lankan Localities

	Jaffna		Badulla		Colombo	Hambantota	
	Urban	Rural	Urban	Rural		Urban	Rural
Mean response	2.38	2.15	3.00	3.05	2.81	2.38	2.15
Standard deviation	0.49	0.69	0.72	0.79	0.66	0.49	0.69
Significantly different from Urban Jaffna (95% CI)		No	No	Yes	Yes	Yes	Yes
Significantly different from Rural Jaffna (95% CI)	Yes		No	Yes	Yes	Yes	Yes

Note: 1 = extremely high, 2 = very high, 3 = high, and 4 = affordable.

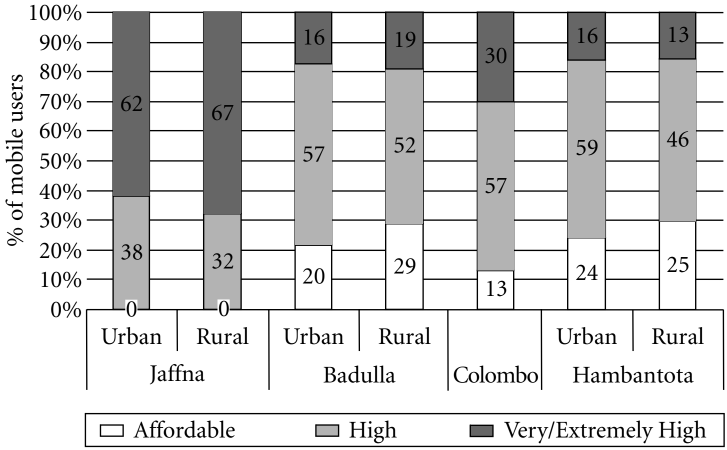


Figure 3.2
Views on the Cost of Using Mobiles at the BOP in Sri Lankan Localities

Heavy Use of Phones in Jaffna

Table 3.2 showed that there were very few fixed phone users in the Jaffna district among teleusers at the BOP, but a large number of public access phones users; from here on, this chapter considers both of these categories as one, given that it is likely that the public access phones in question are actually fixed phones. Furthermore, while the general patterns in the calling behavior reported are based on the respondent's recall, as Appendix 1 notes, this is subject to a degree of inaccuracy (also resulting in relatively higher numbers of respondents who did not answer questions on call frequencies and durations); however, the numbers can be considered as indicative of the actual calling patterns.

In general, Jaffnaites appear to be heavier users of the phone than those in the rest of the Sri Lankan samples, given the more frequent calls being made and received on all modes (fixed, public access and mobile).

Jaffna's calling patterns diverge dramatically from the other localities with regard to international calls: 55 percent of teleusers at the BOP in Jaffna receive more than one international call per month, and 18 percent make more than one international call per month; while these numbers are still low (that is, one call per month), they are considerable when compared to the other Sri Lankan samples, as seen in Figure 3.3. This is probably due to the high number of migrants from Jaffna. There are very few respondents in the Jaffna sample who never or rarely receive international calls on fixed/public access lines.

This pattern corresponds to the unofficial estimate that about 80 percent of the total households in the Jaffna district have members who have left Jaffna and now reside abroad.[4] Many families are fragmented and telecom helps them to stay in touch, and also, very importantly, provides a means of securing financial remittances, which is an important reason to keep in touch, for many.[5] Foreign remittances may be a significant source of income for most households in Jaffna. However, official statistics on this category of income are not available.

Within the Sri Lankan samples, Jaffna stands out, with a high frequency of international calls being made and received. Figure 3.4 shows that a significant percentage of users among mobile users at the BOP in Jaffna receive more than five calls a month.

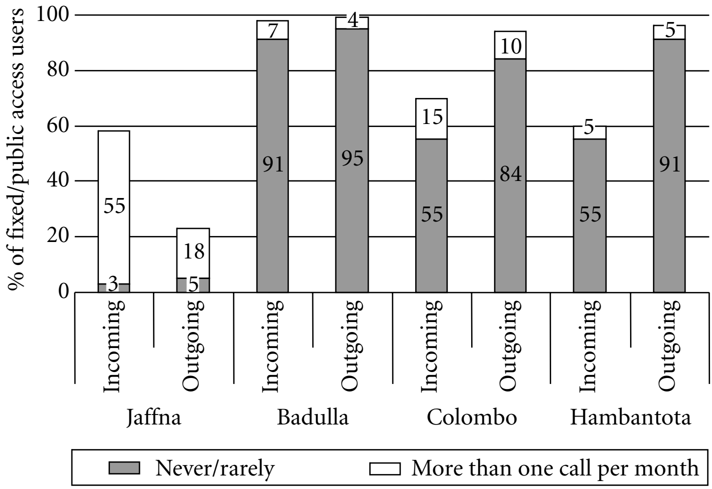


Figure 3.3
Frequency of International Calls on Fixed/Public Access Phones at the BOP in Sri Lankan Localities: Incoming and Outgoing

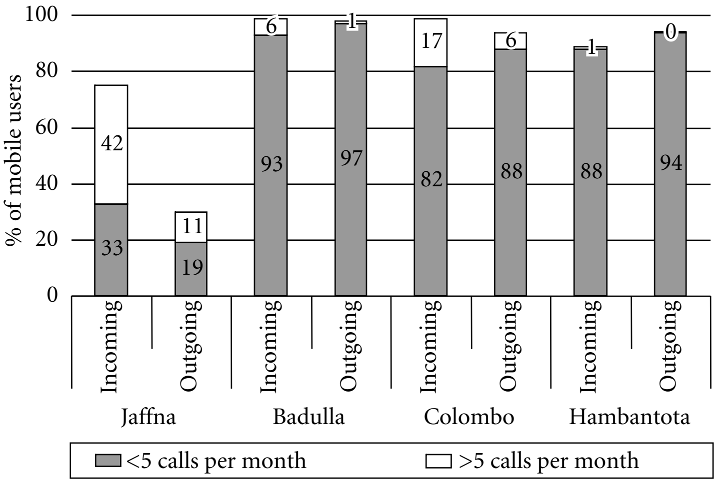


Figure 3.4
International Calls on Mobile Phones at the BOP in Sri Lankan Localities: Incoming and Outgoing

A majority of respondents in Jaffna claim to use the phone to 'keep in touch with friends and family abroad', as shown in Table 3.7. This is explained by high international migration and fragmented families. When looking at the stated purpose of 'keeping in touch with family and friends abroad', the geographical dispersion of families becomes more evident in Jaffna as compared to the rest of Sri Lanka.

Table 3.7
Use of the Phone to Keep in Touch with Family and Friends Abroad at the BOP in Sri Lankan and Indian Localities

		Fixed Phone Users (%)	Mobile Phone Users (%)	Public Access Phone Users (%)
Sri Lanka	Jaffna	n/r	75	55
	Badulla	11	n/r	8
	Colombo	20	18	n/r
	Hambantota	6	8	5
India	Cuttack	13	61	23
	Dehradun	4	n/r	5
	Gorakhpur	7	11	7
	Kasargod	30	29	17
	Mumbai	26	20	15
	Neemuch	0	n/r	1
	Sivaganga	10	n/r	18

Note: n/r-percentage not reported due to low base.

Jaffna's higher use of phones for keeping in touch with people abroad has some similarities to Kasargod in South India, which also has a high migrant population; this is also seen in Colombo and Mumbai, the large metropolis, where a significant part of the population is formed of migrants from other parts of the country.

Table 3.8 shows the frequency of international calls on mobiles in the Sri Lankan localities. Mobile users at the BOP in Jaffna clearly make and receive more international calls to keep in touch with family and friends.

It is also interesting to note that keeping in touch with friends and family abroad is more significant with mobiles than with other modes. This is so in Sri Lanka due to the liberalization of the international telephony market in 2003, which brought down international calling rates by around 70 percent (PIPU, 2004). For example, the per-minute

Table 3.8
Frequency of Calls to Keep in Touch with Family and Friends Abroad (Incoming and Outgoing) per Month for Mobile Users at the BOP in Sri Lankan Localities

	Jaffna (% of Mobile Users)	Badulla (% of Mobile Users)	Colombo (% of Mobile Users)	Hambantota (% of Mobile Users)
Number of incoming calls per month				
None	24	75	74	92
1–5 calls per month	35	17	11	7
6–10 calls per month	22	3	6	0
>10 calls per month	18	6	10	1
Number of outgoing calls per month				
None	70	90	85	92
1–5 calls per month	19	7	7	8
6–10 calls per month	9	0	7	0
>10 calls per month	3	3	1	0

tariff to Canada was LKR 55 to LKR 70 before liberalization, whereas it has fallen to LKR 11 per minute or lower, depending on the package, three years later. Furthermore, prepaid mobile users can make international calls without a large deposit as long as sufficient credit is available in the account.

Incidentally, urban Jaffna had the highest Internet use among the samples in Sri Lanka, significantly more than any of the other samples at a 95 confidence interval. Fourteen percent of teleusers at the BOP in urban Jaffna used the Internet, as compared to one percent in rural Jaffna, 3 percent in Colombo, and 2 percent in Badulla and Hambantota. This reflects the higher demand for international communication in Jaffna, being satisfied through a cheaper alternative, Internet telephony—an alternative that may not be available in rural Jaffna, owing to the lack of infrastructure (that is, fixed lines).

Another reason attributed to the high use of telecom, both incoming and outgoing, national and international, in Jaffna, is that many residents from the neighboring ‘uncleared’ or rebel-held areas of the Vanni come to Jaffna to make calls abroad. Even though SLTL has given a limited number of telephones to the towns within the LTTE-controlled areas, vast areas of the Vanni are still out of bounds for both mobile and fixed phones. Charges in Kilinochchi (the center of LTTE administration) are very high, especially for overseas communication. Therefore many of the residents go to Jaffna (or Vavuniya) to make calls.[6]

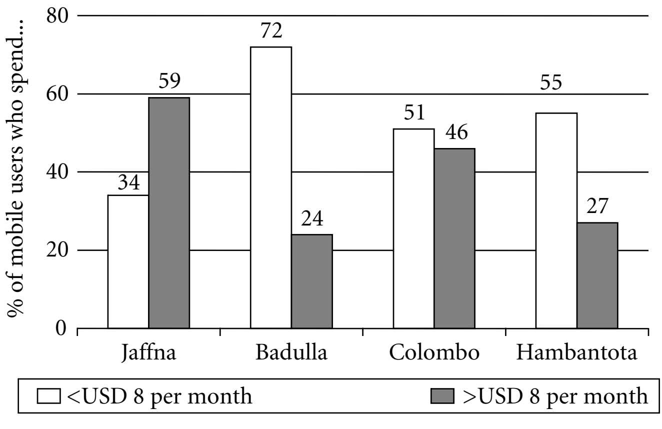
Expenditure on Telecom

People in Jaffna seem to spend more on mobile communication, on an average, than the other Sri Lankan locations, as Figure 3.5 shows.

A higher percentage of Jaffnaites spend more than USD 8 per month on mobile communication. This is explained by the fact that they make the most international calls. Even after the lowering of international rates since 2003, they are costlier than local and national calls.

Similarly when fixed and public access users are considered, it can be seen that expenditure levels are as high among the Jaffna teleusers at the BOP as for those in Colombo (Figure 3.6).

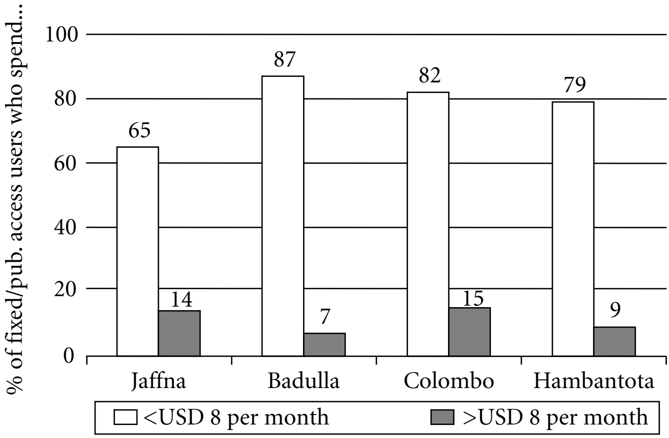
If it is assumed, conservatively, that all the high spenders were earning USD 100 a month, the results indicate that 59 percent of mobile users at the BOP and 14 percent of fixed users at the BOP in Jaffna spent at least 8 percent of their income on telecom. This is considerably higher than what is normally expected. As Chapter 1 discusses,



Bases : Mobile users: Colombo : 72 Hambantota : 105
Badulla : 72 Jaffna : 125

Figure 3.5
Expenditure on Telecom by Mobile Users at the BOP in Sri Lankan Localities

Note: The LKR amounts have been crudely converted to USD, at the exchange rate of LKR 100 to the USD.



Bases: fixed/public access users Colombo : 163
Hambantota : 255 Badulla : 256 Jaffna : 256

Figure 3.6
Expenditure on Telecom by Fixed and Public Access Users at the BOP in Sri Lankan Localities

Note: The LKR amounts have been crudely converted to USD, at the exchange rate of LKR 100 to the USD.

research is beginning to show high numbers such as these. However, caution must be exercised with this finding because it is possible that the respondents may have been understating their monthly income, especially because they may be receiving sporadic remittances that are not always included in answers regarding the monthly income.

The calls made by Jaffnaites appear to be longer as compared to those in the other three localities, which could be one of the major contributors to the higher spending.

Use of SMS

Jaffna had the highest use of SMS among the Sri Lankan localities studied, with 57 percent of mobile users using SMS locally, and 6 percent also using it internationally, as seen in Figure 3.7. Domestic use was similar to that in Colombo, but the use of international SMS was significantly higher. SMS offers a cheaper way of communicating across borders as compared to calling.

Call Duration

It appears that in general, Jaffnaites spend more time on the phone, especially mobile users, speaking for longer than those in the other Sri

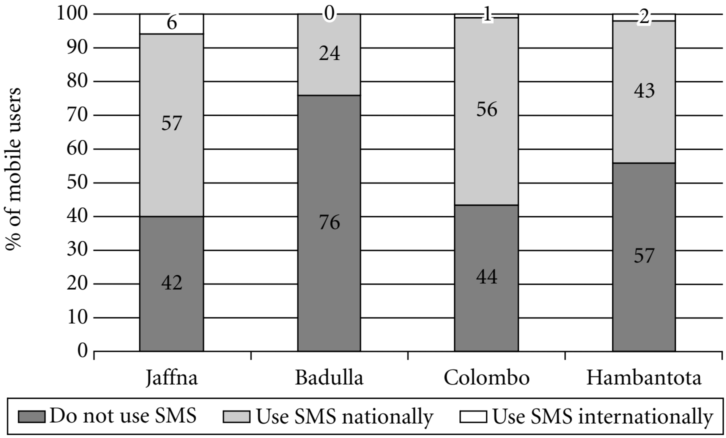


Figure 3.7
Use of SMS by Mobile Users at the BOP in Sri Lankan Localities

Lankan samples on both incoming and outgoing calls, except in the case of outgoing international calls, where a marginal number spend more than five minutes on calls; this is perhaps a result of cost-consciousness given the higher call rates. The average call durations among mobile users, as reported by the respondents, are given in Table 3.9. Those for fixed and public access users are given in Table 3.10.

In the light of the fragmented nature of Jaffna families, this is an expected outcome. The calls are likely to be of a longer duration because the calls that are made, or received, are to/from the many friends and family who are outside the district.

Social Status and Fashion

It appears that at the BOP in Jaffna using a mobile phone is associated with improved social status, particularly among urban BOP users, 21 percent of whom chose to use a mobile as they perceived that it improved their social status. This percentage is higher than in other Sri Lankan locations, which range from 0 percent to the highest of 10 percent for Colombo (Table 3.11). This is in sharp contrast to the Indian samples that were also studied, where using a mobile phone was perceived to improve social status among 57 percent of mobile users.

The same is true with regard to carrying mobile phones as a form of fashion. In Jaffna, 11 percent of the urbanites think it is fashionable. This again differs from the rest of the Sri Lankan samples. Among

Table 3.9
Average Duration of Outgoing Calls on Mobiles at the BOP in Sri Lankan Localities

		Average Call Duration	Jaffna (% of Mobile Users)	Badulla (% of Mobile Users)	Colombo (% of Mobile Users)	Hambantota (% of Mobile Users)
Incoming	National calls	<5 minutes	35	93	90	87
		>5 minutes	50	3	8	4
	International calls	<5 minutes	14	21	29	8
		>5 minutes	60	6	3	2
Outgoing	National calls	<5 minutes	73	93	96	94
		>5 minutes	20	1	0	4
	International calls	<5 minutes	23	10	21	10
		>5 minutes	2	0	0	0

Table 3.10
Average Duration of Outgoing Calls on Fixed and Public Access Phones at the BOP in Sri Lankan Localities

		Average Call Duration	Jaffna (% of Fixed and Public Access Users)	Badulla (% of Fixed and Public Access Users)	Colombo (% of Fixed and Public Access Users)	Hambantota (% of Fixed and Public Access Users)
Incoming	Local calls	<5 minutes	23	35	60	52
		>5 minutes	7	5	7	2
	National calls	<5 minutes	18	41	58	54
		>5 minutes	17	10	6	4
	International calls	<5 minutes	14	5	10	3
		>5 minutes	41	2	4	2
Outgoing	Local calls	<5 minutes	35	78	95	85
		>5 minutes	8	4	2	3
	National calls	<5 minutes	52	91	89	93
		>5 minutes	12	7	1	5
	International calls	<5 minutes	18	7	15	10
		>5 minutes	6	1	0	1

the Indian samples, 60 percent felt that is more fashionable to use a mobile phone. This is perhaps due to the fact that the mobile is more of a recent phenomenon in Jaffna, as it is in India.

Table 3.11
Reasons for Choosing to Use a Mobile at the BOP in Sri Lankan Localities

	Jaffna				
	Urban	Rural	Badulla	Colombo	Hambantota
	(% of Mobile Users)	(% of Mobile Users)	(% of Mobile Users)	(% of Mobile Users)	(% of Mobile Users)
Improves my social status	21	3	1	10	6
It is fashionable to use one	11	7	6	4	7

Concluding Remarks

This study demonstrates that the people in post-conflict societies, such as Jaffna, despite considerable financial constraints, have a higher demand for telecom services than people in areas directly unaffected by conflict. Understandably, a greater share of the income of people in post-conflict societies is spent on keeping in touch with family and friends.

Areas that have suffered extended periods of violent conflict are often characterized by a significant proportion of the population migrating to non-conflict regions as refugees or otherwise. The civil war that affected the Jaffna peninsula for two decades led to a net loss of around one-third the pre-conflict population; many fleeing the district, and even the country. Families left behind are fragmented. The need to keep in touch, as well as the need for financial support in the form of remittances from relatives abroad have driven demand for telecom services to a level that is dramatically higher than in other areas of Sri Lanka. People make and receive many more international calls, and calls are longer than in other parts of Sri Lanka. The need to secure financial remittances further increases the importance of keeping in touch with those living away from home. The telephone is not just an instrument to keep in touch, but one that secures the livelihood of these conflict-affected people.

The need for keeping in touch has proved to be a top priority, even where costs are perceived to be high, and service problems exist. The data suggests a more inelastic demand for telecom services than in other parts of the country. Although people are willing to spend larger amounts of their regular monthly income on telecom, none of the respondents perceive the cost to be 'affordable' unlike respondents in other areas. This indicates a lack of choice.

Limited telecom options during the time of conflict, as a result of government restrictions as well as limited infrastructure, contributed to a large pent up demand for telephones. As in the case of Jaffna, once operators are able to commence service in such an area, connections will surge; low cost wireless technologies, such as Global System for Mobile Communications (GSM) and Code Division Multiple Access (CDMA), can play a critical role in getting people connected quickly. Connections can be provided immediately, especially where prepaid approaches can be adopted. The wire-line alternative can be slow and costly, especially where infrastructure is not only limited, but most likely damaged as a result of conflict. Furthermore, while people have previously been heavily reliant on shared means of fixed access, through public call offices for instance, mobile telecom service may be preferred for its virtue of mobility, despite higher call costs. Mobiles allow people to make calls, as well as be contactable at any given time as long as service is available, which can give users a greater sense of security.

Notes

1. Further details on the study can be found in Appendix 1 of this book.
2. http://www.slt.lk/data/forhome/011telecon_new.htm#
3. Note: bases are small.
4. M. Sarvananthan, Personal Communication, August 2005.
5. M. Sarvananthan, Personal Communication, August 2005.
6. M. Sarvananthan, Personal Communication, August 2005.

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Section 2
Access, against all Odds

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Introduction

Section 1 demonstrated that there is significant demand for connectivity at the Bottom of the Pyramid (BOP). The evidence from the BOP research goes against several common, and still prevalent, misconceptions—that those at the BOP have no need for telecom services, and/or are unable to afford telecom services. Government-owned operators who are said to be driven by considerations other than profit have in the past seen little reason to serve such segments. As a result, large swaths of financially constrained market segments have remained unserved, or underserved. The rapid growth triggered by the lowering of barriers to market entry and competition have extended service to some degree, but even after liberalization, many at the BOP have remained underserved because of bad policy, poor regulation and unimaginative business plans.

Telecom networks are made up of an access component (what customers directly interact with) and a backbone component, made up of 'big pipes' that carry large volumes of voice and data. The emphasis in this section is on the access network, though not simply limited to the equipment. For example, in Chapter 5, the emphasis is on business models that make access possible through Grameen Village Phone Operators (VPOs).

Chapter 4 is about people who want to use networks, not about networks per se. It describes the massive volunteer-based information and communication technology (ICT) education campaigns conducted in Indonesia around connectivity, assisted, among others, by the International Development Research Centre (IDRC). Faced with impossibly difficult conditions caused by bad policy, poor regulation and overall non-responsiveness from the government, civil society activists such as co-author Purbo engaged in efforts to educate consumers and producers of communication services. Because of the strength of that educated community, the Indonesian civil society was able to pull off a major policy reform, the delicensing of the 2.4 GHz frequencies used for Wi-Fi.

This section looks at how market participants, where policy and regulatory inadequacy compounded by hostilities from incumbent operators have found their own solutions. These workarounds may not be optimal, as in the case of Wi-Fi being used for backhaul in the absence of reasonably priced leased lines (Chapter 6), but they are the best available alternatives.

The Chapters in this section look at the cases of Indonesia and Bangladesh. Both of these countries have been poor performers in terms of telecom and broader ICT infrastructure (Figure S2.1), compared to their regional peers.[1] The growth that has been achieved has been a result of complex workarounds to surmount barriers thrown up by incumbent telcos as well as the government.

Both countries have suffered from dysfunctional regulatory and policy environments which have prevented them from achieving anything near their potential. But perversely,

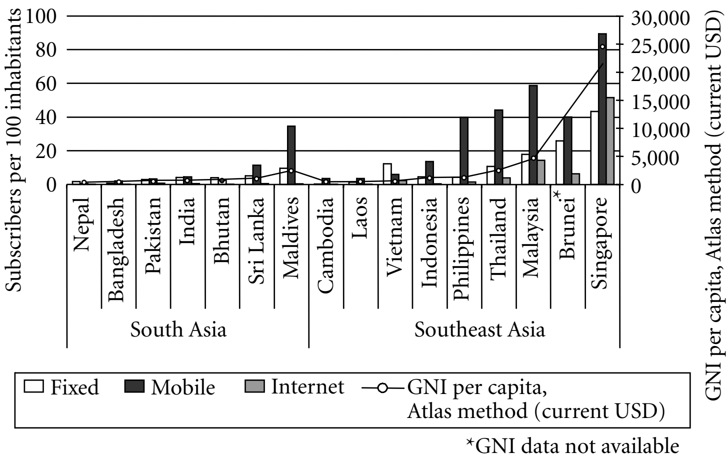

Figure S2.1
Fixed Phone, Mobile, and Internet Subscribership per 100 Inhabitants: South Asia and Southeast Asia (ASEAN and SAARC Countries, respectively, 2004)

Source: ITU (2006).

the same hostile environments have also created innovation in the form of the world renown Grameen Village Phones that may have contributed to the award of a Nobel Prize in 2006 to the visionary Professor Muhammad Yunus, and to technical and educational innovation in Wi-Fi in Indonesia—that too will probably be recognized with a significant award in the near future.

The business innovations described in Chapter 5 have given Bangladesh, one of the poorest countries in South Asia, a surprisingly high level of rural telecom access. This innovative reseller model has connected 50,000 of the 64,000 villages in the country to telecom services (Grameenphone, 2006). Poor but entrepreneurial Bangladeshi women are assisted in purchasing a mobile phone which is connected to Grameenphone's GSM network, but provided subsidized airtime, so that the reseller may turn a profit. The demand that these phones generate is responsible for the network operator's highest ARPUs. Four percent of Grameenphone's subscribers who were village phone operators generated 16 percent of its revenue, as Chapter 5 reports. These innovations, with appropriate modifications, can and should be emulated.

The complex Indonesian workarounds described in Chapter 6 need not be emulated abroad. Yet the accompanying education and awareness building should be, if the objective is the co-innovation of ways to connect rather than the passive consumption of policies and services. The analysis of the workarounds leads to different conclusions, namely the identification of specific policy and regulatory barriers that require reform.

The key factor that has to be understood in both these cases is that the resulting systems/structures arose out of necessity, not choice. In the case of Indonesia, hostility of the incumbent towards private operators and licenses that prohibited them from building the links they could not buy left Internet service providers (ISPs) helpless. This gave rise to the innovation. In the case of Bangladesh, the business innovations were driven by high handset costs and low income levels in villages.

Thus, while these two approaches were optimal in their particular circumstances, they probably should not be replicated unchanged. As Chapter 5 points out, there are other options that may be more suitable, depending on the circumstances. In today's prepaid world, the necessity to involve a third party to administer billing and collection does not arise; with handset costs falling below USD 30, the need for micro-loans no longer exists.[2]

This section, perhaps more than any other in this book, is illustrative of the inadequacy of purely technological solutions. People who have been made aware, business innovations that take full account of the existing price and affordability constraints, technical and operational workarounds to policy and regulatory perversities—these are the things that can get people connected. In the never-perfect world of policy, there will always be a need for human imagination and the will to make possible the use of technology to get people connected.

Notes

1. Both countries have seen considerable growth in the mobile sector since 2004.
2. See Knight-John, Zainudeen and Khan, 2005 for more discussion.

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4

Geektivism

Tahani Iqbal and Onno W. Purbo[1]

Introduction

Indonesia is one of the largest countries in Asia, spread across three time zones, with a population estimated to be 221 million in 2005.[2] Stricken with political and economic instability, frequent natural disasters and ethnic conflict, Indonesia has faced a series of domestic crises. In addition to these difficulties, the Government of Indonesia has not played a positive role in the development of the country's Information and Communication Technology (ICT) sector in the form of effective regulation and policy making. Instead, several poor regulatory decisions[3] based on short-term goals have had a negative impact on telecom and Internet infrastructure and service development. The limited growth and development seen in the recent past can be largely attributed to the untiring efforts of Indonesian civil society.

The many definitions of civil society share a common feature; it is the arena in which people come together to pursue common interests because they care enough about something to take collective action (Purcell et al., 2006). This includes representatives from professional and grassroots levels, community media activists and media interest groups, volunteers, youth activists, philanthropic institutions, as well as human rights advocates, to name but a few. Due to their strength in numbers and reach, civil society organizations play an important role in educating the public, building capacity (through knowledge transfer and training), promoting public-interest objectives, and influencing government decisions. With the emergence of the Internet and other ICTs as global information tools, civil society has gained significant weight in political and economic arenas (Zinnbauer, 2001); similarly, it has an important influence on the development and diffusion of these ICTs. This chapter describes the role that civil society has played in promoting Internet use in Indonesia against a backdrop of meager state-support for the development of the ICT sector.

INTERNET USE IN INDONESIA

Internet development in Indonesia, as in many countries, was initiated by the academic and research community in the early 1990s. Access, at that time, was limited to a small circle of scholars and 'techies' based at universities connected to UniNet, the first Indonesian inter-university network.[4] The Internet became accessible to the general public only after the launch of Indonesia's first commercial Internet service provider (ISP), IndoNet, in 1995 (Table 4.1), and the subsequent spread of public Internet access points, commonly known in Indonesia as *warnet*.[5]

Table 4.1
Indonesian ICT Sector (1990–2005)

	1990	1995	2000	2005
1. Internet subscribers	0	31,000 (1996)	384,000	1,500,000
2. ISPs	0	2	139	232*
3. Internet hosts	0	2,351	26,727	112,630 (2004)
4. Internet users		50,000	1,900,000	10,000,000
5. Internet customers per 100 inhabitants	0	0.01	0.19	0.69
6. Fixed subscribers per 100 inhabitants	0.6	2	3.23	3.97
7. PC penetration		0.50	1.05	3.68

Sources: (1) ITU and APJII estimates,[6] (2) APJII,[7] (3) ITU estimates,[8] (4) ITU and APJII estimates and BPS (2006),[9] (5) Figure 6.7, Chapter 6, (6) BPS (2006) and ITU estimates, and Figure 6.7, Chapter 6, (7) ITU estimates[10] and BPS (2006).
*This number (given by APJII's website) is most likely an underestimation of the actual number, given that about one-third of ISPs in Indonesia are said to operate without a license (see Chapter 6).

Although growth in Internet use was slow during the first five years, the number of users increased rapidly from 2000 to 2005, as seen in Chapter 6. Nevertheless, Internet penetration is still lowest in Indonesia when compared to peers,[11] and as indicated by the six-dimension Internet rating model developed by the Mosaic Group,[12] there is room for improvement—Indonesia has an overall rating of 15.5 out of a total of 24. This can be attributed to the lack of adequate infrastructure as a result of restrictive government policy and ineffective regulation by Directorate General of Post and Telecommunication (DG Postel) and Badan Regulasi Telekomunikasi Indonesia (BRTI). Fixed infrastructure, on which Internet services depend, is dominated by the state owned incumbent, PT Telkom, who along with PT Indosat, another state owned operator, control international gateways. Because of the dominance and political influence of these two operators, regulators have been unable to implement effective reforms; the monopoly situation has resulted in excessive prices (Schwab, Porter and Sachs, 2002), under-developed networks and a lack of access to telecoms. Chapter 6 provides more details on the policy and regulatory framework.

Chapter 6 argues that, owing to Indonesia's skewed geo-demographic structure and license conditions which only permit network operators to build infrastructure, ICT development has been concentrated in the metropolis (in urban centers like Jakarta, Bandung, Bali, and Surabaya) while rural areas lack access to even the most basic telecom infrastructure.[13] Telephone and computer penetration have gradually increased over the years, but these figures are still very low in comparison with the Philippines and Thailand. The existing ICT infrastructure is said to serve only 1 to 5 percent of Indonesia's population (Purbo, 2003). Although the government had plans to connect all the major islands and cities by satellite, submarine, and terrestrial cable (NUSANTARA 21), they were shelved due to the absence of investment capital.

Since most Indonesians have no access to fixed telephones, computers or the Internet, and because they cannot afford to own these facilities or pay to use these services (even when access is available),[14] the *warnet* model of Internet access has been successful. *Warnets* provide relatively affordable access ranging from as low as US dollars (USD) 0.05 to USD 0.09 per hour any time of the day, and it is not surprising that 1.56 percent (approximately 3 million) of Indonesian households use these access points (BPS, 2006).

Another factor contributing to the low use of ICTs is the limited knowledge and use of English in Indonesia. The national language of Indonesia, a dialect of Malay called Bahasa Indonesia, is used in education, government, and business, while other local dialects are still very important in certain areas. As such the ability to use the Internet is limited.

The ICT civil society has played a pivotal role in educating thousands of Indonesians in ICTs, with assistance from the private sector. The community has promoted the use of the Internet and relevant ICTs to people across Indonesia from the early 1990s. Initially constituting academics alone, the community now encompasses a wide group of individuals, from ICT experts to a range of users/practitioners—techies, hackers, programmers and general users, and activists; these groups try to promote the use of the Internet and ICTs at all levels of the society and in all aspects of life. In addition to this core group, many Indonesian businesses (ISPs, *warnets*, etc.), students, teachers, and the general public have taken to extending ICTs affordably and effectively to the last mile, as Chapter 6 will show. As their reach and influence has broadened over the years, the group has striven for a reasonable mix of supply- and demand-side measures to enable diffusion of the Internet throughout Indonesia. Actions aimed at educating the people, especially the youth, and promoting alternatives to gain better access to ICTs, have resulted in a significant increase in Internet use (Figure 4.1).

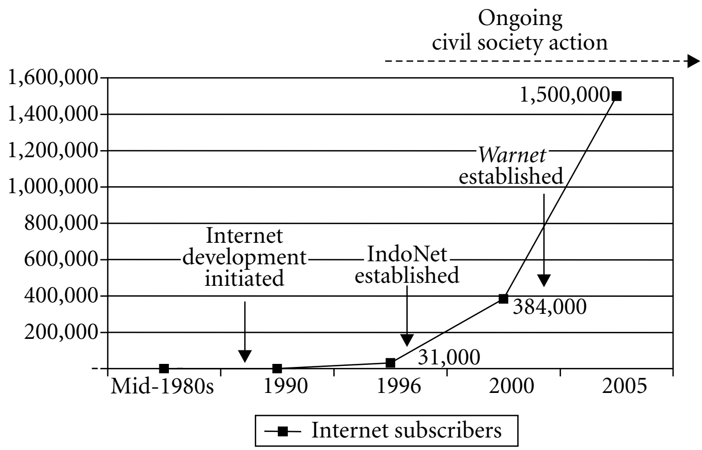

Figure 4.1
The Development of the Internet in Indonesia

Source: Authors.

When the Internet was opened to the public in the mid-1990s, very few people knew enough about the technology to make use of it; there was a definite lack of IT expertise. Realizing early on that the effective use of technology required appropriate skills and know-how in addition to access itself (Lim, 2002), the ICT community focused their efforts on spreading knowledge of the Internet to as many people as possible, in order to generate an interest in ICTs. This was executed by conducting many training sessions and distributing information resources across the nation. The growing numbers of experts and users—the products of the original information distribution cycle—have gone on to promote ICTs in their own communities by authoring various books and conducting tutorials in local dialects. This education process can, therefore, be seen as a recurrent cycle of teaching and learning, leading to an ICT-literate Indonesian society.

This ongoing process has resulted in the added benefit of creating a pool of well trained ICT intellectuals and experts who have gone on to create relevant software and hardware tools for the Indonesian ICT user. Consequently, there has been a continuous improvement in local software applications and web content, and even the development of innovative networking solutions (neighborhood and school networks) with assistance from the private sector. These actions have improved Indonesia's Internet presence and encouraged increasing numbers of Indonesians to get online.

Products of Community Action

Growing community action in Indonesia has resulted in bringing about an ICT literate society, improved online content, a large number of local software applications and innovative workaround network solutions. This sub-section discusses these results in more detail.

ICT-literate Society

In order to enable knowledgesharing among the public, the community conducts regular training courses (seminars, demonstrations, and road shows) across the country. Recognizing that lowcost knowledge distribution is important for the adoption of ICTs, these courses are usually taught for free (or, for about USD 3 to 5 per head, at most) and feature ICT experts, practitioners and activists, including participants from the private sector. Even hackers, well known among

Indonesians, such as Jim Geovedi and Irvan, make presentations at these events. Depending on the resources available, the courses range from hands-on practical sessions to simple face-to-face discussions with the students, mostly youth. Programs are conducted on various topics, from regulatory issues (public access and Wi-Fi, and VoIP) to technical issues like Free and Open Source Software (FOSS), software and website development, programming, etc., while the most common sessions are the general ICT awareness programs. The former courses are focused more on schools and colleges, while the latter are taught to the general public. Taking into account the demand for these training sessions, it is normal to have over 300 people attending each seminar, and about two to three seminars in two to three different cities every week. As more Indonesians become interested in ICTs, the frequency of training courses has multiplied. Private sector assistance comes in the form of funding to conduct these tutorials and road shows; some companies donate equipment to budding ICT researchers, authors, and users. Even the Indonesian Ministry of Education assists in organizing, coordinating, and implementing this kind of community action. The Ministry has played a major role in the growth of the ICT sector—it has been a strong proponent of ICT education and has even made plans to introduce the subject in school and university curricula. ICT organizations were to collaborate with educational institutions and ICTs were meant to be used as learning tools, but these plans could not be implemented due to various impediments (Belawati, 2003). Despite these setbacks, the Ministry of Education, in collaboration with other (government) entities, supports ongoing civil society activities that bring about greater ICT education and awareness in Indonesia.

Media such as radio, television, and newspapers are also used to promote the use of computers and the Internet. ICT-related education programs are frequently telecast on TV; radio talk shows host ICT activists and experts, and newspapers carry articles written by them. The dissemination of information through the use of print (pamphlets, fliers, magazines, and books) and online publications (newsletters, e-zines, and e-books) is also undertaken. Publications in local languages are useful sources of information to those interested in learning about ICTs.

Unlike in other countries, Indonesia's hackers have a positive impact on local web content and software development, as they publish their experiences in magazines, books and online media. Authors can get up to USD 700 to USD 900 per book in royalties; each book is sold at concessional rates of about USD 2 to 3 on an average, or is distributed free-of-charge at training courses. Indonesian technology magazines are also widely available and cost USD 1 to 2. Many of these magazines accept contributions from local authors and pay about USD 15 to 25 per article.

Although a number of programs are operated by the government, the key drivers of Internet development in Indonesia are civil society groups. Umbrella organizations like Masyarakat Telematika Indonesia (MASTEL) and the Indonesian Infocom Society, which bridge the government, private sector and other interested parties, play a significant role by 'conducting various activities to promote and develop Indonesian telecommunication expertly and evenly'. They focus on industrial development through better access and content and domestic applications (FOSS, e-commerce, etc.) and hardware development. Asosiasi Penyelenggara Jasa Internet Indonesia (APJII), Indonesia's ISP Association, carries out a number of educational programs, in association with the private and public sectors, hoping for the growth of the service industry and increasing Internet users to 20 percent of the population by 2007. There is also a large FOSS sub-community within the ICT community.

Due to these efforts, many Indonesians are getting online and making better use of ICTs. Many of these individuals have careers in IT, some as academics and others as techies. Many students who are trained at these seminars and tutorials develop software applications appropriate for use in Indonesia (the programs are operable in Bahasa Indonesia and are freely downloadable). Others develop web content for Indonesian Internet users, increasing appropriate local content. Additionally, the development of workaround networking solutions by these individuals has enabled cheap Internet access to previously unconnected areas in Indonesia and is their most important contribution so far.

Better Online Content

The Internet is a global communication medium, facilitating information retrieval, publication, dialogue, and coordination amongst groups and individuals across the world. From websites and data repositories, to mailing lists/fora, user groups, online communities, chat rooms and blogs, the Internet provides the domain, reach and freedom for an author to develop his/her writing skills and make his/her voice heard across an audience that is both local and global. While some of these discussions are confined to closed groups, others are open to the public.

Other popular online media used for social purposes, knowledge sharing, business activities and general information exchange, are mailing lists and user groups. Tech user groups can be loosely categorized into ICT policy enthusiasts, hackers, techies, programmers and network administrator communities. Almost all these groups operate in Bahasa Indonesia and are hosted at Yahoo! Groups (over 45,000 in total, however, only a few are active and effective). Hacker group Jasakom-Perjuangan is currently the largest in Indonesia with over 12,000 members, while the Network Administrator community, represented by Indowli and Asosiasi–Warnet, has over 10,000 members. These groups facilitate the discussion of current IT affairs, tech problems, and business ideas, among other ICT topics.

Local Software Applications

The Linux community, Sony AK Knowledge Centre and Open Source-Indonesia groups are playing important roles in determining the course of FOSS development in Indonesia, while the Indonesia Goes Open Source (IGOS) initiative by the government and other private sector institutions provide ancillary support. The government established copyright laws in 2003 and issued a decree requesting the development of software in Indonesian languages using Open Source platforms. Without encouragement by the ICT communities to develop and use FOSS in Indonesia, the decree would have been of no effect. In addition to the increased use of Linux and other open-source software, many local software applications have been developed by amateur and professional programmers who are members of these communities.

The most impressive software developed so far, the Indonesian Digital Library Network (DLN), improves the quality of graduates coming out of the university system, through easy access to information that they could not have accessed otherwise. For instance, a student on the island of Kalimantan can gain easy access to the Institute of Technology, Bandung (ITB) library located in Bandung, on the island of Java, as easily as he can gain access to a digital library in New Zealand. Unsurprisingly, the DLN won an award from the American Society for Information Science and Technology (ASIST) in 2001 and the prestigious Indonesia Infocom Business Community (i2bc) e-Award in 2002 which honors organizations that make a positive impact on ICT development in Indonesia.

Many individuals who develop Indonesian FOSS applications have had no formal ICT training, apart from the courses conducted by the ICT community. The rest of their knowledge has been obtained through their own initiative and through the use of freely available online and offline resources.

Workaround Network Solutions

The most impressive outcome of civil society and private sector action is undoubtedly the development of 'workaround' networking solutions; these have enabled cheaper access to the Internet in the previously underserved areas of Indonesia. This innovation came about as a result of persistent attempts to bypass Telkom's last mile infrastructure (and, therefore, avoid paying excessive charges), made by ISPs and other small and medium ICT entities.

As explained in Chapter 6, ISPs have been forced to pay PT Telkom's exorbitant charges, making Internet subscriptions too costly for average Indonesians. In order to circumvent this, ICT experts and academics developed 'neighborhood networks' and 'school networks' which provide lowcost, shared Internet access around neighborhoods and schools, respectively, using wireless networks (Wi-Fi). These access points follow the *warnet* model of operation and make use of wireless networks that rely on radio waves, running on 2.4 GHz or 5.8 GHz bands up to 5–8 km and, most importantly, bypass Telkom's last mile infrastructure. By running either a Unshielded Twisted Pair (UTP) cable around the neighborhood or by using a Wi-Fi access card and using bandwidth from nearby Internet cafés (or schools), Internet connectivity can be distributed throughout the area for as low as USD 15 to 30 per house per month. As more households and computer units join the network, and as technology develops, the cost further declines (unfortunately, along with quality). While most school networks provide the same services as Internet cafés for a cost of about USD 0.5 per student per month, others resell bandwidth to distribute connectivity around their neighborhoods. School networks allow many more people to access the Internet than just those who can afford personal computers (PCs) in their homes.

Setting up and maintaining a wireless connection for a Neighborhood or School Network is a low-cost activity.[15] An advanced ICT-literate individual can build a Wi-Fi network without much difficulty. These alternative network solutions are discussed in detail in Chapter 6.

Emerging VoIP (Internet telephony) is another feature that has become available to Indonesians through Neighborhood or School Networks, which allows cheap communication, both locally and globally. By utilizing VoIP to make phone calls, Indonesians avoid the excessive call charges of PT Telkom and PT Indosat. Currently 15 Indonesian VoIP providers are in operation and the cost of carrying data in and out of the country is declining. Equipment for Internet telephony is now available off-the-shelf and is fairly easy to use; the one-time cost for a VoIP handset is around USD 20 to 70 (a Telkom circuit-switched handset costs around USD 25 to 35, and a fixed wireless handset costs between USD 35 to 50) and the monthly operating costs are about USD 25. This technology can be used to build a community telephone network sidestepping PT Telkom's telephone infrastructure, which again further reduces costs per call.

Civil society actions have had major impacts on Indonesian Internet development and use; within a short period of 10 years it is estimated that over 10 million Indonesians, more than 4,000 schools, and over 4,000 Internet cafés (including the *warnet*) have gone online. Significant progress has been made in the creation of an ICT-literate society, improved online presence and better local applications. What is most significant is that all of this has been achieved without much government and donor support.

Concluding Remarks

Despite a lack of regulatory support from the Indonesian government as well a variety of geographical, political, and economic obstacles, progress has been made in the deployment and use of the Internet in Indonesia with the support of local communities. Much progress has been made in the diffusion of ICT education in the country.

With the exception of the Ministry of Education, the Government of Indonesia has not provided much support for the development or adoption of ICTs; in fact, its telecom policies have constituted a major barrier. While the private sector enjoys the benefits of competition in the IT market, the fixed telecom sector is essentially monopolistic, although the regulatory framework states otherwise. It is imperative that more enlightened policies and regulations are implemented for the benefit of all Indonesian citizens; the recent reforms proposed by the government show promise. Such policies would include those that not only permit, but also encourage private participation in infrastructure development, and help to reduce prices through competition. Effective regulation is also required in the sector. Since the unlicensing of the 2.4 GHz band for Wi-Fi in January 2005, the government has been making better decisions in consultation with the ICT community. It has forced telecom operators to cut leased line prices by 50 percent[16] and now has plans to introduce a least-cost subsidy auctions to roll-out backbone networks. To ensure competitiveness in the telecom sectors, the authorities have plans to introduce another international gateway provider and have already allowed the entry of new players in the fixed wireless and mobile sectors (Goswami, 2006).

The ICT community aggressively promoted the use of the Internet throughout Indonesia, and their actions have resulted in the creation of an ICT-literate society, an improvement in Indonesia's online presence and better local applications. These outcomes and the development of alternative network solutions that enable affordable access to the Internet have had positive impacts on the sector.

NOTES

1. Divakar Goswami assisted in the preparation of this chapter, with the verification of certain facts.
2. World Bank: http://devdata.worldbank.org/data-query
3. For example, granting exclusivities to incumbents for the fixed-line sector and international gateway; licensing framework that prevents ISPs from building infrastructure; no tariff regulation of leased line and international bandwidth which are crucial inputs for provision of Internet service, etc. See Chapter 6 and Goswami and Purbo (2006) for more information.
4. This network is now the base of the non-commercial research and academic information network known as IPTEKnet.
5. Abbreviation of *warung Internet*, loosely translated as cybercafé or Internet café.
6. ITU World Telecommunication Indicators 2004 database and APJII estimates (http://www.apjii.or.id/dokumentasi/statistik.php?lang=eng)
7. APJII (http://www.apjii.or.id/dokumentasi/statistik.php?lang=eng)
8. ITU World Telecommunication Indicators 2004 database.

9. There are many estimates of the number of Internet users in Indonesia based on varying and arbitrary definitions. For instance, the APJII estimate for Internet users is derived by multiplying the number of subscribers by some factor close to 10. The most reliable figure of 10,000,000 Internet users in Indonesia is the result of a national survey carried out by BPS in 2005. http://www.apjii.or.id/dokumentasi/statistik.php?lang=eng
10. ITU World Telecommunication Indicators 2004 database.
11. See Figure 6.1.
12. The model takes into consideration (a) Pervasiveness, (b) Geographic dispersion, (c) Sector absorption, (d) Connectivity infrastructure, (e) Organizational infrastructure, and (f) Sophistication of use, http://mosaic.unomaha.edu/gdi.html
13. Of the 66,778 villages across Indonesia, almost 65 percent remain unwired.
14. The cost of owning a telephone includes an initial connection charge of USD 31 and monthly subscription charges of USD 3.4 in addition to per minute call charges (ITU, 2006), the total of which is unaffordable to most Indonesians. Besides owning telephones, few Indonesians own PCs. A basic, no-frills personal computer can cost between USD 200 and 250 and this is far too costly for an Indonesian earning an average of USD 80 per month. Additionally, Internet access charges (that is, the subscription to an ISP) vary between USD 5 and 60 per month, depending on the type of connection (telephone, cable, or fiber optic). Based on ITU (2003) figures, the average Indonesian spends up to 28 percent of his income per month for Internet access.
15. It costs approximately USD 2,000 to set up a neighborhood network, which, if divided among the neighborhood, will reduce individual charges further.
16. 'Leased Line Tariffs to be Regulated', *Bisnis Indonesia*, September 27, 2006.

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5

Making a Business out of a Village Phone

Malathy Knight-John

Introduction

Greater access to ICT networks and to ICT-enabled services have been hindered in many developing countries by factors ranging from policy and regulatory failures to misperceptions of the cost-effectiveness of providing these services to 'marginal customers'.[1] Yet, there is empirical evidence of considerable untapped business potential among such marginal customers. Innovative approaches to network development and expansion have been found, especially in the developing world.

The objective of this chapter is to analyze the necessary and sufficient conditions for network expansion and investment in marginal communities, drawing from the experience of the Grameen Village Phone (VP) program, an innovation of the Grameen Bank (GB) of Bangladesh. The VP program has been successful in providing access to telecommunications to over 45 percent of the villages in Bangladesh, as at the end of 2005, through providing microfinance to villagers to purchase a mobile phone and a Grameenphone (GP) connection, which is then operated as a pay-phone, providing access to fellow villagers for a charge. This is particularly impressive in a country that had 3.44 telecom (fixed plus mobile) subscribers per one hundred inhabitants in 2004. The VP program has been hailed as a unique model for the development of rural telecom infrastructure, promoting development and poverty alleviation in Bangladesh through the use of ICTs expanding telecom access to the rural poor, while maintaining a sustainable business model.

The models that work are defined and shaped by specific policy, regulatory and institutional environments and by the technology available at a particular time. Because specificity does not readily lend itself to practical and generalizable policy insights, the access problem is approached through the lens of transaction cost economics in order to retain a comparative perspective. As such, this chapter argues that access solutions evolve through the minimization of the transaction costs of doing business; that rational entrepreneurs will structure their models to ensure both cost-effectiveness and sustainability. In the process, 'win-win' solutions for most stakeholders may emerge.

The second part of this chapter examines the common misconceptions regarding provision of telecom services to marginal customers; this misconception is particularly pernicious in countries with low telephone penetration levels. This part looks at evidence from Bangladesh, India, and Sri Lanka. The next part sets out the basic conceptual framework relating to transaction cost minimization and analyzes the Grameen solution. From this central thesis of transaction cost minimization, a range of options are considered from an 'in-house' or vertically integrated model to various forms of outsourcing solutions, such as resellers and virtual network operators (VNOs)—and, finally unveiling the factors likely to produce these outcomes. The conclusion touches on the debate surrounding traditional microfinance approaches vis-à-vis market-based approaches in improving the lives of marginal communities, cementing the argument that markets can, and have been made to work for the poor, provided that business strategies create workable incentive structures.

The Access Problem: Dispelling the Myths

The under-provision of telecom services for potential users in countries with low telecom penetration is linked to two misperceptions. First, that the demand for telecom services among marginal customers is too low to generate commercially viable business. Service providers tend to believe that marginal customers cannot afford the services, if they need them at all. Second, that the transaction costs of providing services to marginal customers include a significant payment collection component, which is perceived as being too high to justify rolling out the network.

New research suggests that investing in marginal communities is good for business. In Bangladesh, the VP program has demonstrated that there is an enormous untapped demand for telecom services amongst the rural poor. Studies indicate that users of these village phones spend around 7 percent of their income on telecom services on an average (Prahalad and Hammond, 2002) with consumer surplus yielded by a single phone call from a village to Dhaka estimated to range from 2.6 to 9.8 percent of mean monthly household income (Richardson, Ramirez and Haq, 2000, p. 2). It is estimated that the average net income earned by a village phone operator (VPO) is more than double the per capita income for Bangladesh (Alauddin, 2005). From a social perspective there is evidence that the VPOs—entrepreneurial women in rural Bangladesh—gain empowerment as they generate an income, participating in family decisions in a society where traditionally women have little or no say (Keogh and Wood, 2005). Chapter 1 showed that among telecom users at the BOP in the samples studied, 64 percent of the mobile users spent *at least* 4 percent of their income on mobile communications.

These findings indicate that the purchasing power of marginal customers may be higher than believed and point to a large unmet demand at the BOP. However, they tell only half the story. Unleashing this potential not only depends on an informed perception of marginal customers as a potential profit base (something that GB acquired through years of interaction with its clients as a microfinance institution with deep roots in rural communities); it also depends on the way in which services are packaged, marketed, and delivered—that is, how the business model is structured to minimize transaction costs.

Minimizing Transaction Costs of Increasing Connectivity: The Grameen Solution

The essence of transaction cost economics (TCE) is its approach to the 'allocation of economic activity across alternate modes of organization (markets, firms, bureaus, etc.), [using] discrete structural analysis, [and describing the firm as] a governance structure (which is an organizational construction)' (Williamson, 2005, p. 41). An important contribution made by TCE to socio-economic analysis and to the understanding of business structures and strategies is its focus on the science of contract; this focus draws from the fields of law, economics and organization theory. In contrast to traditional neoclassical economics but in line with the broader new institutionalism that it is situated within, TCE gives prominence to the role of governance in shaping the structure of a transaction, or a particular organization structure. To cite one of the founders of institutionalism, Commons (1932, p. 4), 'the ultimate unit of activity…must contain in itself the three principles of conflict, mutuality and order. This unit is the transaction.' In short, governance is seen a means to bring in order, to mitigate conflict and allow for mutual gain.

At a practical level and for the purpose of this analysis, TCE implies that the organizational structure that will evolve is determined largely by the transaction costs involved in providing a particular service. In the Grameen case the high transaction costs associated with the provision of telecom services to the rural poor are lowered by the extensive physical and social infrastructure that Grameen has on the ground; the outcome is an 'in-house' model where all parts of the process remain within the Grameen 'family' of organizations.

Extending Network Access

The VP program, an initiative of GB and Iqbal Quadir, a US-based Bangladeshi, was set up through the establishment of two companies—Grameen Telecom (GTC, a non-profit rural telecom company) and Grameenphone (a for-profit mobile network operator). It has been in operation since 1997. This innovative strategy for network expansion was conceived within an environment of limited interconnection facilities—hostile conditions created by the incumbent fixed operator, Bangladesh Telegraph and Telephone Board (BTTB), and permitted by government apathy. These unfavorable initial conditions led GP to seek alternative means of penetrating the countryside, resulting in a network sharing agreement with Bangladesh Railway, which led to the acquisition of a 1,800 km long fiber optic network; this arrangement essentially gave the company access to a nation-wide network parallel to that of the incumbent. With the fiber optic network under its belt, GP also obtained a critical strategic advantage over rival operators constrained by insufficient interconnection with BTTB and has thus been able to expand its coverage throughout the country rapidly. GP's coverage is extensive, and has by and large followed the railway network. Furthermore, as Figure 5.1 illustrates, the VP program has

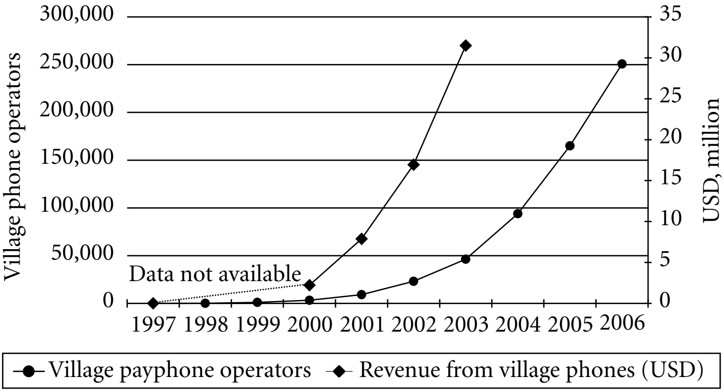

Figure 5.1
Growth in Village Phone Operators (1997–2006, September) and Grameenphone's Revenue from Village Phones (USD) (1997–2003)

Sources: Grameen Telecom (2005), http://www.grameenphone.com and *Grameenphone Annual Report 2005*, *Grameenphone Annual Report 2003*.[2]

expanded significantly since its inception, with over 250,000 VPOs in September 2006[3] and a positive return in terms of revenue as shown in the same figure.

The 'Grameen Family' Infrastructure

The Grameen family of organizations is an important element of the VP program's success—screening creditworthy clients and ensuring repayment (both activities carried out by GB branches at the village level), and allowing for economies of scope. The mechanics of the VP program and the role of the three key organizations involved—GP, GTC, and GB—as well as their relationships are illustrated in Figure 5.2. GB provides loans to selected VPOs to obtain a connection to GP's cellular service; in July 2005, when this research was conducted, the amount of the loan was approximately USD 133 (Grameen Telecom, 2005). The VPO resells telecommunications service to people in and around their villages, for a profit.

Grameenphone has been able to piggy-back on GB's established micro-finance infrastructure in the context of determining and ensuring the creditworthiness of clients. The streamlined selection process, which has resulted in the screening out of bad debtors, and a repayment rate

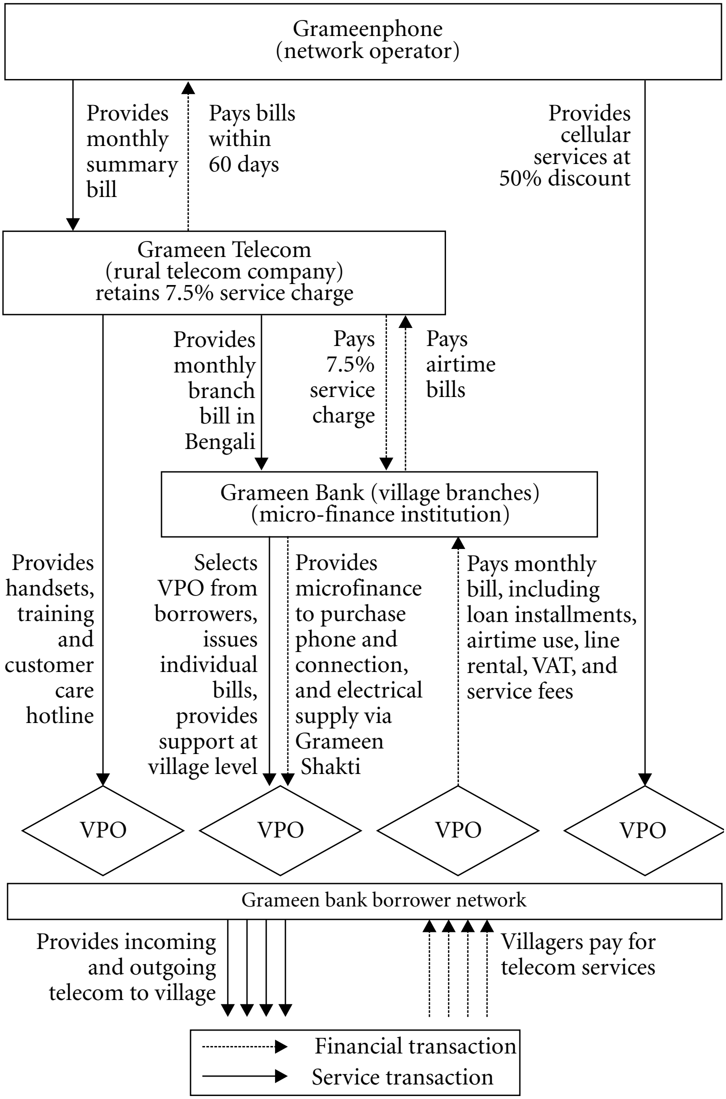

Figure 5.2
Relationships among Grameenphone, Grameen Telecom, Grameen Bank Branches, and Village Phone Operators in the Context of the Village Phone Program

Source: Knight-John, Zainudeen and Khan, 2005.

of approximately 98.95 percent,[4] is depicted in Figure 5.3. GB is the first point of contact for VPOs with GB staff permanently located in villages and regularly meeting borrowers. These regular meetings with VPOs work well to avoid problems of moral hazard (unwillingness to pay back) and adverse selection (carrying a larger percentage of bad debtors) associated with informational asymmetries between lenders and borrowers.

The scope economies associated with GB's microfinance base include the provision of micro-loans to selected VPOs to purchase a handset and a connection; loans for solar panel cells and DC batteries are also provided in locations where there is no electricity through Grameen Shakthi, another member of the Grameen family.

The Selection Process

Although the members decide among themselves who gets the phone and becomes a VPO, the borrower must also:

- have been a member of the Bank for a minimum period
- have a good track record of repayment
- have a good business in operation, and have time to operate the VP
- have at least one literate member in her household, if she isn't
- have access to electricity
- live in a central location within the village

Other factors are also considered, such as whether the woman's husband is a criminal or not. This process is to ensure to the greatest extent possible that the woman and the community benefit from the VP.

GB Members	➢ Members nominate a borrower to become VPO
↓	
GB Center	➢ Center manager checks out borrower to ensure she fulfills criteria and submits information for approval up GB hierarchy
↓	
GB Branch	
↓	
GB Area Office	
↓	
GB Zone Office	➢ Approves (or disapproves) nominee; GTC staff (at GB Zonal Office) make request to issue phone to approved VPO candidate
↓	
GTC Head Office	➢ Issues phone to VPO

Figure 5.3
The Village Phone Operator Selection Process

Source: Knight-John, Zainudeen and Khan, 2005.

There is also a significant 'power relationship' between GB and its borrowers that own 94 percent of the total equity of the Bank—illustrated by the 16 decisions[5] that clients must commit to when becoming a member of the Bank. This vertical power structure between the Bank and the VPOs is complemented by peer pressure; loans are given to groups of five and the entire group is denied credit if one person defaults. Thus, the risk of jeopardizing one's reputation in a tightly integrated village community helps to create a strong incentive mechanism for the repayment of loans.

The Grameen model has led to a situation where in 2004, the VPOs that made up approximately 3.85 percent of GP's subscriber base accounted for 15.5 percent of GP's total airtime revenues (Alauddin, 2005), while incurring less costs that those associated with a regular subscriber. As at June 2005, the average revenue per user generated by a VPO connection was twice that of a regular subscriber.

From the perspective of GP, the company that owns and operates the cellular network, the VP program is *one* customer; GP treats the entire program as a bulk buyer of airtime, issuing a single summary bill in English at the end of the month to GTC for the aggregated airtime of all the VPOs. GTC then makes out airtime bills in Bengali for each GB branch office, with a summary for that branch. The GB branch makes out individual bills for each VPO, and the actual collection of monies from VPOs is carried out by the GB branch at the village level; monthly bill collection is integrated with loan repayments (including for the initial package). The branch pays the bill to GTC by the last date of payment. GTC bears marketing and advertising costs of the VP program, supplies handsets, provides support, training, service, and repair of handsets, and overall management of the VPO network (Grameen Telecom, 2005).

GP therefore avoids several costs it would incur if it were to provide individual connections to VPOs without the involvement of GTC and GB. GP only incurs costs related to:

- communication infrastructure
- technical support
- provision of airtime (which is provided at a 50 percent discount)
- provision of a bulk bill to GTC
- government licensing and regulatory compliance and liaison
- government financial and taxation liaison

Affordable Mobile: The Grameen Strategy

The Grameen solution also takes into account the demand side of the equation, that is,, the affordability factor. For example, the shared access model used in the VPO program—where one phone provides access to multiple users—concentrates demand and aggregates purchasing power. Citing Prahalad and Hammond (2002, p. 10): 'an individual consumer might not be able to afford a particular product or service, [while] a group, or even a whole village, often can.'

GP also provides airtime to GTC for the VP program at a discounted rate of around 50 percent. Whilst this was initially part of GP's business strategy (embodied in the principle, 'good development is good business'), it is now one of GP's biggest Corporate Social Responsibility programs. The discount is an exclusive privilege offered by GP to GTC, and applies to all rates that are normally charged to GP customers. The tariffs charged by GTC to VPOs are hence less than what regular GP customers pay. The discounted rate allows GTC to cover its costs, and the VPOs to make a profit. Thus, in the absence of an airtime discount, the rates that VPOs would have to charge users in order to cover costs would be much higher; in turn, demand for telecom services would be lower, and hence the profitability of each VP would be reduced, and the sustainability of the program would be negatively affected.

Serving Marginal Customers Profitably: Business Models that Enhance Access

The Grameen solution has two characteristics. First, it is a reseller model, where the telephone is owned by a local entrepreneur, who resells services within the locality—in this case the village. Second, it is an 'in-house' solution—a model of transaction-cost minimization that has appeal in the context of low-trust/credibility conditions in countries with weak law and governance capacities.

The Grameen solution evolved in a specific market, regulatory and technological context; it is by no means a universal remedy for the problem of access to marginal consumers. Yet, as seen earlier in this chapter, the Grameen story does provide very useful policy insights on converting a potentially unfriendly business environment into one that can work for all stakeholders. The keys to its success—the factors that lend themselves to generalization for policy and business purposes—are the identification of the relevant transaction costs and the design of a solution that can minimize these costs; a cost-effective model that would also ensure business sustainability. In the remainder of this part, we extend our central thesis of transaction cost minimization to explore other solutions or models for enhancing network participation.

The Prepaid Reseller Approach

This solution, adopted in the Ugandan variation of the Grameen model, provides a lower-transaction-cost alternative to the 'original' model. The original Grameen model takes a post-paid approach, where the VPOs settle the airtime bill at the end of the month. In the prepaid variation of the model, users who have already secured a handset and connection to a network operator (through the Village Phone-type program) buy airtime in advance—either by purchasing prepaid 'top-up' cards for specific (discreet) values (for example, 100, 500, or 1,000 Taka) or by using 'electronic-refill' systems for any desired amount.[6] This can usually be done at designated retail outlets, such as grocery stores. As the services are used, the available credit is periodically 'topped up'.

The most advantageous aspect of this approach is that the need to screen creditworthy customers and ensure repayment is eliminated. People pay for services before using them, so there is no risk of non-payment of bills. Users of prepaid mobile connections have largely been in developing countries,[7] where fixed telephony is either unavailable or very limited or, in instances where mobile service exists and marginal customers are unable to obtain 'post-paid' connections for lack of creditworthiness. Often in developing countries, credit histories are not well documented, making it difficult for operators to distinguish between customers who are likely to pay their monthly bills and those who are not. Such informational asymmetries drive up risk and therefore the transaction costs of doing business through monthly subscriptions, or a 'post-paid' approach.

An operator may avoid and/or reduce certain costs through a prepaid approach, but significant costs will still be involved in a prepaid system. Prepaid operations require sophisticated software systems that can keep track of account balances and deduct the correct amount of credit for all types of services provided. Costs are also incurred in printing and distributing charge cards (or top-up cards) to retailers. If an electronic refill system is in place, then this also requires sophisticated software as well as a small piece of equipment for the retailer to credit customers' prepaid accounts.

The Local Reseller Approach

Another solution to network access that has evolved is the reseller model. The basic model is made up of a network operator that owns and maintains the network infrastructure and provides the 'service' (that is, airtime) to a buyer, who then resells this airtime usually for a profit.

There are two versions of this model, each defined by the nature of the relationship between the reseller and the network operator. Here we look at the first version: that of the local reseller. The second kind of reseller is the 'VNO,' or 'virtual network operator', discussed subsequently.

In a local-reseller approach, an entrepreneur obtains telephone line(s) from a network operator, paying a connection fee and a monthly bill, which includes line rental and airtime charges. The local reseller provides telecom services to people in the vicinity, most likely, making a profit. The relationship between the network operator and the reseller is similar to that of a regular customer, except for discounts for wholesale purchase, if at all. Resellers may or may not be required to obtain a license, or register with the regulator, depending on the regulatory regime that prevails in a particular jurisdiction.

In theory, the risk from the network operator's perspective should be greatly reduced, as the local reseller collects use charges from the end users—whom the network operator perceives to be risky. However, this solution has its own problems. The perception among operators in Sri Lanka, for instance, is that the local resellers pose a greater risk factor than individual subscribers, often running up bills in the equivalent of thousands of dollars, leading to line disconnection upon non-payment. Under the current legal infrastructure, there is little to stop these resellers from obtaining a new line at a slightly different address (for example, street number '59/1', as opposed to '59'), under a different household member's name, and by starting a new business. Moreover, in countries where legal enforcement is weak, it is sometimes more costly to take legal action than simply write off bad debts. What is apparent from the empirical evidence on the local reseller approach, therefore, is that its workability depends on the institutional setting—in particular, the norms, principles and practices of law and governance that prevail in a given environment.

The Virtual Network Operator (VNO) Approach

The second kind of reseller is the VNO—exemplified by the British mobile operator, Virgin Mobile. In this approach, the VNO establishes itself as an operator without building a network; instead, it piggy-backs on the network of an existing operator and resells services under its own brand name, utilizing its own assets such as brand name and distribution facilities.[8] In this instance, the relationship between the VNO and the network operator is one where the former purchases bulk airtime from the latter, paying by the minute. The network operator avoids costs such as billing, collection, distribution, etc. The network operator incurs lower operation/variable costs and can afford to sell airtime to the reseller at a discounted or bulk rate.

In the VNO approach, the risk of providing service to the marginal customer is transferred from the network operator to the reseller (the VNO); that is, assuming the VNO does not default on payment to the network operator. An additional benefit accruing to operators is the ability to reach users in segments that have not been captured by their own brand names. What this implies also is that VNOs have the greatest positive impact when they team up with carriers that have a relatively small market share or a brand name that is not strong enough to withstand competition on its own; this model is less attractive for market leaders. As pointed out in the analyses by Pyramid Research (2005a, p. 2), UK's T-Mobile has been able to grow its market share by about 7 percent since it teamed up with Virgin Mobile in 1999. It is questionable, however, if these beneficial impacts would be replicated in the case of market leaders such as Verizon or Vodafone that have established their brand image globally.

An additional point raised by Pyramid Research (2005b) is that there is little space for VNOs in the context of markets that have pent-up demand and scarce network capacity. Telecom markets in the African region, for instance, have very different characteristics—with subscriber growth at record levels, network operators with stretched capacity confronting problems of poor call quality and call completion rates and average revenue per user (ARPU) in the prepaid segments falling rapidly; VNOs do not appear to be a viable option in situations of low ARPU levels.

Conclusion

This chapter attempted to answer two questions, based on empirical evidence: first, what does the evidence indicate with respect to the perception that there is little value in investing in marginal customers. Second, if there is empirical evidence that there is significant business potential at the BOP, what are the business models or approaches that can be used to extend access in a sustainable manner—models that will facilitate a win-win situation for all stakeholders. As illustrated in the analysis earlier in this chapter, the perception that it is not cost-effective to extend network access to marginal customers is not true.

Using the conceptual framework of TCE, we then set out a generic 'rule'—transaction cost minimization—for the structuring of workable and sustainable business solutions to the access problem. Using the Grameen model as a starting point, we unpack the conditions for success. Technology plays a relatively lesser role in generating a workable solution than a correct understanding of the market and the associated transaction costs, and tailoring an appropriate solution. The choice between in-house and out-sourcing models or between different versions of out-sourcing solutions depends on the nature of transaction costs that a business faces in a given environment and at a given time.

Drawing from the microfinance approach taken by Grameen—a market-oriented approach with an appropriately crafted incentive structure, and suitable institutional mechanisms—markets can, and do serve the poor, as well as other marginal customers. To illustrate, the VP program provides VPOs with a livelihood, a means of generating a steady income by reselling telecom services, in effect a 'market' solution. This approach sets into motion a virtuous cycle and facilitates a win-win solution for all stakeholders, with the VPOs generating an income that in turn increases the certainty of repayment—an encouraging factor for operators to provide rural telecom services.

Notes

1. In this chapter, the 'marginal customer' is defined as one that is excluded from market transactions under a given configuration of demand and supply conditions; if, for instance, supply is increased by a single unit, then the marginal customer would be included in the transaction.
2. http://www.grameen-info.org/bank/GBGlance.html, accessed September 2006.
3. Exchange rate of BDT 66 to USD 1 used, from www.xe.com, September 7, 2005.
4. http://www.grameen-info.org/, accessed August 2005.
5. For example, the borrower will outlaw dowry practices, use pit latrines, drink only from tube wells where available, if not boil their water or use alum, educate their children, etc.
6. The electronic refill system is not yet available through all operators in all countries.
7. It is estimated that over 50 percent of the world's mobile users are on prepaid plans. In developing countries, the percentage is much higher—http://www.sfu.ca/cprost/prepaid/early.htm; the findings reported in Chapter 1 also support this with 83 percent of mobile owners in the Sri Lankan and Indian samples studied choosing prepaid mobile connections.
8. Adapted from the definition of 'mobile virtual network operators' or MVNOs given by Sekino, Tripathy and Di Capua (2005, p. 3).

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6

Wi-Fi: The Network Fix

Divakar Goswami

Introduction

Wireless Internet technologies have the potential to bridge the digital divide between countries and regions that have well developed telecommunications infrastructure and those that do not. The Internet has the potential to improve the lives of people, especially in hard to reach areas outside urban centers. Given the necessary infrastructure, a wide array of interactive multimedia solutions—from government services, to education, to commerce—can be brought to these usually underserved areas. However, such areas are typified by poor infrastructure and connectivity.

It is precisely in places where infrastructure is poorly developed that wireless networking, particularly the Institute of Electrical and Electronic Engineers (IEEE) 802.11x standards, popularly referred to as Wi-Fi, can be viable solutions that allow leapfrogging of some parts of the traditional wired network to connect people in far flung villages to each other and to the wider world via the Internet. The fast declining costs of wireless technology along with the embedding of Wi-Fi chipsets in a variety of mobile devices, including mobile phones, can potentially extend some form of broadband Internet connectivity to difficult areas of the world (Wireless Internet Institute, 2003).

However, the challenge of bridging the digital divide has been less an issue of finding and deploying the right technologies and more of finding ways to overcome institutional, regulatory, and market barriers to satisfy connectivity needs.

Despite the overwhelming benefits of Wi-Fi for rapidly extending connectivity, only 41 percent of developing countries allow license-exempt wireless spectrum for Wi-Fi, compared to 96 percent of developed countries (Wireless Internet Institute, 2003). Developing countries lag in Wi-Fi-enabling regulations because they are yet to carry out necessary regulatory reforms which will transform their telecommunications sectors from those dominated by government-operated monopolies to those with workable competition. Where incumbents have been partially privatized, the government continues to retain controlling shares in the operator. Where regulators have been appointed, they have been undermined by undue interference. In these countries, the regulatory environment is not conducive to license-exempt bands that allow a panoply of services, including voice, to be provided by wireless, circumventing the legacy infrastructure of the incumbent. It is understandable that incumbents who have invested in a wired infrastructure would be hostile to any 'disruptive' technologies that can loosen their hold (Wireless Internet Institute, 2003). What is less understandable is why incumbents who have not invested in rural areas and in data services are still hostile to Wi-Fi.

The Wi-Fi Potential

Although wireless local LANs were in existence before Wi-Fi standards were established, communication among wireless equipment manufactured by different vendors was often not possible (Kharif, 2003). In 1990, under the aegis of the IEEE, a group was formed to develop common wireless standards. After the IEEE 802.11 standard was published in 1997, vendors developed Wi-Fi equipment around two variants of the 802.11 standard: 802.11b (operating in 2.4 GHz band) and 802.11a (operating in 5.8 GHz band) by early 2000. Other variants of the 802.11 standard were developed over time, offering higher bandwidth for data transmission, as shown in Table 6.1.

The potential of Wi-Fi in developing countries goes beyond homes and urban centers, which have been the preferred sites of deployment in developed countries. The very features that make it popular in developed countries make Wi-Fi attractive for bridging the digital divide: its ease of set-up, use, and maintenance; its relatively high bandwidth; and, most importantly, its relatively low cost. High demand for Wi-Fi equipment has brought down unit costs (Pentland, Fletcher and Hasson, 2002); Wi-Fi routers and cards retail below USD 80 each.

Table 6.1
Wi-Fi Standards

Family of Wi-Fi Standards			
Standard	Speed	Frequency Band	Compatible with
802.11b	11 Mbps	2.4 GHz	b
802.11a	54 Mbps	5 GHz	a
802.11g	54 Mbps	2.4 GHz	b, g
802.11n	100 Mbps	2.4 GHz	b, g, n

Source: Author, based on Wi-Fi Alliance, http://www.wifialliance.com/

Using antennae and repeaters, the range of a Wi-Fi connection can be extended from 50 m to 20 km (Pentland, Fletcher and Hasson, 2002). With this kind of range and low deployment costs, Wi-Fi technology opens up new possibilities for providing rural connectivity.

In one 'wireless' leap, Wi-Fi offers countries the opportunity to connect regions that currently lack wire-line infrastructure; it can also help to connect difficult-to-wire terrain to provide cost-effective connectivity to farmers, traders, and fishermen who live outside urban centers. Not only are Wi-Fi networks significantly cheaper than wired networks, they can be built without obtaining permits and laying cables.

However, Wi-Fi has a number of limitations. It is prone to interference from other Wi-Fi networks in the vicinity and other devices like Bluetooth, cordless phones, microwave ovens, etc., which use the same frequencies. Interference degrades network performance and affects reliability. Furthermore, there is a steep range/bandwidth trade-off, the further one is from the wireless access point. For the above reasons, Wi-Fi cannot provide carrier-class reliability that one expects from fiber optic or microwave links that transport data at high speed and over large distances. It is precisely for this reason that Wi-Fi by itself cannot be a connectivity solution for an entire country. It still requires a link to a high-performance fiber optic backbone. At best, Wi-Fi is effective as an access network for providing last-mile connectivity and as a low-capacity, backhaul network for carrying data over 5 to 10 km, as cases from around the developing world show.

Wi-Fi Deployment in Developing Countries

The number of developing countries that have unlicensed the 2.4 GHz band for Wi-Fi services are increasing although their numbers are still small. For example, most of ASEAN and SAARC countries require some form of licensing for deploying Wi-Fi technology (Open Spectrum Foundation, 2006). Among developing countries that have deployed Wi-Fi, coverage is limited to a few localities or regions with a few exceptions.

In India, the unlicensing of the Wi-Fi frequencies saw a sharp growth of wireless hotspots due to private investment. However, the earliest deployment of Wi-Fi in India was made on an experimental basis in rural localities under the DakNet project. This project used the 'store-and-forward' system that asynchronously connected villages via a bus that was equipped with a wireless access point, pioneered by First Mile Solutions (FMS).[1] By and large, the growth of Wi-Fi deployment in India remains concentrated in a few urban centers and the benefits of wireless technologies are still to be leveraged in a significant manner for rural access.

FMS has deployed variations of the store-and-forward system in a number of countries including Rwanda and Cambodia. In countries where FMS' store-and-forward system has been deployed, they were made on a small-scale, experimental basis, in most cases with donor funding.

Indonesia stands-out among developing countries in terms of Wi-Fi deployment not only because of the extensive deployment of this technology over a large geographical area but also because this innovation arose from endogenous factors.

Wi-Fi Deployment in Indonesia

Indonesia is the world's largest archipelagic state with more than 17,000 islands. Among the major inhabited islands are Java, where 60 percent of Indonesians live, Sumatra, Kalimantan, Sulawesi, and Papua. Out of a total area of 9.8 million sq km, 81 percent is sea. These physical characteristics pose major challenges to rolling out communication infrastructure.

Wi-Fi deployment in Indonesia is unlike any of the cases outlined in developing countries in the previous section. As early as 1996, before common standards for wireless local LAN were developed, Indonesian Internet Service Providers (ISPs) were using wireless links for back-hauling their data (Simanjuntak, 2005). Long before the 2.4 GHz band was unlicensed in Indonesia, Wi-Fi was deployed in more than 40 towns and cities[2] in different islands (Augustine and Sunggiardi, 2005).

Interviews with representatives from Indonesian Wireless Internet Community (INDOWLI), Association of Computer Businesses (APKOMINDO), and Association of Cybercafés (AWARI) suggest that the geographical coverage of Wi-Fi is approximately 60 percent in Java, 30 percent in Sulawesi, 35 percent in Sumatra, and 5 percent in Papua. Not only is the Wi-Fi coverage more than most developing countries in absolute and relative terms, they have been funded by small entrepreneurs. It is the small and medium-sized ISPs rather than the big telecom operators who have invested in wireless networks.

The advantages of Wi-Fi in providing cost-effective connectivity were discussed earlier. Based on the above rationale and from the evidence of extensive Wi-Fi deployment in Indonesia, one would expect Internet penetration and growth to be high in the country. But the evidence presented in Figure 6.1 indicates otherwise. Within the Association of Southeast Asian Nations (ASEAN), Indonesia ranks in the bottom half for Information and Communication Technologies (ICTs). Its Internet subscriber penetration for the year ending 2005 was 0.39 subscribers per 100 inhabitants.

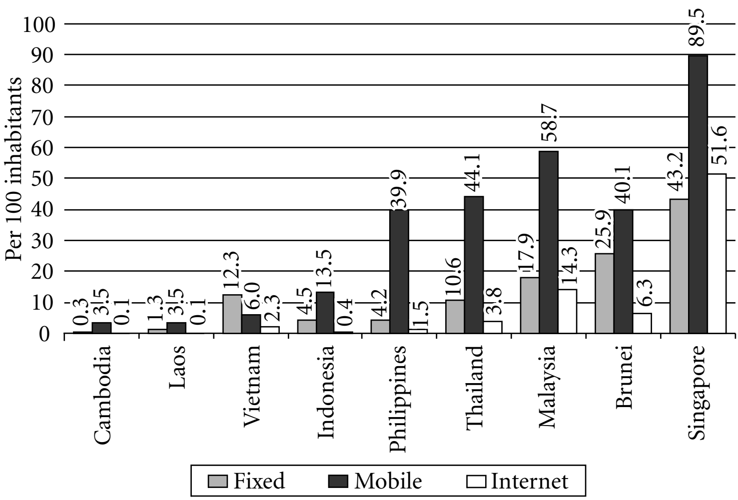

Figure 6.1
ICT Penetration in ASEAN Countries (2004)

Source: ITU (2005).

Wi-Fi deployment in Indonesia has not led to higher Internet penetration, compared to other developing countries. Not only is the Internet subscriber base in Indonesia significantly lower than in its ASEAN counterparts, it is also lower than the ASEAN average. When compared to India, which is also large in size and population and with similar per capita income (Indonesia USD 3,500, India USD 3,100, PPP adjusted), Internet growth in Indonesia is also lagging behind, as can be seen from Figure 6.2. In an eight-year period (1998 to 2005), Indonesia's Cumulative Average Growth Rate (CAGR) for Internet users was 41.2 percent compared to 73.8 percent in India.

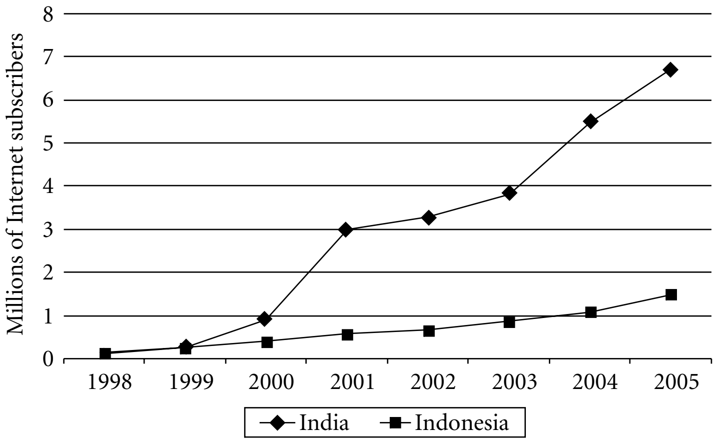

Figure 6.2
Internet Subscribers: Indonesia vs India (1998–2005)

Source: Author, based on data provided by APJII and ISPAI.[3]

It is evident that regulation or policies designed to leverage the low-cost and leapfrogging capabilities of Wi-Fi for achieving greater access have not been implemented in Indonesia. In fact, until January 2005, Wi-Fi deployment was illegal in Indonesia which altogether ruled out a government or regulator role in promoting this technology. The anomaly can only be explained by looking at the context within which Indonesian ISPs deployed Wi-Fi.

Barriers to Internet Growth in Indonesia

From the beginning, Internet growth in Indonesia has been driven by private/non-governmental initiatives, as detailed in Chapter 4.

One of the biggest barriers to Internet development was the high cost of connectivity to the international backbone and domestic leased lines, where they were available. These expenses constituted 60 to 80 percent of an ISP's total monthly cost. Heru Nugroho, former Secretary General of Indonesia's ISP Association APJII, estimated that on an average, ISPs spent about USD 50,000 for international Internet bandwidth per year before the Internet Exchange was established ('Bisnis Indonesia,' 2004b). According to him, bandwidth and networking costs typically represent 25 percent of the total costs of ISPs in other countries.

The high cost of international bandwidth was further exacerbated by the absence of a national Internet exchange. Each of the 35 ISPs had separate international connections to connect to the Internet backbone. Local traffic destined for addresses within the borders of Indonesia was also routed through the Internet backbone and incurred international bandwidth charges. Government initiatives to rectify the local bandwidth and connectivity problems were stalled by the Asian economic crisis in 1997. The government agreed to let the Internet association take the lead in building Indonesia's Internet backbone (Wagstaff, 1999). Led by APJII, a task force was created to develop an Indonesian Internet exchange. It came into operation in 1997.

Theoretically, ISPs could connect from their point-of-presence (PoP) to the Internet Exchange (IIX) by leasing a line from the incumbent. However, in 1997, PT Telkom, the incumbent fixed line operator, did not make leased lines available to ISPs (Allen, 2005).

In the absence of both build and buy options, ISPs decided to continue using the Wi-Fi frequencies, even though it was illegal. The relatively low cost of wireless infrastructure meant that the exposure to risk, in the form of confiscation or closure of the network, was also low.

This peculiar form of Wi-Fi deployment emerged from necessity, not choice. When PT Telkom made leased lines available, the prices were so high that ISPs decided to continue using the Wi-Fi links. Wi-Fi was used in Indonesia both as a backhaul link over long distances and for last-mile access.

Wi-Fi 'Innovation' in Indonesia

The typical ISP network can be divided into an access and infrastructure network, as can be seen in Figure 6.3 (Huston, 1999). In the

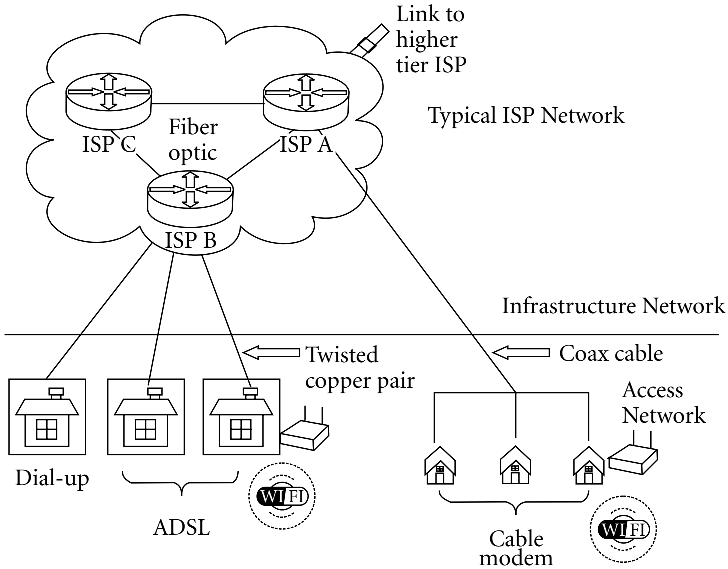

Figure 6.3
Typical ISP Network Architecture

Source: Author.

infrastructure network, ISPs are connected to each other (peers) via a fiber backbone for exchanging traffic and to connect to a higher tier ISP to link to the Internet backbone. From their PoPs, ISPs may either use twisted copper pair, coaxial, or fiber optic cable to connect to the curb. The last meters to the customer premises are connected typically via twisted copper pair or coaxial cable. The end service that is delivered may be dial-up, ADSL or cable-based Internet. Typical use of Wi-Fi would be at the edge of the network, as a wireless residential network with a limited footprint.

The network architecture of an Indonesian ISP is typical, as can be seen in Figure 6.4. The ISPs peer with each other via an Internet exchange to which they connect using a variety of methods, including Ethernet, microwave leased line, or Wi-Fi. Wi-Fi, especially at the 5 GHz band, which continues to be licensed and hence is less prone to interference, is used (illegally) in the infrastructure component of the network to haul traffic from the ISPs' PoPs to the curb. From the curb, the ISP may link wirelessly to a large customer like a school or a cybercafé using 2.4 GHz frequencies.

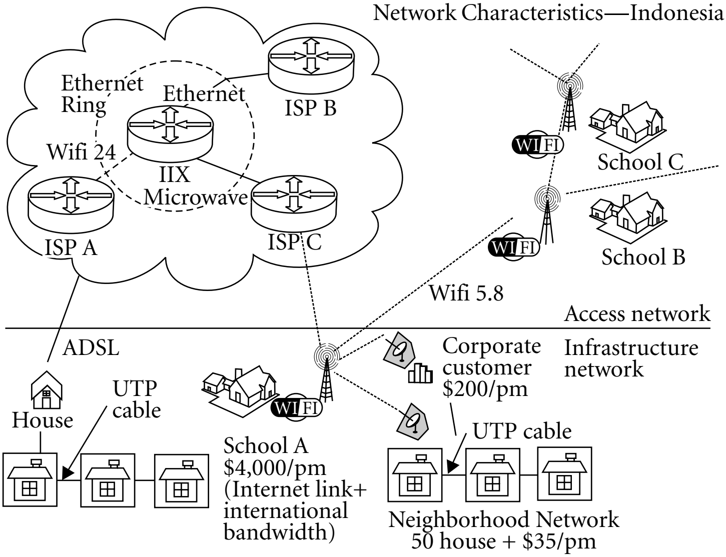

Figure 6.4
Indonesian ISP Network Architecture

Source: Author.

For providing Internet service to neighborhood networks that connect individual houses, ISPs typically use an Unshielded Twisted Pair (UTP) cable to wire the homes, because of the cost savings from using an Ethernet card with the wired option instead of the more convenient but more expensive Wi-Fi access card.

A large customer like a school with a 1 Mbps Internet link will in turn become an ISP by connecting other schools, corporate customers and neighborhood networks. This many tiered retailing of Internet service is necessary to recoup the high retail prices for Internet access. This also explains why more than a third of ISPs operating in Indonesia do so without a license.

A number of factors make Wi-Fi deployment in Indonesia unique. Unlike in the West, Wi-Fi is not deployed primarily as a network for the home but is rather used as an access network to connect large customers such as schools and cybercafés. There is also a blurring of the access and infrastructure network as the wireless link is deployed as a low-capacity backbone to carry data over large distances. Reversing common wisdom, the ISPs use aerial cable to connect homes rather than Wi-Fi because it is cheaper to deploy the former. Finally, because of the lowcost and ease of setting up a wireless network, anyone with bandwidth can and will become an ISP, especially when exorbitantly high retail prices have to be recouped.

A business customer for dedicated Internet access typically pays about USD 4,000 per month for a 2 Mbps link to the IIX and a 512 Kbps international link to the Internet backbone. In order to recoup this high cost, a business customer interviewed for this study became an unlicensed ISP and provided Internet service to 129 customers, which included five schools, 20 Internet cafés, and neighborhood networks connecting 104 homes.

For this Internet service, each school was charged USD 100 per month, each cybercafé USD 200 per month, and each individual house around USD 35. In this instance, not only was the business customer able to cover its costs comfortably but in terms of customers, it was a larger ISP than the licensed upstream provider!

'Unlegal' activities[4] were not restricted to the use of the 2.4 GHz and 5 GHz bands for Wi-Fi. Because of high local and international backbone costs, it is sometimes cheaper for ISPs to connect to the Internet backbone directly via satellite, bypassing Indosat's international gateway and avoiding payments for local leased lines. In most cases, direct access to a satellite link by ISPs is considered illegal since not all satellites have landing rights in Indonesia. Representatives from APJII have argued that if bandwidth prices were to fall in the country, the margin between the legal bandwidth price and the illegal will be narrowed, and ISPs will have a greater incentive to avoid the grey market (APJII—Internet Service Provider Cost, 2003).

From the discussions with ISPs and large customers like schools, it was evident that cost factors were the primary reasons why Wi-Fi has been used extensively in Indonesia. The licensing framework also played a part in the choice and will be discussed in greater detail later. The next part will unpack the cost factors.

Leased Lines and International Bandwidth Prices

By any measure, the retail price of USD 4,000 per month for a 512 Kbps Internet link is very high. When that price is seen in relation to the per capita income of Indonesia, it is astronomical. By examining the cost components of the ISPs, one can gain a better understanding of why retail prices are so high. The two major variable cost components of an ISP operating in Indonesia are the cost of domestic leased lines and international bandwidth. In order to determine whether leased line prices or international bandwidth prices are 'high' in Indonesia, it is necessary to compare them with other countries in the region and with international benchmarks.

As can be seen in Table 6.2, a 2 Mbps leased line for a 2 km link provided by an operator costs USD 18,000 a year in Indonesia (48 times that of India).[5] Indonesian prices are four times the EU benchmark price. For the 200 km link, the ratios indicate that Indonesian prices are five to six times the EU benchmark and the price in India.

Indonesian international bandwidth prices are also significantly higher. As can be seen in Table 6.3, the price of a 2 Mbps full-circuit international link in Indonesia is four to five times the price charged in India.

Table 6.2
Comparison of Annual Domestic Leased Line Prices: Indonesia, India, and EU Benchmark (2005)

	2 Mbps Link	
	2 km	200 km
Indonesia	USD 18,000	USD 45,000
India	USD 376	USD 7,603
EU benchmark	USD 4,802	USD 9,219
Ratio of Indonesian to Indian price	48:1	6:1
Ratio of Indonesian to EU benchmark price	44:1	5:1

Source: Author, based on data provided by operators in Indonesia and India, Commission of European Communities (2005).

Table 6.3
Comparison of Annual International Full-Circuit Prices to US West Coast in India and Indonesia: Prices (USD) and Price Ratios

	Full Circuit
	2 Mbps
PT Indosat (Indonesian incumbent)	USD 108,528
DT Putra(Indonesian satellite provider)	USD 146,400
India	USD 37,200
Ratio of PT Indosat to India price	3:1
Ratio of DT Putra to India price	4:1

Source: Author, based on IPLC prices for Indonesia provided by Internet Data Centre (IDC) and India price from operator (Allen, 2005).

Even when compared to its Asia-Pacific peers, Indonesia's leased line prices are on the higher side as can be seen in Figure 6.5.

Since leased lines are a critical producer good for ISPs, high leased line prices naturally result in high retail prices for Internet services. As can be seen in Figure 6.6 and Table 6.4 comparing ADSL prices, retail price for Internet services are between four to five times more expensive in Indonesia than India.[6]

Innovating around Constraints

The Indonesian case is an example of innovation around constraints. The inadequate supply of network infrastructure, both of backbone and leased lines, resulted in Wi-Fi being chosen as a substitute for filling the 'missing links' in the network. The high price of domestic leased lines meant that ISPs and others relied on a more cost-effective solution in the form of Wi-Fi links. The high price of international bandwidth saw ISPs connecting directly through satellites to the Internet backbone. The high retail price of Internet service spawned a large number of unlicensed reseller-ISPs using Wi-Fi to recoup the high price.

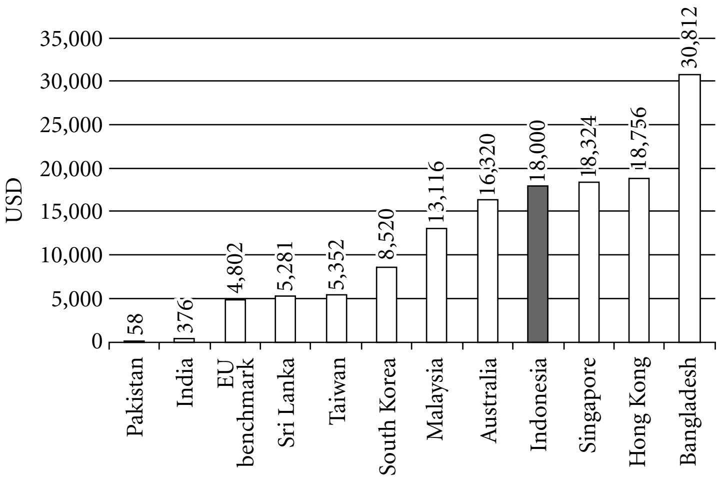

Figure 6.5
Annual Leased Line Prices for 2 Mbps, 2 km Circuits for Asia-Pacific Countries (2005)

Source: Author, based on data provided by operators in Pakistan, India, Bangladesh, Sri Lanka, and Indonesia, Badan Regulasi Telekomunikasi Indonesia (BRTI) leased line study, Commission of European Communities (2005).

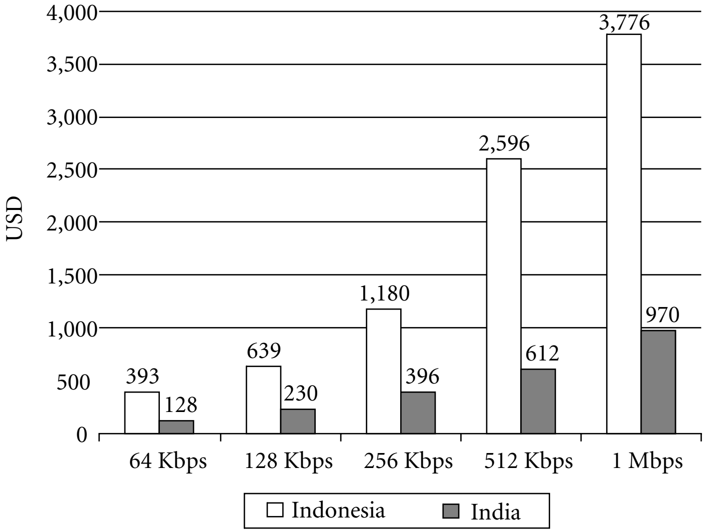

Figure 6.6
Comparison of Monthly Internet Prices for Business Users in Indonesia and India (2005)

Source: Author, based on data provided by Indonesian ISP, Indian ISP.

Table 6.4
Comparison of Monthly ADSL Retail Prices in Indonesia and India: Prices (USD) and Price Ratios (2005)

	Bandwith	
	384 Kbps Usage limit: 1 Gb* 2 Gb**	512 Kbps Usage limit: 2 Gb*
Indonesia*	USD 74	USD 93
India**	USD 23	USD 41
Ratio of Indonesian to Indian price	3:1	2:1

Source: Author, based on data provided by BSNL and PT Telkom.[7]

The question of why Indonesia has more Wi-Fi deployed than most developing countries has been partially answered. Initially, ISPs were not given build or buy options; they were not allowed to build infrastructure; yet the incumbent did not provide leased lines. It is possible that PT Telekom did this to prevent potential competition from ISPs in the Internet service market and in the voice market with the possible use of VoIP. But it is also possible and likely, as will be ex-plored in greater detail later, that PT Telkom did not have adequate infrastructure on the ground to provide leased lines to ISPs, even if they wanted to. From the ISPs' point of view, whether PT Telkom did or did not have adequate infrastructure, they (ISPs) did not have access to infrastructure that they needed and were forced to improvise with available technology for a workaround solution. If ISPs were allowed to invest in communication infrastructure, it is likely that they would have chosen a different technology. But in this instance, having invested in Wi-Fi, many ISPs continued to use it even after PT Telkom made leased lines available.

Many countries suffer from high leased line and international bandwidth prices. However, we do not see them responding like Indonesia, by deploying Wi-Fi widely. Hence, the earlier allusion that this question has only been partially answered. There are other factors that have contributed to the unique outcome in Indonesia, namely the role played by the civil society and the licensing framework governing the telecom sector. The former was discussed in Chapter 4 and the latter is explored here.

The anomaly between extensive Wi-Fi deployment and a low Internet subscriber base in Indonesia can be explained by the high cost of Internet service and the multi-tier retailing of Internet service by unlicensed ISPs. APJII gets its subscriber data from the registered ISPs who are licensed. Considering that at least a third of the ISPs in Indonesia are not registered and reselling of Internet service is widespread, it would be reasonable to assume that a large number of subscribers and users are not being counted.[8]

Significantly high prices and unavailability of basic communication infrastructure services indicate shortcomings of regulation. The regulatory and market environment are examined below to explain the high communication infrastructure prices and also the behavior of the incumbents and the ISPs.

Indonesia's Telecom Sector

Overview

The performance of the Indonesian telecom sector has been uneven. Although mobile growth rates are impressive, the rest of the sector is plodding along. In 2005, Indonesia had a combined mobile and fixed line penetration of 19.2 per 100 inhabitants (4.4 fixed, 14.8 mobile). Indonesia has lagged behind the other members of the ASEAN (Jakarta Post, 2002). For example, in Malaysia, the penetration rate for fixed and mobile combined was 76.61 percent in 2005 and in the Philippines it was 44 percent during the same period (ITU, 2005). The digital divide is acute not only between Indonesia and its peers but within Indonesia itself. In the eastern provinces, only 0.02 percent of the population has fixed line phones. More than half of Indonesia's 70,000 villages (or about 43,000 villages) do not have access to any public telephones (Smith and Sulaiman, 2004).

Drivers of the Reform Process

The Asian financial crisis of 1997 resulted in a dramatic decline in Indonesia's economy that led to social and political unrest. The financial instability caused by the sharply depreciating Ruppiah, among other factors, compelled the Indonesian government to approach the International Monetary Fund (IMF) for a loan of USD 10.4 billion.[9]

The crisis also had a profound impact on the telecom sector. Foreign and domestic investments dried up with the political turmoil unleashed by the financial crisis and forced the Indonesian government to suspend the ambitious Nusantara 21 Project to connect Indonesia's major islands by submarine and terrestrial cable (Chowdhury and Murniadi, 2004). However, the long-term gains from the restructuring of the sector in response to the external shock are being reaped today. As can be seen in Figure 6.7, the telecom sector as a whole is more dynamic than it ever has been.

The crisis forced the Indonesian government to follow a reform trajectory that it probably would not have followed if left to itself. The IMF Letter of Intent issued in January, 2000,[10] stipulates a host of reforms for the telecom sector, including making the sector fully competitive by privatizing both state-owned telecom companies (PT Telkom and PT Indosat) and restructuring the sector, finalizing and implementing the 1999 Telecommunications Law that explicitly separates policy and regulatory functions, and rationalizing the extensive cross-ownership of PT Telkom and PT Indosat in the sector, among other measures.

More than five years on, the continued dominance of the two government-run operators and the absence of an independent regulator are clear testimony of the Indonesian government's reluctance to

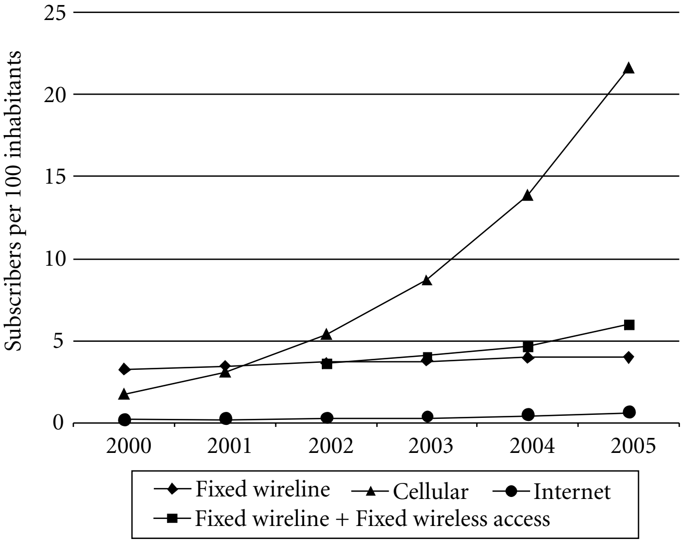

Figure 6.7
Growth of Fixed, Mobile, and Internet Subscribers per 100 Inhabitants in Indonesia (2000–2005)

Source: BRTI, Annual reports of PT Telkom, PT Indosat, PT Excelcom, Bakrie Telkom, APJII.

reform. As discussed in the next sub-section in detail, the Indonesian government has largely made nominal reforms, more true to the letter than the spirit of its agreement with the IMF. Yet, even these half-hearted reforms have contributed to the creation of a vibrant mobile sector.

Current Market Environment

Indonesia's telecom reform process can be broadly divided into two stages, the first spanning the early 1990s with the partial privatization of the state-owned telecom incumbents, and the second stage beginning with the setting up of a regulatory agency and ending the exclusivity rights of the incumbents in fixed telephony after the Asian financial crisis (Sugondo and Bhinekawati, 2004). As can be seen from Figure 6.8, the reform process in Indonesia has been slow and halting with the result that even after 15 years the sector is still dominated by two government-controlled incumbents and suffering from weak regulation. The obvious success story is in the competitive

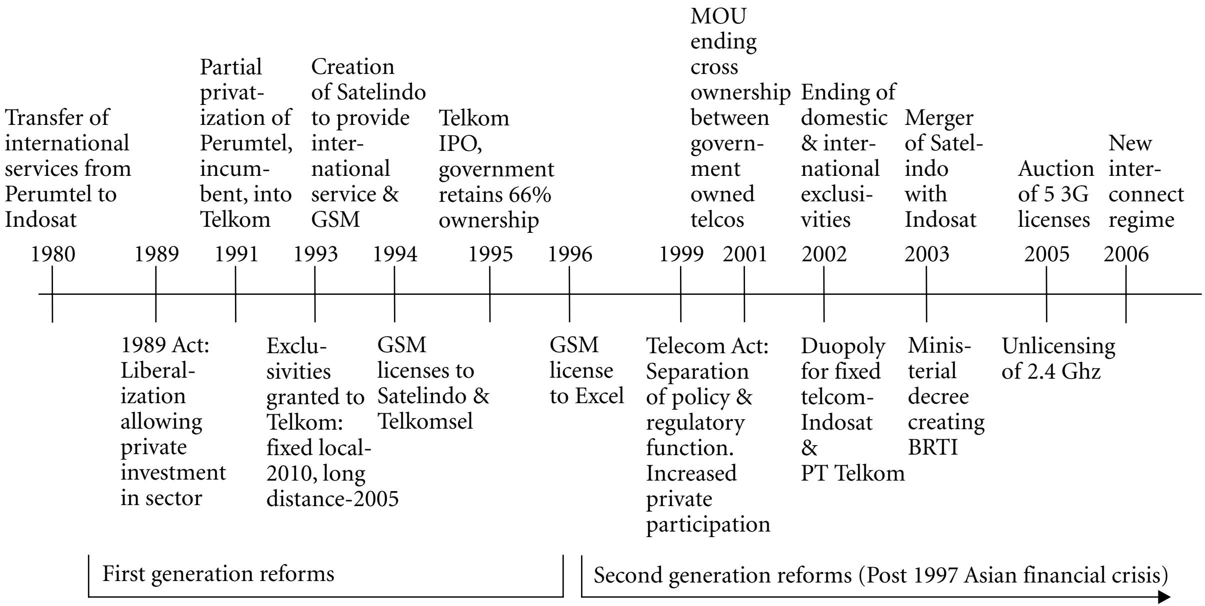

Figure 6.8
Timeline of Indonesia's Halting Reform Process

Source: Author.

mobile telephony sector, which has shown remarkable growth and has contributed to increased total telephone penetration (14.8 mobile connections per 100 inhabitants versus 4.4 fixed connections per 100) (Sugondo, 2005).

From the early 1980s, the telecom sector was dominated by two operators that monopolized all national and international services. PT Indosat was the exclusive provider of international services and operated the international gateways and satellite links. PT Perumtel operated fixed local and long distance services until 1991, when it was partially privatized and reconstituted as PT Telkom. The government created PT Satelindo in 1993 to be the second provider of international service. However, competition was limited since PT Indosat owned 7.5 percent of its shares and PT Telkom 25 percent. Furthermore, PT Satelindo and PT Indosat were required to charge identical tariffs for international service (Minges, 2002). In 1994, PT Satelindo and PT Telkomsel were granted a GSM license. Excelcomindo, a company that the government did not hold shares in, was also given a mobile license in 1996.

The impetus for the second generation of reform came primarily from the IMF. As part of IMF's bailout package, the Indonesian government agreed, among other things, to rapidly privatize both state-owned telecom companies to finalize a new telecom law and set up a transparent regulatory body. The Indonesian government complied with some of the stipulations by passing the Telecommunications Law No. 36 of 1999.

Complying with the commitments to end cross-ownership between PT Telkom and PT Indosat, the Indonesian government separated the two companies in 2001. PT Telkom bought PT Indosat's entire share in PT Telkomsel and PT Indosat bought all of PT Telkom's shares in PT Satelindo. PT Telkomsel's GSM operations were merged with PT Telkom and PT Satelindo's GSM and international operations were merged with PT Indosat.

The Telecommunications Law of 1999 advanced the end of the exclusivity held by PT Telkom for fixed local calls from December 2010 to August 2002, and for long distance from December 2005 to August 2003. PT Indosat's exclusivity over international calls was ended from August 2003 instead of December 2004 (Adiwiyoto, 2004). However, to date, no new licenses have been given to any operators for fixed line services. But the government has doled out USD 49 million (Jakarta Post, 2006) as the first installment of 'compensation' to PT Telkom for ending its monopoly early. The government has not undertaken additional divestment of the telecom incumbents and remains in control of both companies. It owns 51 percent of PT Telkom and the 'golden' and controlling share of PT Indosat.

The current market structure, as shown in Table 6.5, is one that constrains market participation. Historically, exclusive licenses made PT Telkom the monopoly provider of fixed line services. Even though the government has allowed PT Indosat to provide fixed services, it does not have adequate infrastructure on the ground to compete with PT Telkom and provide services such as leased lines.

Furthermore, the absence of an interconnection regime[11] mandating cost-oriented interconnection has precluded investment by PT Indosat in the fixed sector. In fact, PT Indosat continues to rely on PT Telkom for leased lines and domestic backbone links.

Regulatory Environment

Although the Telecommunication Law of 1999 enabled the creation of an independent regulatory agency, that option was not exercised until 2003. The ministerial decree of 2003[12] established the Indonesian Telecommunications Regulatory Body, BRTI,[13] to be effective, starting January 2004. However, BRTI has been seen as a 'transitional' body

Table 6.5
Barriers to Market Participation in Indonesia

Telecom Services	Telecom Operators
Fixed wire line local	Exclusive right 1996–2010 to PT Telkom (Prematurely ended in 2002, but only de jure)
Fixed domestic long distance	Exclusive right 1996–2005 to PT Telkom (Prematurely ended in 2003, but only de jure)
Fixed wireless local	Limited competition (Satelindo)
Fixed international	Monopoly 1995–2004 (Indosat)
Mobile GSM	Competitive (Satelindo, Excelkomindo, Telkomsel etc.)
Internet service provision	Quasi competitive; currently 124 ISPs plus 54 unlicensed

Source: BRTI, Annual reports of PT Telkom, Satelindo, Indosat, Excelkomindo, Telkomsel.

that would become fully independent only at some undetermined future time (Sugondo, 2005).

BRTI is crippled by design. Its budget is allocated by the ministry *Direktorat Jenderal Pos dan Telekomunikasi* (DGPT). BRTI only plays an advisory role to the DGPT. Although DGPT is required to consult BRTI on regulatory matters, it is not obliged to follow BRTI's recommendations. BRTI's decisions should be final but, in practice, they are revised by DGPT.

The Regulatory Committee of the BRTI has five members. Since the Chairman of BRTI is also the Director General of the ministry, there is no separation of policy and regulatory functions. Furthermore, BRTI has to report to the ministry every three months or more frequently, if deemed necessary (Adiwiyoto, 2004). The Indonesian Competition Authority, *Komisi Pengawas Persaingan Usaha* (KPPU) in its assessment of BRTI also concludes that it does not have a strong legal basis, its dependence on the ministry for budgetary support makes it less independent, and the overlap between BRTI and DGPT's functions breeds confusion in decision-making (Adiwiyoto, 2004).

Interviews with members of the regulatory agency and the ministry indicate that no decisions detrimental to PT Telkom can be taken even if such decisions are good for competition. A new entrant that provides backbone services also confirmed that they have to keep leased line prices aligned with PT Telkom due to pressure from the ministry. In order to preserve the financial interests of the incumbents, the Indonesian government is preventing the telecom sector from reaching its full potential and the benefits of affordable access being realized. The current regulatory environment is not conducive for competition or rapid growth of the sector.[14] This is compounded by a licensing framework that inhibits infrastructure rollout.

The telecom licensing structure led to the adoption of Wi-Fi by ISPs as a substitute for backbone. Currently, telecom licensing falls into three categories (BRTI, 2004):

1. Telecommunications Network Providers
2. Telecommunications Services Providers
3. Telecommunications for special purpose[15]

Telecommunications Network Providers are the only ones allowed to build infrastructure. With a Network Provider license, it is possible to provide services for:

(a) Fixed Network: local, long distance, international, and closed user network
(b) Mobile Network: terrestrial, cellular, and satellite

Since ISPs are considered to be Telecom Service Providers, they are not allowed to deploy any infrastructure. Wi-Fi was adopted because it did not involve conspicuous actions such as digging roads and laying cables. And since the investment for a link costs as little as USD 700 (Sunggiardi, 2005), the capital that was put at risk from confiscation was low. Although 2.4 GHz has been unlicensed, it is still illegal for ISPs to deploy any infrastructure, including Wi-Fi, since they are not licensed as Network Service Providers.

The current licensing framework contributes to the inadequate supply of telecommunication infrastructure in Indonesia. The single supplier in fixed line services resulting from the licensing framework was identified by the Indonesian Infocom Society, MASTEL, as the main cause of scarcity of network infrastructure which was constraining Internet development (Setiyadi, 2005). According to Setiyadi, there are not enough Network Operator Centers (NOCs) that interface between the last-mile and the upstream backbone providers in Indonesia. Furthermore, since the ISPs are not allowed to build network infrastructure by licensing conditions, it weakens the ISPs' negotiating power with higher-tier ISPs. MASTEL strongly recommended that the Indonesian regulator should allow ISPs to build their own infrastructure so that they do not have to rely on the monopoly network provider. Clearly, there is a need to strengthen the independent functioning of BRTI and to re-examine the licensing framework, in order to unshackle the telecom sector and Internet growth.

Uneven Backbone Availability

Telecom networks include access networks and backbone, or the 'big pipes' that connect different access networks. Generally, the backbone's capacity is greater than the networks connected to it. Without backbones, local networks would be isolated. Backbones are the basic building blocks of any national or international telecom infrastructure.

In the early years of the Internet in Indonesia, Wi-Fi played a significant role as a low cost, low-bandwidth backhaul for ISPs. On many routes, the incumbent was unable to provide backbone services because it lacked backbone capacity in many of the islands and regions. Outside of Java and Sumatra wired backbone infrastructure was non-existent. Even today, Papua, Moluccas, Kalimantan, and Sulawesi have poor backbone coverage and have to depend on expensive satellite backhaul. Fiber optic-based backbone is sparsely deployed in Indonesia. Much of it has been deployed in the last five years. The backbone in Sumatra consists of a terrestrial microwave network which is linked to Java with a submarine cable. The island of Java has the greatest amount of fiber deployed in the backbone network. Most of the other islands rely on microwave links or satellite.

Inadequate supply of backbone in Indonesia is primarily due to the lack of competition. Although there was demand for backbone infrastructure from ISPs, business users, and other telecom operators, PT Telkom as the legal monopoly did not make the necessary investments. Much of the recent backbone that has been deployed by PT Telkom is a result of pressure from PT Excelcomindo, the competitive mobile provider.

The extensive deployment of Wi-Fi for backhaul is testimony to the inadequate supply of backbone infrastructure. The first time that Wi-Fi was used as a backhaul connection to serve the function of a low-capacity backbone was in 1996 by the ISP, Cabi.net (Simanjuntak, 2005). Until 1998, PT Telkom did not have adequate infrastructure. For example, 2 Mbps tails for the local link were unavailable; the best that PT Telkom could provide was 64 Kbps (Purwadi, 2005). Wi-Fi was attractive to ISPs because Wi-Fi access points could be set up easily in areas that lacked network infrastructure, and it offered higher bandwidth than was available from PT Telkom at a much lower price. The only problem was that at that time, the use of 2.4 GHz bands for Wi-Fi was illegal. Hence, in an environment in which supply of leased lines were constrained, Wi-Fi was used as an alternative infrastructure solution.

However, Wi-Fi is a sub-optimal solution. It is prone to interference and does not provide carrier-class reliability. Furthermore, its capacity is of a different magnitude compared to fiber optic or even microwave links and throughput rapidly degrades with distance. The most important disadvantage of Wi-Fi is its severely limited range (10 to 20 km). Hence, not surprisingly, Indonesian ISPs who were interviewed were unanimous about their preference for genuine backbone and leased line links if they were available at cost-oriented prices (INDOWLI, AWARI and APKOMINDO, 2005).

Currently, the use of Wi-Fi as a backhaul network is on the decline in the larger cities where adequate backbone infrastructure is available. Despite this, some ISPs continue to use Wi-Fi in the 5.8 GHz bands to haul data over distances as long as 14 km. ISPs that continue to use Wi-Fi in large cities do so primarily to avoid paying for leased lines that are priced significantly higher than benchmark prices in other countries, as was shown earlier.

Conclusions

Wi-Fi 'innovations' in Indonesia are not a result of enlightened policy designed to extend communication infrastructure to unserved areas but rather a workaround solution to hostile market and regulatory conditions. As Samarajiva (2006) concludes in a study on leveraging wireless technologies to achieve rural connectivity, institutions matter. Unless effective policies are in place that allow market entry, manage rights of way, and promote cost-oriented and non-discriminatory access to bottleneck facilities, efforts at bridging the digital divide using wireless technology will fall short of their objectives . The Indonesian experience with Wi-Fi confirms this. Until the market is further liberalized and the regulatory process strengthened, it is unlikely that full potential of the Internet can be realized in Indonesia.

The silver lining for Indonesia is the inherently lower costs of Wi-Fi compared to wired last-mile access technologies, providing the country with potentially explosive Internet growth if regulatory and market conditions are right. A large pool of ICT-savvy teachers and 'geek' activists produced as a result of civil society initiatives, lucidly described in Chapter 4, make it more likely that the benefits of connectivity and infrastructure can be leveraged optimally in Indonesia.

There are a number of lessons from Indonesia that may be applicable to developing countries:

1. Although technology has certain transformative qualities, it cannot by itself bridge the digital divide. The hard work of ensuring that the policy and regulatory pre-conditions must be undertaken in order to realize the benefits of technology.
2. Indonesia shows that Wi-Fi deployment can be commercially viable and that it can be sustained with private investment.

3. Competition in the backbone market is necessary to build the foundation of a developing country's communication infrastructure.

Developing countries with entrenched telecom monopolies can hasten the deployment of broadband by delicensing Wi-Fi frequencies. If ISPs can use Wi-Fi in the access network, they can bypass the incumbent's local loop to provide Internet and other communication services—-if they can be assured of reasonable access to leased lines.

This chapter showed the peculiar uses Wi-Fi was put to in the backbone network, and not in the access network, as is the case in other countries. As the regulatory environment improves and leased lines are made available at more reasonable prices, Wi-Fi use in Indonesia is becoming more normal.

Notes

1. http://www.firstmilesolutions.com/
2. The following are some of the towns in Indonesia with Wi-Fi service: Sumatra-Aceh, Medan, Jambi, Bengkulu, Pekan Baru, Batam, Palembang, Lampung; Java-Jakarta, Bogor, Bandung, Cirbon, Semarang, Yogya, Solo, Magelang, Salatiga, Surabaya, Malang, Kediri, Madiun, Mojokerto; Kalimantan-Pontianak, Banjarmasin, Palankaraya, Samarinda, Balipapan; Sulawesi-Makasser, Manaddo, Palu, Gorontalo, Kandari; Maluku-Ambon; Papua-Jayapura, Timika, Manokwari; Bali-Basar.
3. Data accessed from Internet Service Providers (ISPs) Association of India (ISPAI) website: http://www.ispai.in August 2006.
4. In the interviews with ISPs, when the author referred to some of their operations as being 'illegal,' the ISP representatives corrected the usage of the term by coming up with one of their own—'unlegal'—to denote the grey area of the law and the widespread flouting of the rules governing Wi-Fi frequencies.
5. The Indonesian regulator, BRTI, announced regulation to reduce leased line prices by as much as 50 percent on September 26, 2006 (http://www.lirneasia.net/2006/10/leased-line/)
6. Policy and regulatory action on lowering leased line prices, initiated by LIRNE*asia* research and advocacy, had led, by April 2007, not only to lower leased line prices but also to significant reductions in ADSL prices.
7. Data for India was accessed on BSNL's website: http://www.bsnl.co.in/service/dataone_tariff.htm in February 2006. Data for Indonesia was obtained from PT Telkom's website: http://www.telkomspeedy.com in February 2006.
8. Although APJII also provides a separate figure for Internet users for Indonesia that ITU also reports in its indicator database, the author found that APJII routinely multiplies the subscriber base by 10 to obtain it. Hence, the stated user numbers are not accurate.

9. Indonesia Letter of Intent with the IMF, available at: http://www.imf.org/external/np/loi/103197.htm
10. http://www.imf.org/external/NP/LOI/2000/idn/02/index.htm
11. On February 8, 2006, the Ministry issued Government Regulation (GR) No. 8/2006 which mandates a new cost-based interconnection tariff scheme for all telecom network and service operators to take effect from January 2007.
12. Ministerial Decree No. 31 of 2003.
13. Badan Regulasi Telekomunikasi Indonesia.
14. The mobile sector is an exception because the government has introduced a number of players and effective competition exists.
15. The third category of license is for government, defence communication and broadcasting.

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Section 3
Regulation: To Stifle or Enable?

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Introduction

This section deals with core issues of telecom policy and regulation. Here, the debates tend to be a little more esoteric than in the previous two sections. The direct implications for consumers of the issues discussed here are not obvious. But they do matter. The interpretation and enforcement of rules in this 'structural' layer of telecom networks have resulted in single telecom operators dominating large geographical areas and in reducing the availability and increasing the price levels of telecom services.

If governments and regulatory agencies get the 'structural' layer wrong, the ramifications can be serious. The design of the Access Deficit Charge (ADC) regime in India, documented in Chapter 10, resulted in enormous additional revenues flowing to the government owned telecom operator BSNL. Revenues like these, together with those from high revenue customers who were already on its network because of its historical position as the monopoly provider, enabled BSNL to build an enormous backbone network that reduced the costs of supplying voice and data services to the rural regions of India, as documented in Chapter 7.

Being present in rural areas and having exclusive access to cheap backhaul capacity, the former monopoly was now in a position to capture most of the universal service funds disbursed by the government, as detailed in Chapter 9. The process that began with the stated necessity of compensating the government owned incumbent for providing services in rural areas below cost ends by transferring massive amounts of funds under various labels from the customers of the private operators to the government owned operator. The evidence so far does not suggest that the objective of narrowing the urban–rural divide is being achieved, as shown in Figure S3.1. Despite the massive transfers to the incumbent, the gap has increased, not decreased, suggesting that incumbent-favoring policies have failed.

Not all the results of the policies of placating and subsidizing the incumbent have been bad. Teleusers at the BOP who were surveyed from Indian rural areas in the study and were reported about in Section 1, reported greater access to fixed phones than their counterparts in Sri Lanka (Figure S3.2).

The chapters in this section raise some critical policy and regulatory issues, but do not necessarily give the final word on them. But it is possible for discerning readers to evaluate the pros and cons of an issue in the light of their specific circumstances and reach appropriate conclusions.

Are the 'big pipes' on which large volumes of voice and data are hauled over long distances within and between countries essential facilities that should provide open access to all competitors on non-discriminatory terms and at cost-oriented prices? Or should they be considered the 'private property' of the incumbents to be used as they please to advance their business in the new competitive environment?

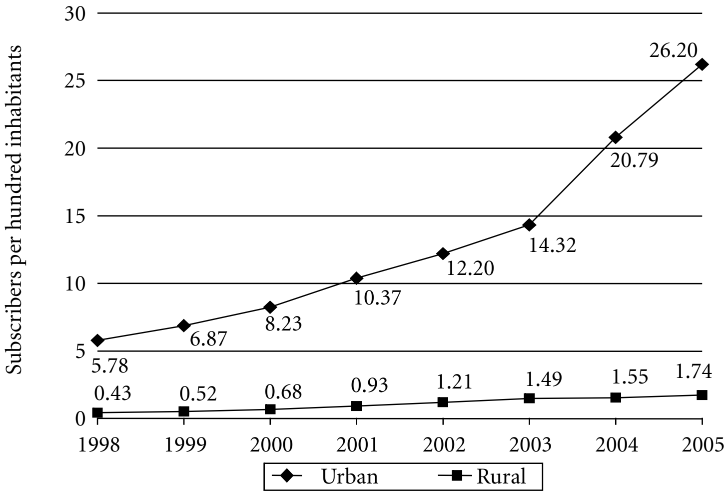
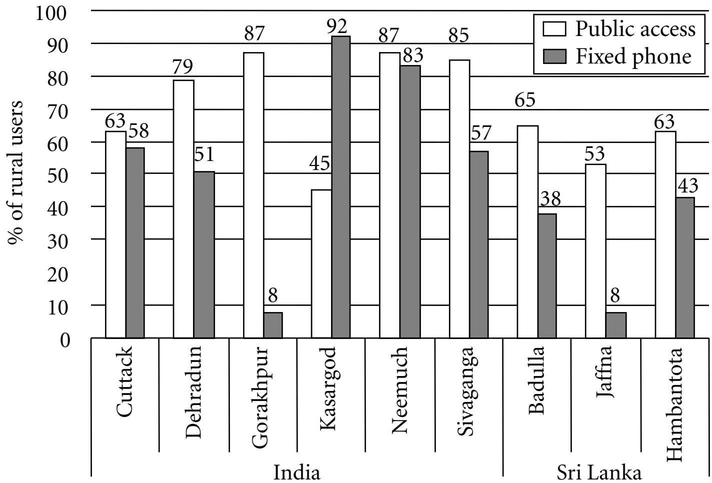


Figure S3.1
Urban versus Rural Subscribers (Fixed Plus Mobile) per Hundred Inhabitants in India (1998–2005)

Source: TRAI (2005).



Base: Rural users India: 1,181 Sri Lanka: 587

Figure S3.2
Use of Fixed and Public Access Phones by BOP in Rural Sri Lankan and Indian Localities

Source: LIRNE*asia* (2005).

Chapter 7 discusses these questions at length, based on the Indian experience. The Government of India, it appears, has taken a position that the incumbent is free to use its backbone network to optimize its competitive position. The entrants are invited to build their own backbone networks, which several have started to do. The chapter lays out the calculus of determining the commercial viability of building competing fiber networks. Indeed, the private operators with a national scope, as well as infrastructure providers, are building backbone networks.

In other countries, the calculus may be different. The population or customer density that would justify the building of multiple fiber links in India may not exist in another country. The governments and the regulators elsewhere may place a greater value on avoiding wasteful duplication of resources. On the other hand, even if governments see the waste of duplicate backbone networks, they may not be able to effectively regulate the incumbents and have no alternative but to ask new entrants to build their own networks.

Chapter 8 describes what comes closest to a policy fiasco among the policy and regulatory actions analyzed in this book. With all good intentions, the government of Nepal, its regulatory authority, the World Bank, and assorted consultants set out to provide telecom services in one of the most rugged and beautiful terrains in the world, Eastern Nepal including Sagarmatha (also known as Chomolangma or Mount Everest), home to some of the world's poorest people. For this purpose, they selected a great policy instrument, the least-cost subsidy auction, developed and found effective in Latin America.

But the enterprise faced a series of misfortunes. An auction was held and a winner identified. Then the entire royal family of Nepal was massacred and an unpopular and authoritarian king ascended the throne. The winner of the auction departed, forfeiting a considerable deposit. But the proponents soldiered on. They redesigned the auction, obtained necessary assurances from the government, the regulatory authority and the government-owned, unreformed incumbent to ensure that conditions for a fresh bid.

The auction was held and a winner was selected. He did not run away, but started to build his network in Eastern Nepal, using satellite VSAT (very small aperture terminal) technology. Now the edifice began to collapse. The regulator with the skills and the commitment retired and the project lost a strong internal champion. The incumbent invaded the territory of the entrant in violation of explicit commitments and set termination charges for his network at exorbitant levels that compelled the entrant to charge outrageous retail prices. The new regulator did not intervene effectively and at the right time.

This was not all. The external environment that capsized the first auction rolled again. The king banned all political parties and assumed power. Among other things, he shut down all the telecom networks in the country, allowing them to restart very slowly and under onerous conditions. The new entrant found that most of its identified locations were now prohibited and he was not even allowed to visit some locations where he had installed connections.

The question is, should everyone else have followed the first winner of the auction when he cut and ran. At what point does one give up on a project because a country's governance framework has deteriorated? Should one use least-cost subsidy auctions only in countries with good governance and where promises made are kept? If these stringent criteria cannot be met, what can be done about the unserved and the underserved? Is telecom a dessert that can be enjoyed only after the meal of good governance has been served?

These questions resonate strongly with the debate around e Sri Lanka, a path-breaking ICT development project in Sri Lanka that is sliding from satisfactory to unsatisfactory ranking because of a change in leadership resulting in significant deviations from the original design that reflected international best practise (Hanna, 2006). The answers to these questions are not in the chapter, but have to be worked out by the reader in active engagement with the material presented in it.

Like the Nepal least-cost subsidy auction, the Indian least-cost subsidy auctions described in Chapter 9 were conducted most transparently, which suggests that good governance is an attainable goal in South Asia. But the design of the Indian auction was such that pretty much all the subsidies ended up with the incumbent. The massive Indian Universal Service Obligation Fund auctions, the Chapter shows, were designed in ways that more or less determined the incumbent being declared the winner.

Infrastructure sharing, interconnection, and other regulatory preconditions that must exist for a truly fair least-cost subsidy auction are identified in Chapter 9. In a gratifying turn of events, the criticisms made of the universal service subsidy disbursements in early drafts of the preceding research report were picked up by the Telecom Regulatory Authority of India (TRAI) and included in its recommendations to the Government of India. However, with many countries getting ready to establish universal service funds, the lessons extracted from India's experience are likely to be of great value, even if it is in terms of learning 'what not to do'.

The discussion of the multiple iterations of the process of designing the ADC regime in India provides an object lesson in protracted and progressive policy deliberation. Under enormous pressure from the incumbent as well as its government 'owners', the TRAI designed and announced a series of ADC regimes that were repeatedly corrected and improved in the face of substantive criticism. It is almost as though the iterative process was needed in order to wear down the resistance of the guardians of the incumbent.

The chapters in this section throw significant light on the regulatory preconditions that have to be met for effective action to extend networks in environments of less than optimal governance. It is not a collection of best practices that are presented for emulation, but rather a series of real-life exercises that will help readers make realistic assessments of actions needed to effectively extend networks under difficult conditions.

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7

One Backbone, or Two?

Harsha Vardhana Singh and Rohan Samarajiva

Introduction

In the course of designing a least-cost subsidy auction for regional telecom networks to serve the underserved northeast[1] and deep-south regions of Sri Lanka, it was calculated that the existing backbone network of the Sri Lankan incumbent operator Sri Lanka Telecom Limited (SLTL) was likely to give it at least a USD 7 million advantage over other potential bidders if the auction was conducted without first ensuring that the winner could connect to and use the existing fiber ring to reach the urban concentrations of the west coast and international networks.

Chapter 9 shows the important role played by the massive backbone infrastructure deployed by the Indian incumbent operator Bharat Sanchar Nigam Limited (BSNL) in allowing it to win most of the universal service subsidy auctions. Lacking the cost advantage afforded by having their own fiber or digital microwave backbone networks and unable to gain timely access to the incumbent's backbone and (thereby match the incumbent's advantage), the private operators had to concede to the competition at considerable financial and political cost.

The discussion of Wi-Fi innovations in Indonesia in Chapter 6 also illustrates the critical importance of backbone infrastructure for Internet service providers. All these examples point to the significance of backbone infrastructure—the importance of having the infrastructure and of sharing what exists.

Backbone is that part of the network used to provide communications services. A distinction can be made between national and international backbones, or cable or fiber and radio-based backbones, or terrestrial and satellite links, as well as the level of coverage (entire country or partial). Various types of backbones exist including copper, fiber-optic cable, co-axial cable, digital microwave, Very Small Aperture Terminal (VSAT), and satellite transmission; the backbone includes not just the conduits for carrying traffic, but also the microwave towers and masts. Technologies are constantly being upgraded and per-unit costs are declining. The extent of upgradation and the extent of cost decline have been extensive. Indications are that such changes will continue. The increase in capacity has been very significant with fiber-based systems, but progress is being made with wireless systems too with substantially higher data transfer rates likely to be achieved in the near future.

Backbone infrastructure, or the 'big pipes' that knit a collection of local-access networks into a national network and national networks into a universal network that spans the globe, has attracted greater attention in recent times (see infoDev, 2005 report) for a number of reasons.

In the early stages of telecom reform in the mature, developed market economies, it was assumed that backbone networks could not, and would not, be duplicated. They were seen as 'essential facilities,' understood as 'facilities that cannot reasonably be economically or technically duplicated.' In many cases, new entrants faced a mandate to use the backbone facilities of the incumbent, for the reason that not to do so would cause wasteful duplication.

As this theoretically derived policy principle began to be applied in developing economies, problems appeared. In some cases, the incumbent simply lacked the capacity to provide facilities to new entrants, even if the will was present. The inefficiencies and constraints inherent in government monopolies precluded them from quickly supplementing backbone capacity to accommodate the new business. More importantly, the incumbents were averse to sharing their networks with, and making life easy for, the new entrants. This was the case even when adequate capacity existed. If lack of access to the backbone drove up the entrants' costs, that was all the better.

In this context, and in the absence of strong regulatory mechanisms to compel incumbents to share backbone, reformers retreated. The focus was placed on absolutely essential matters such as ensuring technical interconnection and adequate access to frequencies, with new entrants expected to solve their backhaul problems as best as they could.

Wasteful duplication was not a concern, especially when it was known, or assumed, that the incumbent did not have adequate backbone capacity to accommodate the rapidly growing traffic volumes.

Understandably, new entrants were not keen to sink their capital into long-gestation backbone investments when pent-up demand in the urban agglomerations beckoned. The second-best solution of ensuring some kind of market entry, even if the regulatory preconditions could not be satisfied, led to a politically damaging outcome that reinforced the mantras of 'cream skimming' and 'cherry picking' favored by the opponents of reform.

As the supply of telecom services exploded in the urban areas thanks to aggressive new entrants and equally aggressive responses from incumbents, the political pressure began to build for serving the rural areas as well. Ministers and regulators exhorted the new entrants to venture out to rural areas; license obligations, where they had been written to include rural supply, were sought to be enforced when exhortation failed. The new entrants did their internal calculations, comparing the immediate and certain returns from investing in expanding the local-access networks in the urban agglomerations versus the longer-term and uncertain returns of building out backbone and local-access networks in regions with few customers likely to generate high revenues, and found the rural extensions uneconomical even in the face of penalties. Penalties were paid and the new entrants stayed in the urban redoubts.

In the face of this apparent obduracy, governments did what was within their power, at least in India where it had retained the authority to direct the incumbent; it ordered the incumbent to extend the network to rural areas. Possibly because the managers saw this as serving multiple purposes, the directions were followed. In addition to pleasing the political masters, rural backbone roll-out increased capital expenditures and strengthened the competitive position of the incumbent. It would be a stretch to claim that they understood the extension of reliable backbone infrastructure to rural exchanges as a surefire method of winning universal service subsidies, but that was a possibly unanticipated outcome of the roll-out of backbone infrastructure. Whatever the motive was, the end result, as shown in Table 7.1, was greatly beneficial to the incumbent, both politically and economically.

Table 7.1
Incumbent's Exchanges Connected to Reliable Infrastructure in India (March 2005)

	Exchanges	Connected by Optical Fiber	Connected by Digital Microwave	Connected by Satellite	Other**
Chennai	210	210	0	0	0
Kolkata	518	518	0	0	0
Maharashtra	4941	4687	226	10	18
Gujarat	3289	3289	0	0	0
Andhra Pradesh	3341	2965	238	5	133
Karnataka	2708	2647	61	0	0
Tamil Nadu	2147	2043	62	4	38
Kerala	1218	1204	0	6	8
Punjab	1536	1533	0	0	3
Haryana	1115	1109	4	0	2
Uttar Pradesh (West)	955	891	0	0	64
Uttar Pradesh (East)*	2760	2385	292	0	83
Rajasthan	2341	2254	31	15	41
Madhya Pradesh and Chhattisgarh	3437	3085	19	15	318
West Bengal and Andaman & Nicobar	1416	1367	35	14	0
Himachal Pradesh	934	714	132	50	38
Bihar and Jharkhand	1591	1534	3	0	54

Orissa	1136	1129	4	0	3
Assam	594	475	115	4	0
Northeast	485	234	79	65	107
Jammu & Kashmir	363	257	55	47	4
Total	**37,035**	**34,530**	**1,356**	**235**	**914**

Source: Authors, based on Telecommunications Regulatory Authority of India (TRAI) data.[4]

Notes: * Uttaranchal data has been combined with Uttar Pradesh (East).

** These other reliable media are underground cable (4 exchanges), Analog/Digital UHF[2] (458 exchanges), PCM[3] (2 exchanges), and other media (450 exchanges).

Politics is short on memory and impatient with complexity. To a great extent, the judiciary of developing countries, which lacks familiarity with economic theory, is also prone to accept simple arguments whether or not they reflect economic reality. The extract from a news report given below is illustrative:

> Rejecting the cellular operators' demand for sharing of the BSNL network and infrastructure, particularly in rural areas, the Minister said the government operator took initiative in areas where its private counterparts failed to venture. Now when the BSNL has turned into a good business opportunity, it needs to capitalize on it.... The Government has given enough concessions to the private players and they should now leave Delhi and work in other places to consolidate their position and build infrastructure. ('Remove Connectivity Hurdles,' 2005)

However, now that much of the pent-up demand in urban areas has been mopped up and the regulatory agencies are moving beyond fire-fighting to more sophisticated analyses of the problems of distorted network extension, the issue of backbone networks has risen in salience. The issues of incentives for building and sharing backbone have also risen on the agendas of the knowledge communities on telecom reform, as evidenced by the research on the subject, especially in Africa (infoDev, 2006).

This chapter addresses some of the issues of ensuring efficient roll-out of backbone infrastructure, with special reference to India, a country with backbone in place, even if not optimally used. It develops a simple model for assessing the viability of self supply of backbone by entrants and discusses the policy actions that can be taken to create the conditions for competitive supply of telecom services in rural areas. The model can be used to understand the supply of backbone by two kinds of providers: the 'pure' infrastructure provider, which does not provide services at the retail level, and the service provider, which provides access to others while using it to provide services directly.

Threshold Demand and Price Levels and Commercial Viability of Backbone

The lump-sum nature and level of investment required for backbone infrastructure implies that there is a threshold level of demand, below which the investment is not commercially viable. In the case of India, in some areas and for some operators (primarily for the incumbent), demand appears to exist in the range of the threshold; in many areas, especially rural and underserved areas, demand and supply are not in line with threshold demand, requiring different forms of policy and regulatory intervention.

The longer it takes to reach this threshold level of demand, the greater will be the additional costs to cover (due to losses in the initial years). The payback period will become extended, particularly due to the discounting of applicable net revenues.

There has been considerable emphasis on open-access models for promoting the establishment of the telecom backbone. Important reasons for this include the lower costs that integrated or stand-alone operators supplying backbone infrastructure would have if the backbone is optimally used and the incentives they have to provide others with access to their backbone. However, to expect the infrastructure provider to have greater incentive to establish the backbone, on the grounds that its costs are lower, would not be correct in general. There will be situations when the incentive for a service provider to invest in the backbone is going to be greater than that for the infrastructure provider. In other situations, depending on the relative revenues and costs, only a service provider may invest in the backbone, or only an unintegrated or stand-alone infrastructure provider may do so.

Situations in which investment in the backbone will not be made commercially by both the service provider and the infrastructure provider can be identified. The government will have to take specific measures to assist the process, including providing incentives in these situations. To consider the various possible outcomes, prevailing demand is denoted 'D,' the threshold level of demand 'D_T,' and the prevailing supply of backbone 'S.' Table 7.2 summarizes the conditions under which investment in backbone would be commercially unviable.

Table 7.3 summarizes the situations for which investment in backbone would be commercially viable.

Thus, in certain situations, it is necessary only to focus on addressing the supply constraint; increasing the prevailing demand in the market will not help increase backbone. On the other hand, in a number of situations, the supply of backbone will not increase unless the prevailing demand in the market rises.

Table 7.2
Likely Growth in Backbone and Requisite Policy Responses in Situations in Which Investment in Backbone is Commercially Unviable in India

Demand/Supply Situation	Salient Features	Likelihood of Increase in Backbone	Requisite Policy Response for Increasing Backbone
1. $D_T > D > S$	• Inadequate demand • Excess demand in comparison to supply (i.e., waiting list in market) • Not certain whether certain factors constrain supply	Unlikely	• Increase prevailing demand ▪ Decrease D_T through policies to reduce costs, increase operational flexibility, and reduce delays ▪ See if any factors are constraining supply, and address them
2. $D_T > S > D$	• Severely inadequate demand (i.e., major demand constraint) • No excess demand in comparison to supply (i.e., no waiting list in market) • Not certain whether certain factors constrain supply	Unlikely	• Strong focus on increasing prevailing demand ▪ Decrease D_T through policies to reduce costs, increase operational flexibility, and reduce delays ▪ See if any factors are constraining supply, and address them
3. $S > D_T > D$	• Severely inadequate demand (i.e., major demand constraint) • No excess demand in comparison to supply (i.e., no waiting list in market)	Unlikely	• Strong focus on increasing prevailing demand ▪ Decrease D_T through policies to reduce costs, increase operational flexibility, and reduce delays

Source: Authors.

Table 7.3
Likely Growth in Backbone and Requisite Policy Responses in Situations in Which the Investment in Backbone is Commercially Viable in India

Demand/Supply Situation	Salient Features	Likelihood of Increase in Backbone	Requisite Policy Response for Increasing Backbone
1. $D > S > D_T$	• Definite situation of supply constraint • Excess demand in comparison to supply (i.e., waiting list in market)	Likely, if supply constraint is addressed	• Address factors constraining supply ▪ Increasing demand will not help increase backbone
2. $D > D_T > S$	• Severe supply constraint • Excess demand in comparison to supply (i.e., waiting list in market)	Likely, if supply constraint is addressed	• Address factors constraining supply ▪ Increasing demand will not help increase backbone
3. $S > D > D_T$	• Definite situation of demand constraint • No excess demand in comparison to supply (i.e., no waiting list in market)	Unlikely, unless demand constraint is addressed	• Increase prevailing demand

Source: Authors.

If there is excess demand in the market and/or likely growth in demand, it is possible that the capacity demanded will exceed the threshold level for attracting investment in the backbone. Infrastructure sharing can increase incentives for investment, as the costs can be allocated among the various entities sharing the infrastructure. The effective cost of the backbone to the user is reduced by sharing. This is more likely to happen when the backbone is installed by an infrastructure provider than when it is installed by a service provider. Universal-service funds and government programs to expand and promote broadband can change the viability frontier; improved interconnection and access revenues can also increase viability, making backbone investment viable in areas that were previously commercially unviable.

There also exists a 'price-threshold level,' or a price level below which the extent of increase in demand would be so large that the stimulus from this large market demand would make investment in backbone self-sustaining and viable, even for what would otherwise be non-viable investments. It may, therefore, be desirable to take steps to create the conditions for prices to decline below the price-threshold level.

Once the market reaches the relevant price threshold, the future growth in demand and revenue sources (through value-added services, Internet, and broadband) would ensure that the investment becomes more attractive. Further, it is likely that with competition and introduction of new technologies, price would decline due to market pressures alone.

With respect to the adequacy of the telecom backbone in a country, the nature of analysis will depend on the particular circumstances in the country. Three possible scenarios can be postulated:

(a) The backbone in the country is adequate. In this situation, within the proposed framework, the policy focus needs to be on access only, including policies related to infrastructure sharing.
(b) Backbone in the country is generally adequate, but some areas have inadequate backbone supply. Where supply of the backbone is adequate, the focus would be on access; where supply of backbone is inadequate, policy would focus on both the establishment of the backbone and access.
(c) Supply of backbone in the country is inadequate. Both the establishment of the backbone as well as access to the backbone have to be examined.

A Stylized Equation of Revenues and Costs

The analysis begins with an illustrative stylized equation for revenues and costs relevant for the telecom backbone. In simple terms, establishment of a backbone, or access to the backbone, depend on the returns from such activities.[5] The capital intensive telecom industry requires relatively large investments in backbone, and since the gestation period for obtaining adequate returns is long, there are substantial uncovered costs, especially in the initial years. The present value for the surplus on the investment can be shown simply as:

(i) Present value of the investment $=$ R – C, or Revenues – Costs.

Or as:

(ii) $$\text{Present value} = R_1 - C_1 + (R_2 - C_2)/(1+\beta) + (R_3 - C_3)/(1+\beta)^2 + \cdots + (R_n - C_n)/(1+\beta)^{n-1}$$

$$\text{or} \quad \sum_{j=1}^{n} \frac{(R_j - C_j)}{(1+\beta)^{j-1}}$$

where,

- o 1, 2, …, n are the different years for which the investment is in operation;
- o R_1, R_2, etc., are the revenues in different years from the investment in the network;
- o C_1, C_2, etc., are the costs in different years from the investment in the network; and,
- o β is the rate of discount.

For the investment to be viable, the present value must be greater than or equal to zero. In addition, the investor may also consider whether the payback period or the break-even period is short enough in view of the conditions in the financial market, that is, availability of funds over different periods of time. In effect, this implies an increase in the discount rate, β.

The presence of β in equation (ii) also shows that if there are some constraints or policy situations which delay the investment from becoming fruitful in terms of final capacity available and used, the present value of the project's returns will become less. Thus, high priority should be given to implement policies which bring revenues earlier, or to increase the revenue base in the critical initial years themselves (when use and consequently revenues are also likely to be low).

For understanding the factors which affect the establishment and provision of the backbone, it is useful to separately consider two types of operators. One is the operator who establishes the backbone only to sell the infrastructure service.[6] We will term this operator as the 'infrastructure provider.' The other operator is one who establishes the network and sells telecom services using that backbone, and also provides others with access to its backbone. This operator will be termed as 'service provider.'

Bearing this distinction in mind, the components of equation (ii) above are slightly expanded yielding a stylized equation (iii), to give the following representation for the present value of the investment made in the backbone:

(iii) Present value

$$\begin{aligned} &= (R_v + R_{va} + R_{is})_1 - [(r + d + i)\,(I_k + I_v) + W_k + W_v + T]_1 \\ &+ \{(R_v + R_{va} + R_{is})_2 - [(r + d + i)\,(I_k + I_v) \\ &+ W_k + W_v + T]_2\}/(1 + \beta) + \cdots + \{(R_v + R_{va} + R_{is})_n \\ &- [(r + d + i)\,(I_k + I_v) + W_k + W_v + T]_n\}/(1 + \beta)^{n-1} \end{aligned}$$

$$\text{or} \quad \sum_{j=1}^{n} \frac{[R_v + R_{va} + R_{is}]_j \ -[(I_k + I_v)(r + d + i) + W_k + W_v + T]_j}{(1+\beta)^{j-1}}$$

where,

- R_v, R_{va}, and R_{is} are the revenues from voice, value-added, and revenues from selling infrastructure (or access charges) respectively. All services which are non-voice services, are categorized as value-added services;
- I_k and I_v are the investment required to begin providing services, and additional investment required when volume of services provided is increased respectively;
- W_k and W_v are, respectively, the working expenditure counterparts of I_k and I_v;
- r is the required rate of return on equity;
- d is the depreciation rate on investment;

- o I is the interest rate on debt;
- o T is the total of the charges paid to government such as license fee and spectrum charge.

A consideration of the revenue and cost components in equation (iii) will provide a better insight into the difference in the response of a service provider and an infrastructure provider to various situations, as well as the different types of financial and public support policies that can be used to encourage the availability of the telecom backbone. The detailed equation will be relevant more in the section dealing with government policies. For most of the remaining analysis, the simpler forms of the equation, such as in equation (i), are adequate to examine the different factors which affect the establishment of, and f access to, the backbone. The simpler equations are easier to handle and are adequate to broadly indicate the importance of various relevant factors for the purposes of this chapter.

The general points that can be derived from equation (iii) are:

- An increase in revenues implies improved present value, as does a decrease in costs. The revenue increase can take place, for example, due to larger number of services being provided or due to an increase in use. Unit costs may decrease as technology changes, or with an increase in the utilization of the network.
- In equation (iii), the revenues from services are normally much higher than the revenues from selling only infrastructure.[7] Thus, normally, $R_v + R_{va} > R_{is}$.[8]
- Likewise, the incremental cost of increasing the capacity is less than the initial cost. This happens both because the costs of the system decrease over time, and because the capacity of the system can be increased with proportionately less investment. This implies that $I_k > I_v$ and $W_k > W_v$. As a result, average costs per unit capacity will decrease with an increase in installed capacity.
- Since the establishment of the backbone requires a minimum, lump-sum investment, the average cost per unit of traffic will decrease as usage increases.
- The lump sum nature of investment also implies a threshold level of demand below which the investment is not commercially viable.
- The longer it takes to reach this threshold level of demand, greater will be the additional costs (due to losses in the initial years) to

cover, and the payback period will become extended, particularly due to the discounting factor applicable to the net revenues of different years.

- With technological change, there is a decrease in costs, and an increase in the types of products under the value-added category that may be provided. The latter would imply an increase in R_{va}. The decrease in costs can result in price decline and greater use, which may change R_v—the change in R_v will depend on the extent of the increase in use in comparison to the decline in price.
- If changes in technology allow other service providers to cut into the market of established operators providing access services, there will be a downward pressure on R_v and R_{va} for established access providers.
- The various components of revenues and costs, the interplay between performance in different years, and the likelihood of backbone not being established in several areas which are commercially unviable, implies that the government may need to develop an overall vision and policy framework, and identify initiatives that must be taken by the private sector, and the supporting initiatives from government.

Service-provider and Infrastructure-provider Incentives

A 'pure' infrastructure provider and a service provider who also provides infrastructure in addition to retail services will have different incentive structures with respect to installation of backbone and providing backbone to others.

An infrastructure provider establishes the infrastructure only to supply access to others. By definition, therefore, the main issue for such an operator is whether or not to establish the backbone because, once established, the question of denying others access does not make sense.[9] In other words, for an infrastructure provider, the establishment of infrastructure and access to infrastructure go hand in hand.

For operators with an interest in both the service market and the infrastructure market, an incentive favoring establishment of backbone is not automatically accompanied by an incentive to give others access. A service provider with infrastructure has three possibilities of earning revenues: revenues from voice services (R_v), revenues from value-added services (R_{va}), and revenues from selling infrastructure (or access charges) (R_i). A conflict may arise with respect to revenue earned by providing access to backbone (R_i) and the revenue sources earned from sale of the services using the backbone ($R_v + R_{va}$).

Normally, for any given capacity of the backbone utilized for provision of a service and for providing access to the backbone, the revenues earned through voice and value-added services will exceed the revenues from providing access to the backbone. In fact, by definition, for any specified capacity the corresponding amounts of revenue $(R_v + R_{va}) > R_i$; if it is not so, then the operator will generally not be able to lease capacity and then use it profitably, since the revenues earned through services sold will not cover the costs of providing services using that capacity.

Therefore, incentives exist for the service provider with infrastructure to use the network itself and not provide its competitors with access to that network. If a service provider believes that the market revenues from services will be reduced if he allows others to use his backbone and compete with him in the services market, such an operator will balk at giving others access to its backbone. This incentive structure is likely to prevail in general.

As a market is opened up, entrants will seek to capture the most valuable customers in the established market from the incumbent. The incumbent will be averse to actions that may contribute to such competition, such as providing access to the backbone. If the backbone is fully utilized before the opening of the market, there is a clear trade-off between earning $R_v + R_{va}$ and earning R_i. Since the former is likely to be greater than the latter, access to the backbone will be provided by the incumbent only if mandatory. However, even when the backbone is not fully utilized prior to market opening, and R_i can be earned without necessarily losing a portion of $R_v + R_{va,}$ the incumbent is likely to refuse to supply access or offer access at an unreasonably high price or at unacceptably low quality because it wishes to hinder the ability of the entrant to compete in the services market. Here too, the efficient use of the backbone will rest entirely on regulatory intervention.

This kind of behavior will not be exhibited by an infrastructure provider. If competition in the backbone leasing market is to be encouraged, infrastructure providers are more likely to offer competitive pricing than service providers.

A service provider is more likely to provide access to its backbone, if it perceives the threat to its $R_v + R_{va}$ to be minimal. This is likely to happen only when the market is growing so rapidly that the service provider with backbone can increase its market even in the presence of competition. However, in this scenario, it may experience or perceive constraints to backbone capacity and may restrict supply to competitors as a result. Here, regulatory action to ensure non-discriminatory treatment will be required.

If the price for access to the backbone is low in relation to cost, the supplier will not have an incentive to provide it and buyers will lose all incentive to build additional infrastructure. Setting the right price to maintain the balance between 'build' and 'buy' decisions is a challenge for regulation. If R_i is relatively low, others will prefer to 'buy' rather than 'build,' and those with the backbone will prefer not to sell at all. In fact, if R_i is set too low, even the infrastructure provider may not have incentive to build and maintain the network.

In light of the differing incentives of infrastructure providers and service providers in terms of giving access to the backbone, particularly the disinclination of service providers to give access under most conditions, a strong case can be made for a separation of functions. In this view, the operations of the service provider should be segregated into two separate units, one dealing with the establishment and provision of network elements such as backbone, and the other providing services through the lease of backbone, and such like, from the infrastructure unit. One example is the recent voluntary structural separation of British Telecom (BT).[10]

Commercial Viability of Private Investment in Backbone in India

Table 7.1 provides a picture of a widely spread backbone in India. Three points may be emphasized with regard to this data.

First, India is prepared with its widespread optical fiber backbone network to provide broadband in much of the country. With increasing sophistication of radio-based technologies, this coverage could be extended practically across the entire country.

Second, the growth of the backbone in India has taken place in a manner analogous to that of Korea, with the government bearing the burden of building the backbone. The difference is that BSNL, on behalf of the government, made these investments from its funds (supported by revenue sources such as Access Deficit Charges at a later time). The important point is that in both countries, the government intervened to extend the backbone to provide a basis for further growth of the telecom services.

Third, the extensive roll-out of the backbone was achieved by a single operator, the incumbent. This implies that the other operators have to be provided access to the existing backbone, or they should build a backbone of their own. For this, the following issues need to be examined:

- How the backbone is being extended in terms of distribution across the country, and the factors which will affect the viability of the backbone's extension, for example, revenues earned and the demand for services.
- Since the extension of the backbone will take some time, it is also necessary to consider the issue of access to the backbone, including the policy regarding infrastructure sharing and difficulties that may be experienced by private operators in laying backbone.[11]

If commercial considerations govern the laying of telecom backbone, it would first be laid on routes yielding adequate returns on investment. Thus, one could have significant backbone capacity but it would serve mainly cities and towns. Hence, in addition to the total availability of the backbone, distribution must also be considered.

The main private operators are extending their backbone networks across the country. Table 7.4 shows the extension of backbone by an operator who holds licenses for all the regions or circles in the country. The infrastructure providers are also increasing their capacity and coverage. For example, RailTel is planning to have about 42,000 route km of fiber by March 2008 (Table 7.5). PowerTel was planning a broadband network of about 19,400 km to be completed in 2006. As on March 2005, the network commissioned by PowerTel was 15,534 km. These infrastructure providers will keep increasing the coverage and capacity because they plan to enter the telecom market as national long distance service providers.

Table 7.4
Reliance Infocomm (India): Optical Fiber and Digital Microwave (March 2005)

License Area (1)	Fiber Route (km) (Phase I—Completed) (2)	Fiber Route (km) (Phase II—Ongoing) (3)	Fiber Route (km) (Phase I + II) (4)	Digital Microwave (5)
Delhi	1,626	9	1,635	21
Mumbai	1,477	398	1,876	
Chennai	1,080	221	1,301	
Kolkata	497	232	729	
Maharashtra	7,054	1,898	8,952	72
Gujarat	5,127	1,209	6,336	15
Andhra Pradesh	6,652	2,887	9,539	10
Karnataka	4,838	1,057	5,895	22
Tamil Nadu	5,303	1,086	6,389	58
Kerala	2,876	1,022	3,898	15
Punjab	2,263	1,295	3,558	11
Haryana	1,823	755	2,578	
Uttar Pradesh (West)	2,224	1,830	4.54	91
Uttar Pradesh (East)	2,009	1,654	3,664	
Rajasthan	3,020	1,157	4,177	28
Madhya Pradesh and Chhattisgarh	4,873	1,771	6,644	15
West Bengal and Andaman & Nicobar	1,964	949	2,913	163
Himachal Pradesh		103	103	98
Bihar and Jharkhand	2,445	2,393	4,838	5
Orissa	1,456	427	1,883	20
Total	**58,607**	**22,355**	**80,962**	**644**

Source: Authors, based on TRAI data provided.
Note: Phase II has been completed in some circles, and will be fully completed by end 2005.

Table 7.5
Optical Fiber Cable of RailTel Corporation of India

	Report on Route (km) as on January 31, 2004	Report on Route (km) as on April 30, 2005
Total fiber programed ⟶ of which:	**28,317**	**32,378**
(a) Optic fiber cable commissioned	16,807	22,877
(b) Optic fiber cable unlit	2,278	2,097
(c) Optic fiber cable work in progress	3,746	1,694
(d) Optic fiber cable proposed	5,486	5,710
Optic fiber cable future works	**11,652**	**10,240 (by March 2008)**
Grand total	**39,969**	**42,618**

Source: Authors, based on TRAI data provided.

As shown in Tables 7.4 and 7.5, the backbone is likely to be extended by the major operators to cover a large part of the country. However, the private operators will cover only those parts which are commercially viable for them after fulfilling their roll-out obligations, which are specified mainly in terms of 'Points of Presence.' The analysis of commercial viability could be conducted in terms of direct revenues or direct and indirect revenues. These concepts may be explained by considering investment in an incremental portion of the backbone.

Direct revenues are the additional revenues generated by subscribers in the incremental area covered by the incremental investment. Indirect commercial viability means the overall revenues generated by the additional possibilities opened up through the incremental backbone. These incremental revenues are generated not only by subscribers in the area covered by the incremental backbone but also by those who call these subscribers, as well as derived from the general impression about the network giving a more complete coverage, and, therefore, providing better communication facilities for subscribers who are roaming or are mobile in various villages, and so on.[12]

This becomes clearer by considering two different situations: one based on the revenues required to recover the investment in the backbone, and the other based on the data in Table 7.6.

Table 7.6
Reliance Infocomm (India) Subscriber Base in Different License Areas and Notional Subscriber Base for Indicative Viability of Backbone

License Area (1)	Subscribers (December 31, 2004) (2)	Notional Subscribers if 140 Subscribers per Route (km) (Phase I) (3)	Notional Subscribers if 140 Subscribers per Route (km) (Phase I and II) (4)	Ratio of Column (3) to Column (2) (5)	Ratio of Column (4) to Column (2) (6)
Delhi	1,285,388	227,640	228,900	0.18	0.18
Mumbai	1,068,606	206,780	262,640	0.19	0.25
Chennai	479,020	151,200	182,140	0.32	0.38
Kolkata	535,193	69,580	102,060	0.13	0.19
Maharashtra	818,944	987,560	1,253,280	1.21	1.53
Gujarat	771,463	717,780	887,040	0.93	1.15
Andhra Pradesh	857,238	931,280	1,335,460	1.09	1.56
Karnataka	663,433	677,320	825,300	1.02	1.24
Tamil Nadu	515,095	742,420	894,460	1.44	1.74
Kerala	532,565	402,640	545,720	0.76	1.02
Punjab	582,277	316,820	498,120	0.54	0.86
Haryana	225,063	255,220	360,920	1.13	1.60
Uttar Pradesh (West)	347,786	311,360	567,560	0.90	1.63
Uttar Pradesh (East)	469,139	281,260	512,960	0.60	1.09

Rajasthan	361,730	422,800	584,780	1.17	1.62
Madhya Pradesh and Chhattisgarh	342,986	682,220	930,160	1.99	2.71
West Bengal and Andaman & Nicobar	114,634	274,960	407,820	2.40	3.56
Himachal Pradesh	3,721	0	14,420	0	3.88
Bihar and Jharkhand	202,132	342,300	677,320	1.69	3.35
Orissa	122,795	203,840	263,620	1.66	2.15
Total	**10,299,208**	**8,204,980**	**11,334,680**	**0.80**	**1.10**

Source: Authors.

Revenue to Recover Investment in Backbone

The cost of laying the fiber and installing the relevant equipment can be considered in terms of cost per km. This cost may range between INR 200,000 and INR 250,000 per km (approximately USD 4,483). There are other, higher estimates, ranging from about INR 270,000 to INR 400,000 (or USD 6,052 to 8,966) per km. However, the available evidence supports the former. Of this amount, one third is considered the relevant amount that should be earned each year to recover costs and give reasonable returns.[13]

Based on industry data reported by TRAI, on the outgoing and incoming minutes for long distance calls, the amount of revenues earned per subscriber from such calls can be estimated to be about INR 600 (approximately USD 13.45) per subscriber per year. Accordingly, it appears that revenues from about 140 subscribers would be adequate to recover the costs of 1 km of fiber. Commercial viability based on direct revenues would require 140 subscribers per km for every incremental extension of the backbone.

Table 7.6 compares a private operator's subscriber base in December 2004 and the notional number of subscribers that would yield the direct revenues which would make the backbone installed in each circle viable. In the metros, the number of current subscribers is far in excess of those required to make the investment in backbone viable. This does not mean that more backbone should be put in the metros. Rather, the subscribers in the metros need to talk to others in other circles also. Thus, the revenues generated by these subscribers can contribute to the costs of the backbone in the other circles too. For assessing the viability of the network, the indirect revenues have to be considered and not just the direct revenues. Hence, the number of subscribers required to make investment in the backbone viable would be fewer than derived from the direct-revenue method. However, the direct-revenue method is used because it uses a specific amount or subscriber base which is not easy to estimate for the indirect method. The direct-revenue method overstates revenues required to cover the investment costs, compared to the indirect-revenue method.

Where the value in columns 5 and 6 is below 1, Reliance's planned incremental fiber is commercially viable. The higher it is, the less viable is the fiber. Accordingly, column 6 shows that only Punjab and the metro circles at the top of the table can justify commercial investment at the combined Phase I and II levels planned by Reliance Infocomm at the present subscriber levels. The lower levels of fiber roll-out under Phase I can be justified in Gujarat, Kerala, Punjab, and Western and Eastern Uttar Pradesh in addition to the four metro circles. The conclusion for Himachal Pradesh is curious in that the relevant value is below 1 in column 5 and considerably higher than 1 in column 6. This shows that the decision not to roll-out fiber in Phase 1 is commercially justified and that the 103 km of fiber planned in Phase 2 cannot be justified.

However, Table 7.6 also shows that with growth of just over 10 percent of Reliance's subscriber base and the resultant aggregate indirect revenues, the overall investment in the backbone will become viable. However, indirect revenues have to be seen not in aggregate or average terms, but in terms of the incremental investment at each stage. It is likely that the incremental investment would not be covered by indirect revenues especially where there are large shortfalls of direct revenues (for example, in the lower rows in Table 7.6). With the notional subscriber base falling far short of what is needed to recover costs for these circles, it is likely that incremental extension of the backbone will be commercially viable, even taking into account indirect revenues. These circles, therefore, require policy intervention to promote installation of the backbone.

In India, this problem is less serious because the incumbent has installed its backbone in most places. However, minimal demands should be placed on the incumbent. The universal service obligations (USOs) policy in India has therefore identified Short Distance Calling Areas (SDCAs)or local call areas which do not provide adequate revenues to recover costs (termed net cost positive SDCAs). The USO Fund Administrator has identified 1,685 such SDCAs, and USO assistance is to be given to operators to provide rural household connections in these areas, with BSNL covering 1,267 SDCAs, Tata Teleservices covering 215 SDCAs, and Reliance Infocomm covering 203 SDCAs (see Table 7.7). Table 7.8 shows the percentages of net cost positive SDCAs in different circles. This table shows a surprising result, namely, that circles which otherwise appear to be relatively profitable have a substantial portion which gives low revenues. Also, several circles with a large proportion of SDCAs which are net cost positive are also among those which have more than 90 percent of their BSNL exchanges linked with fiber.

Table 7.7
Net Cost Positive SDCAs in Different Circles and the SDCAs in Areas Served by Various Service Providers in India

License Area (1)	Number of Net Cost Positive SDCAs (2)	Primary USO Bid Won by BSNL (3)	Primary USO Bid Won by Tata Teleservices (4)	Primary USO Bid Won by Reliance Infocomm (5)	Primary USO Bid Won by Tata Teleservices (Maharashtra) (6)
Maharashtra	228	172	0	13	43
Gujarat	120	99	0	21	0
Andhra Pradesh	117	81	0	36	0
Karnataka	117	66	8	43	0
Tamil Nadu	24	6	0	18	0
Kerala	15	10	0	5	0
Punjab	18	5	12	1	0
Haryana	16	0	13	3	0
Uttar Pradesh (West)	50	29	9	12	0
Uttar Pradesh (East)*	84	39	30	15	0
Rajasthan	203	118	80	5	0
Madhya Pradesh and Chhattisgarh	318	297	11	10	0
West Bengal and Andaman & Nicobar	13	6	0	7	0
Himachal Pradesh	22	11	0	11	0
Bihar and Jharkhand	122	110	9	3	0
Orissa	96	96	0	0	0
Assam	26	26	0	0	0
Northeast	77	77	0	0	0
Jammu & Kashmir	19	19	0	0	0
Total	**1,685**	**1,267**	**172**	**203**	**43**

Source: Authors.

Table 7.8
Percentages of Net Cost Positive SDCAs in Circles in India

License Area (1)	Percentage of Net Cost Positive SDCAs (2)	Percentage of Exchanges Linked by Fiber on March 31, 2005 (3)
Maharashtra	**75**	**95**
Gujarat	**75**	**100**
Andhra Pradesh	48	89
Karnataka	**65**	**98**
Tamil Nadu	19	**95**
Kerala	26	**99**
Punjab	33	**100**
Haryana	30	**99**
Uttar Pradesh (West)	**78**	**93**
Uttar Pradesh (East)*	42	86
Rajasthan	**83**	**96**
Madhya Pradesh and Chhattisgarh	**90**	**90**
West Bengal and Andaman & Nicobar	18	**97**
Himachal Pradesh	**67**	76
Bihar and Jharkhand	**68**	**96**
Orissa	**80**	**99**
Assam	**57**	80
Northeast	44	48
Jammu & Kashmir	**56**	71
Total	**64**	**93**

Source: Authors.

Note: Shares of more than 50 percent net cost positive SDCAs and shares of more than 90 percent exchanges linked with fiber are highlighted.

Another noteworthy feature is that the main private operators are planning to extend their network across the country even without taking the USO assistance into account. These operators' plans are, by definition, indications of commercial viability. This suggests that the direct-revenue method may be too conservative.

Nevertheless, analyzing demand in terms of aggregate direct revenue effects gives a good perspective on the minimum revenues required to lay the requisite fiber; it identifies the necessary (but not sufficient) conditions for the backbone to be extended to specific locations. More detailed and location-specific information would be required to assess the sufficient conditions for the provision of backbone. However, with greater competition, which will also include the selling point of comprehensive network coverage, more market revenues coming from broadband, and with progress in technologies which can cover larger areas with lower investments, the results based on the necessary condition will more and more reflect those based on the sufficient condition for the investment in backbone being generated.[14]

Policy and Regulatory Responses

Contrary to conventional wisdom regarding reducing wasteful duplication of backbone infrastructure, Indian policy appears to give greater weight to maximizing the freedom of BSNL to do what it pleases with its network. As quoted earlier, the government has accepted the simplistic argument that BSNL should be free to enjoy the benefits of its investment in backbone infrastructure without being compelled to share it with competitors.

This is in line with the Department of Telecommunication's position on the sharing of BSNL's infrastructure by other operators in the context of the subscribers of other mobile operators being allowed to roam on BSNL's network, which has the largest national footprint. BSNL objected to such a ruling on the ground that it laid its network at considerable expense, which provides it with a unique competitive advantage. The Indian policy makers accepted the argument that forcing BSNL to allow other operators' subscribers to roam on its network, where the other operators did not have their own networks, would amount to penalizing BSNL by taking away its market growth strategy and helping the other operators even though they had not invested in the area.

The gist of these policies and announcements is that Indian operators should not only install their own local-access networks, but also build their own backbones to the extent that commercial negotiation with BSNL does not yield satisfactory leasing arrangements.

TRAI recently gave its recommendations to the government on unified licensing,[15] including one to allow a 'niche operator' in each SDCA with less than one telephone per hundred inhabitants. These niche operators would require access to the existing network in order to function; the alternative of expecting them to build their own backbone is utterly unrealistic. It would be worthwhile to consider allowing infrastructure sharing at least in these SDCAs, with appropriate cost-based prices being charged. One complication would be if these SDCAs are also net cost positive SDCAs (which is very likely) and are hence covered by the USO program. It would be necessary to decide how to handle the overlap of USO and potential infrastructure sharing, particularly for broadband purposes. In fact, such a policy could be determined after a year or two for the entire rural area, with the main operators having spread their infrastructure in the meantime.

Other countries less protective of the rights of incumbents over infrastructure, more concerned about avoiding wasteful duplication of infrastructure and more willing and capable of enforcing open-access regulation may wish to take a different course of action. This chapter identifies the various scenarios that are likely to face policy makers and regulators, in terms of supply, demand and threshold demand, and provides the tools to identify the nature of the shortfall in backbone. Such diagnostic tools enable better targeting of policy remedies.

NOTES

1. North East includes the following circles: Manipur, Mizoram, Arunachal Pradesh, Nagaland.
2. Data provided to authors by TRAI.
3. Ultra High Frequency.
4. Pulse Code Modulation.
5. Regarding the various factors that are considered by investors, Bruce and Macmillan (2002, p. 5), mention the following: (i) Operating statistics and ratios: subscribers (or lines), employees per subscriber (or line), minutes of use per subscriber, churn rate, country penetration; (ii) Financial/Operating ratios: average revenue per user (ARPU), revenue per minute, subscriber acquisition cost, enterprise value per subscriber, capital expenditure per subscriber, capital expenditure per minutes of use; and (iii) Financial Statistics/Ratios: operating revenues, EBITDA, EBITDA margin (EBITDA over revenues), free cash flow, debt/EBITDA (Earning Before Interest, Taxes, Depreciation and Amortization), debt/market capitalization, enterprise value/EBITDA, capital expenditure/revenues, Free Cash Flow (FCF) yield, Price-to-Earnings (P/E) ratio, earnings per share, and return on equity.
6. A number of countries have recognized the importance of such specialized service, especially by other utilities, of providing only infrastructure. They have thus created a special category of license for allowing exclusively the service of infrastructure provision. Likewise, the licensing regimes in a number of countries have evolved to distinguish between those who have infrastructure (which they may or may not use to provide telecom services also), and others who do not have their own infrastructure but themselves provide telecom services using the infrastructure resources taken from others.

7. Although, the cost of bad debts, collection costs, billing problems, etc., can increase the cost of provision of services.
8. While this is likely to be true in general, the easiest way of conceptualizing this is to consider the same level of capacity to be used for two alternative sources of revenues, that is, one, leasing the capacity to others, and the other being the use of the capacity to sell telecoms services. A number of simplifying assumptions underlie this comparison, such as the extent of traffic being the same as that reflected in the implicit capacity utilization considered for determining the access charge for leasing the backbone. Thus, the statements based on this analysis should be seen more as indication of the broad likely features rather than being valid under all possible circumstances. These broad features enable us to get a general perspective on the factors that will affect the establishment of and access to the backbone. More detail in terms of the level of capacity utilization is considered in the later sections.
9. However, there is a possibility that the provider may adopt a pricing model that discourages high volumes—the usual monopoly pricing problem.
10. For more detail, see www.btplc.com
11. In this regard, BSNL does not face the same type of situation as private operators because under the Indian Telegraph Act, the erstwhile Department of Telecom (DoT) and now BSNL have greater powers and flexibility for laying their backbone.
12. At present, such a perception is a strong selling point for the mobile service of BSNL.
13. This is in effect a higher return than is normally given in cost based tariffs. This is especially because the depreciation for the most costly items is very low, that is, the lifetime for those items is relatively long.
14. This is also indicated by the result in different tables which show that a number of circles which are considered to be relatively high potential revenue earners are also those which have relatively larger number of SDCAs which are net cost positive.
15. http://www.ictregulationtoolkit.org/files/657_file_3663177.pdf

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8

The Dumbing-down of Smart Subsidies

HARSHA DE SILVA

WHAT ARE SMART SUBSIDIES AND WHERE HAVE THEY BEEN DONE?

The supply of telephony has traditionally been skewed towards the urban affluent as opposed to the rural poor. The literature describes this bias as having been caused by a 'market efficiency gap' and an 'access gap' (see Figure 8.1).[1] The market efficiency gap is the difference between what markets achieve under existing conditions and what they can achieve if barriers are removed. This gap can be bridged through effective competition, private provision of services, and market-oriented policies and regulations that create a level playing

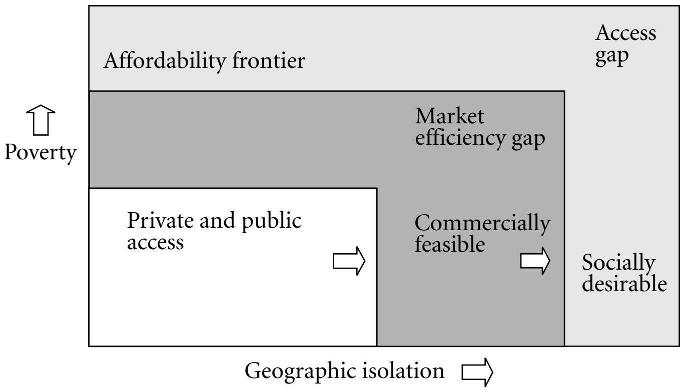

Figure 8.1
Market Efficiency and Access Gaps

Source: Navas-Sabater, Dymond and Juntunen (2002).

field for new entrants. The access gap refers to people and places that remain beyond the limits of the market due to inadequate income levels or its skewed distribution. Bridging this gap needs subsidies to encourage service providers to enter these areas.

Closing the 'access gap' is not a straightforward task. A number of policy and regulatory complexities have to be considered. While there is debate on the ideal sequence of implementation of policy to bridge the two gaps, it is best to address the market efficiency gap prior to the access gap. Besides the policy and regulatory complexities are the geographic and socio-economic factors that have to be taken into account before designing access-gap-bridging policies. Primarily these are the size and terrain of a country; population densities of the settlements; the income level and its distribution among the population.

Subsidies can be distributed in various ways. Based on the criteria of targeting, market distortion and efficiency incentives, least-cost subsidy (LCS) auctions are considered to be the best method and are thus described as 'smart subsidies'. In LCS auctions, bidders are forced to consider the most cost-effective technology and other cost-saving options to bid for the lowest required subsidy, if at all. LCS auctions are very different from the provision of subsidy using a comparative evaluation scheme, which is known as a 'beauty contest' where the award is determined on a merit-based assessment of the applicant's ability to fulfill a given set of requirements. In countries with poor governance frameworks, it is always safer to use the smart subsidy approach, where only a single dollar figure is evaluated, than one that allows discretion to the tender board that evaluates bids.

LCS auctions for bridging access gaps in rural telecommunication services were introduced in the mid-1990s in Latin America. Chile was the first to do so, in 1995–1997, when a subsidy of USD 10.2 million was disbursed by Fondo de Desarrollo de las Telecomunicaciones to roll-out telecom services in some 4,500 rural locations. Other countries in the region used LCS to encourage regional telecommunications services. Some were more successful than others. Table 8.1 gives a summary of smart subsidy projects implemented in Latin America.

Smart Subsidies in Nepal

Nepal is country with some of the most rugged and beautiful terrain in the world, and home to some of the world's poorest people. On the

Table 8.1
Latin American Smart Subsidy Projects

Country	Name	Period	Localities Served	Maximum Subsidy Available (USDm)	Subsidy Granted (USDm)	Subsidy per Locality (USDm)
Chile	Fondo de Desarrollo de las Telecomunicaciones	1995–1997	4,504	24.1	10.2	2,256
		1998–1999	1,412	14.4	9.8	6,919
		2000	143	1.9	1.8	12,727
Peru	Fondo de Inversion en Telecomunicaciones	1998	213	4	1.7	18,800
		1999	1,937	50	11	5,700
		2000*	2,290	59.5	27.8	12,100
Colombia	Fondo de Comunicaciones	1999	6,865	70.6	31.8	4,600
Guatamala	Fondo para el Desarrollode la Telefonia	1998	202	n/a	1.5	7,587
		1999**	1,051	n/a	4.5	4,282
Dominican Republic	Fondo de Desarrollo de las Telecomunicaciones	2001	500	3.8	3.4	6,800

Source: Dymond and Oestmann (July 2002).

Notes: * Implementation delay due to disqualification of subsidy winner; second bidder awarded.
** Network not implemented due to operator failure.

one hand, the incumbent Nepal Telecommunications Corporation (NTC) had failed to bridge the access gap in rural areas of Nepal and, on the other, hardly any private operator activity was afoot. Thus began the discussions between His Majesty's Government (HMG) of Nepal through the Nepal Telecommunications Authority (NTA) and the World Bank to consider alternative mechanisms to service these areas. Taking into consideration the difficulties of attracting private investments to Nepal, it was decided to carve out one administration region and implement a private sector led regional telecommunication service program through the provision of a subsidy as a pilot project.[2]

The beautiful Eastern Development Region (EDR) of Nepal, home to Mount Everest was selected for this pilot project. Because the Regional Telecommunications Development Fund (RTDF) was not yet in operation, the World Bank agreed to provide funds for regional telecommunication services under a long-term credit to HMG.

Based on the lessons of Latin America, the NTA, and the World Bank agreed to call for international competitive bidding. The winner would be the bidder requesting the lowest one-time capital grant. This was to be the first LCS auction in this part of the world.

Design and Implementation Plan: Expectations

The salient features of the license design and implementation plan, developed jointly by the NTA along with their Consultants and the Word Bank[3] are discussed in this sub-section. The area of coverage was 534 Village Development Councils (VDCs) in the Eastern Development Region (out of a total of 893 VDCs) with a rural population of 4 million.

The license was to be issued on a non-exclusive basis to serve the EDR. However, HMG through the NTA agreed not to authorize NTC or grant any new licenses to any existing or new operators to provide services in the identified VDCs for a period of five years after the license. The logic of the five-year exclusivity seems to lie in the view that the five-year duration would help the licensee build its own network and broaden its customer base prior to competition setting in. The licensee was to install, activate, and operate at least two separate public access lines as Public Call Offices (PCOs) in two separate wards of each VDC. In terms of technology, NTA and the Bank chose to let the applicants decide on the basis of the existing infrastructure and geo-demographic and socio-economic conditions in the EDR. The Request for Applications (RFA) stated 'The Licensee may utilize any appropriate wireless or wire-line technologies in the provision of the regional telecommunication services in the Regional Service Area.' The technology had to meet minimum eligibility requirements and service-quality criteria.

The implementation plan also called for 50 percent of the VDCs listed to be served within nine months of the effective date of the license and 100 percent served within 18 months. Failure to meet network roll-out requirements were to result in the loss of eligibility for the regional telecommunication service subsidy, forfeiture of the performance guarantee, termination of the license, imposition of fines, and even the forfeiture of all equipment, land, and other assets related to the regional telecommunication service. However, given the security situation, the RFA stated that these penalties would not be applied if the roll-out delay resulted from *force majeure*. In that event, the RFA stated, NTA would modify the locations.

The RFA specified that the licensee has to provide basic public telephone service consisting local, domestic long distance, and international long distance as mandatory services. Once the above requirements were fulfilled, the licensee was to be authorized to provide additional individual or public telephone access services in any location in the EDR. In addition to the mandatory services, offering Internet access, e-mail, prepaid calling card services, data communication services, and so on, were also authorized in all of the identified VDCs as well as the entire EDR once the roll-out obligations were met.

The license provided that from January 1, 2004, the licensee would have the right to obtain a separate non-exclusive license to provide national long-distance services, and a national license to provide international services using its own international gateway. The conditions for the two licenses were to be the same as any others that would be issued.

The design included a service-quality component that obliged the licensee to meet minimum quality and availability-of-service standards. The licensee was also bound by a number of service-availability criteria. The key availability criterion was that each PCO had to be open during reasonable daytime and afternoon hours (suggested 0900 to 1700 hours), totaling a minimum of eight hours, every day of the week. Where a PCO did not have access to the electrical power grid, the licensee was to provide an alternative source of power.

The Regulatory Framework: Promised

The World Bank was concerned that the many shortcomings in the telecom regulatory environment in Nepal would hinder the success of the project. In order to ensure that regulation would not be detrimental to the proposed project, NTA and the World Bank undertook a number of precautionary measures.

The initial term of the license was set at 10 years, with the licensee enjoying exclusivity in service provision for the first five years. NTA was expected to grant the license renewals, provided that there were no material breaches of the license. The license fee was set at a very low level of NPR 100,000 (approximately USD 1,250) for the initial 10 year period. The licensee was exempted from almost all other fees and levies until the first renewal.

Given the technology neutrality of the design, the licensee was free to use any wireless technology and/or satellite services in providing the services as long as they met stated technical requirements and service quality criteria. The RFA noted that the eventual licensee was required to pay fees on an annual basis for any spectrum license calculated on the same basis and payable on the same conditions as the fees in NTC's spectrum license. However, the licensee was to be exempted from paying spectrum fees as long as NTC was exempted from paying them. The RFA also noted that the licensee would have rights of access to public and private lands and also the rights of inspection and entry set out in the Telecoms Act.

The process of interconnection between the licensee's network and other licensed telecommunications networks in Nepal, including NTC, was to be governed by the Telecom Act's Guidelines for Interconnection.

The tariffs charged by the licensee were to be subject to regulation by the NTA in accordance with the Telecom Act. Except with the prior approval of the NTA, the licensee was not authorized to charge tariffs higher than those set out by 'Regional Telecommunication Service Maximum Tariffs and Default Interconnection Rates' in the RFA (see Appendix 2, Table A2.1).

The RFA stated that the NTA would regulate NTC to ensure that it does not unfairly discriminate against the licensee and does not grant anti-competitive preferences to or cross-subsidize its own regional service operations. The RFA further elaborated that any regional telecom service operations of NTC will be regulated by the NTA so as to ensure that NTC does not abuse its dominant position. It also undertook to ensure that any authorization granted to NTC in the regional service area of the licensee will contain terms and conditions equivalent to those applicable to the licensee.

The above guarantees gave a level of comfort to the bidders in terms of licenses, access to spectrum, tariffs, and possible anti-competitive behavior of the incumbent.

Eligibility, Selection, and Implementation

It is evident that the consultants to the World Bank and NTA intended to maximize the number of potential players that would become eligible to bid at the auction by setting eligibility conditions which were not overly restrictive. The key conditions were that the bidder must become registered as a company in Nepal prior to the license being issued; must have Nepalese investors with a minimum of 20 percent equity; must satisfy the NTA of financing capacity to complete roll-out of the network in accordance with the terms of the license; must provide evidence of operating either a telecommunications network with over 250,000 subscribers, or a telecommunications network with over 500 public telephone access lines in rural areas; and must furnish a bid security of USD 100,000.

The RFA was very clear in how the selection process was to be conducted using a single round LCS auction. It said 'The NTA plans to issue the License and the [regional telecommunication service] Subsidy to the Licensee proposed by the Qualified Applicant that proposes the lowest [regional telecommunication service] Subsidy.'[4] It is important to note that no maximum subsidy amount was announced, taking the position that 'market knows best' and also guarding against bids converging at the maximum allowable subsidy.

The implementation plan of the LCS determined by the winning bid of the auction was straightforward. The RFA stated that the one-time grant was to be payable in four tranches: first tranche of 40 percent once the 534 access lines have been activated and are in operation; second tranche of 40 percent once 1,068 access lines have been activated and are in operation; third tranche of 10 percent as soon as possible after the end of the first year after the activation of services in all identified VDCs; and the fourth tranche of 10 percent was to be paid at the end of the second year after the activation of services in all identified VDCs provided that quality of service standards were maintained.[5]

Nepal LCS Auction Outcome

The NTA commenced the auction process that decided on the present Licensee in February 2003. However, this was the second attempt of the LCS auction. The first attempt was in September 2000. At the 2000 auction, NTA received two bids and the applicant with the lowest subsidy signed a letter of intent to undertake the project. However, with the massacre of the King's family and rising Maoist violence, the winning party withdrew, forfeiting its bid bond. In this context, HMG and the World Bank undertook a total review of the program and weighed the options of suspending the project versus improving the attractiveness of the offer by including conditions that mitigated the risks involved and enhancing the financial attractiveness. It was decided to go ahead with a modified auction.

The RFA documents were made available for purchase in February 2003; a prebid conference with six potential bidders was held in April 2003; and applications for the regional telecommunication service license were received in June 2003. During the bidding process, some potential applicants raised additional concerns related to the financial, regulatory, and security risks. To mitigate some of the concerns, additional changes were made to the proposed regional telecommunication service license.

One of the major concerns addressed was the need for revising the scheduling of payments. If the licensee utilized the Very Small Aperture Terminal (VSAT) technology, 20 percent of the total subsidy was to be paid upon activation of the VSAT network hub station, which had to be based in Nepal. The other payments would be 20 percent of the subsidy upon activation of lines to 20 percent of VDCs; another 50 percent of the subsidy upon activation of 50 percent of the VDCs (for a cumulative total of 70 percent); and a further 20 percent (total of 90 percent) upon activation of all lines. The last 10 percent was to be paid at the end of 24 months of awarding the license. If the independent consultant were to certify that the licensee was prevented from serving some of the VDCs due to *force majeure*, the NTA was to approve a list of alternative locations within which PCOs could be installed.

However, even after all the above changes were effected, the LCS auction process attracted only two bids. One was disqualified on technical grounds.[6] The incumbent NTC was not allowed to bid.[7] Therefore, based on the only bid received, the regional telecommunication service license was awarded in November 2003 after ensuring compliance with licensing requirements, filing of consortium shareholder agreement and registration with Department of Industry, and receipt of the performance guarantee.

Details of the LCS Auction Award

Number of qualified bids	:	One
Licensee	:	STM Telecom Sanchar Private Limited of Kathmandu, Nepal (USA based); Apollo Investment Group is the Nepali shareholder with 20 percent share.
License issue date	:	November 21, 2003
Roll-out completion date	:	June 16, 2005
License validity	:	Ten years extendable by 5 years to 25 years.
Subsidy amount	:	USD 11,865,000
Total number of PCOs to be installed with the subsidy	:	1,068 in 534 identified VDCs of the EDR
Work progress as at October 1, 2005	:	Installation of the Kathmandu hub station began in early March and was certified on April 29, 2004. The hub station at Biratnagar and installation of 20 percent of locations was commissioned on August 26, 2004. 541 PCOs in 271 VDCs (50 percent milestone) were commissioned on January 14, 2005. As of October 2005, 70 percent of the contract amount had been disbursed.
Number of PCOs currently in operation	:	197; mostly in the Terai region. 341 locations closed down by HMG's order.
Installation monitoring, evaluation and certification by:	:	Planetworks Consulting Corporation, Canada

In hindsight, several things could have been done differently, particularly in light of the lessons from Latin America. However, there was the overarching security problem.

At the time of commencing implementation, Nepal was undergoing a serious security threat from Maoist rebels who had been waging an armed campaign against the state since 1996 as a result of which some 11,500 people had been killed. It was not uncommon for hartals to shut down entire cities and villages. Sometimes main traffic arteries were shut down for days. In certain areas, the entire administration was run by the Maoists with no reference to government rules. The security situation was non-conducive from the initial stages of the regional telecommunication service project and it was known to all. It is, therefore, most likely that risk premiums that had to be borne in terms of additional costs would have been included in the bid.

Even though the Maoists created some problems in the initial stages of the roll-out, progress was on schedule until mid-January 2005 when 542 PCOs in 271 VDCs were completed. However, the conflict took a different turn when His Majesty assumed direct rule and took over executive powers on February 1, 2005. The king sacked the Prime Minister, dismissed his government and declared a state of emergency. Using emergency powers, HMG ordered STM to shut down all 542 PCO locations.[8] Subsequently, HMG permitted STM to reopen 25 out of the 542 locations and by end August 2005, when this study was done, HMG had allowed STM to operate 197 PCO locations in total. In the meantime, STM was unaware of the condition of their equipment in the remaining 345 locations as it had not been possible to even visit these sites due to the numerous restrictions placed on them. However, NTA continued to complain that STM were not interested in relocating these PCOs to other 'safe' areas because they had already collected payments (subsidy) for their installation. In late August 2005, HMG granted permission to STM to restart its implementation program and provided a list of 177 new locations. However, it was alleged that these new locations had been decided by the Army without any thought to their viability given that NTC was already present in them.

From the point of view of the success of the project, there is no doubt that a more conducive security environment would have helped. However, in reality, the ground situation was such that all stakeholders needed to have factored in the unpredictable nature of the situation in Nepal. It is in this context that non-security related issues, particularly those related to ensuring a regulatory environment, within which STM could successfully implement and sustain the regional telecommunication service, are discussed.

Did Nepal Learn Anything from the Latin American Experience?

A number of studies have evaluated the design and implementation issues of the Latin American LCS projects and arrived at similar conclusions (for example, Dymond and Oestmann, 2002; Guislain, 2004; Navas-Sabater, Dymond and Juntunen, 2002; Samarajiva, 2002; Wellenius, 2002; World Bank, 2003). The most important criteria for the successes was found to be the favorable telecom regulatory environments. Key regulatory aspects were pricing and interconnection. The discussion below considers the Nepali case in light of the past lessons.

Decision to Proceed with the Auction

The Latin American successes were based on competition, both for the market and for the allocation of subsidies. Each LCS auction winner was selected on the basis of competitive bids. Sometimes incumbents were allowed, at other times they were not. Incumbents, whenever permitted, sought to defend their territories from possible new entrants and new entrants, on the other hand, sought to gain footholds in the demarcated license territories. This competition reduced subsidies at the outset. In Chile, the subsidy given out in some cases was only a sixth of the benchmark.

In this context it is worth revisiting the selection of the Licensee where the Nepalese incumbent was not allowed to bid. An issue that has generated strong opposing views is the decision to continue with the LCS auction despite there being only one eligible bidder—STM. While some, including the NTA and the World Bank, see no reason why the auction process should have been suspended, others argue that going ahead with just one eligible bid was perhaps a significant error in judgment. The consultants to the World Bank are said to have approached more than 100 potential international entities with the regional telecommunication service opportunity and reported that there seemed to be 'sufficient interest from serious bidders to run an auction.'[9]

License Region and Exclusivity

Another success factor in Latin America was selecting the 'right' areas using bottom-up approaches. In Chile, local authorities, community organizations, and telecom companies together submitted lists that were later short-listed by regional authorities. Comprehensive market research was undertaken by the regulator and was shared with bidders. Division of license territories into smaller units and allowing bids for multiple licenses was another factor. This process allowed bidders to assemble territorial blocks according to their corporate interests.

In Nepal, how were these VDC areas in the EDR selected? The question is whether sufficient information on the EDR along with demand forecasts was provided to potential bidders by the NTA. The NTA and the World Bank assert that the input from their rural economic consultants (not those who helped design the regional telecommunication service) was based on extensive ground work and the feedback on the draft RFA provided sufficient information for bidders to formulate their plans. Even though the tender did not require a business plan be submitted for evaluation along with the LCS amount, it is obvious that a business plan had to be prepared to calculate the amount. The question is whether the assumptions in these plans were accurate. The NTA revealed that they did not commission a survey to estimate the potential demand for regional telecommunication service in the EDR prior to preparing the RFA.

The primary lesson from Latin America was the importance of a conducive regulatory environment. Because the World Bank and NTA had taken pains (on paper at least) to ensure such an environment would prevail in Nepal, it is worthwhile assessing the outcome.

The license guaranteed exclusivity to STM for the first five years. No new service provider was to be given licenses, nor was NTC to be allowed to provide any service in those VDCs. This decision was rooted in estimates of the economic activity and, hence, the traffic in these areas. Introduction of competition prior to STM building its network and consolidating its customer base was not seen as advisable given the available demand. However, from the date of selecting STM and the time this research ended (November 2003–November 2005), NTC entered more than 100 of the 534 VDCs exclusively earmarked for the STM. The unauthorized entry of NTC to the areas earmarked for STM was a clear violation of the license condition. However, even after numerous complaints from STM and reminders from the World Bank to stick to the agreed rules of the game, NTA failed to stop this continuing abuse.

Adding to the issue of exclusivity violations is the pending implementation of a Code Division Multiple Access (CDMA) license already issued to NTC. The incumbent is planning to install one million lines in the next five years across Nepal including in the EDR. Technical experts are of the view that the CDMA signal will cover almost all VDCs in the Terai region and many of those in the Hill region, which would result in telephone services at a much lower tariff than the existing STM tariffs.[10] Be that as it may, the general view is that the CDMA roll-out has been talked about for a number of years without any concrete results.[11] If and when the CDMA roll-out takes place, STM's ability to operate their VSAT PCOs at a profit will be seriously compromised.

Interconnection and Tariffs

Interconnection has a very significant impact on new entry, which puts tremendous pressure on the regulator to establish clear and fair interconnection rules for the success of new entrants. The existence of substantial externalities due to incoming traffic towards rural networks, as well as of different incremental operating costs between urban and rural networks, makes a cost-based interconnection regime essential. There is a strong case for asymmetric interconnection favoring the rural operator.

For instance in Chile, tariffs were regulated minimally; all tariffs except call charges within the primary calling area were left for the operators to set under a ceiling. Implementation of a cost-based asymmetric interconnection regime was critical to the viability of the projects. The ability of the regulator to get the operators, particularly the incumbent, to abide by an access charge that reflected the higher cost of operating a network in the rural and sparsely populated license territories was critical. It cost 18.7 times more to terminate a call on a rural network than on an urban network in Chile.[12] This gave an opportunity for the winning operators to build a business case that included revenue from incoming calls. Sixty percent of the revenue of the largest rural operator in Chile was generated by the positive interconnection balance with urban operators in 2002. The large variations in the subsidy per location, for instance, between the first Chilean and Peruvian auctions; USD 2,250 vs. USD 18,800 indicate that the Peruvians relied on the subsidy much more than the Chileans. In Chile, each dollar of smart subsidy resulted in six private dollars, while it was only two private dollars per subsidy dollar in Peru. The existence of a cost-based asymmetric interconnection regime in Chile, and not in Peru, it has been suggested, explains the difference.[13] Colombia and Peru are now moving towards asymmetric interconnection regimes.

The NTA failed to create an environment conducive to the successful implementation of the project in the related areas of interconnection and tariff regulation. Interconnection between the licensee's network and that of the NTC was to be governed by the Telecom Act's Guidelines for Interconnection. However, the RFA did not specify an interconnection charge between the regional telecommunication service licensee and NTC, but indicated a maximum retail tariff of NPR 9 per minute for local calls in the RFA annex on maximum tariffs and default interconnection rates.

An interconnection charge was set eventually. What was agreed between STM and the incumbent NTC was 55 percent of NTC's own 'VSAT tariff.' With the NTC 'VSAT tariff' set at NPR 9 per minute, the interconnection rate between STM and NTC was then set at NPR 4.95 per minute for calls originating on the STM network and terminating on the NTC network. STM, therefore, set its own tariff at the maximum allowable rate of NPR 9 per minute. On the other hand, calls originating on NTC's network and terminating on STM licensee's network were to entail a NPR 0.30 payment from NTC to STM.

At the outset, a local call from STM's network to that of its own network or to NTC cost NPR 9 per minute. This was in contrast to NPR 1 per 2 minutes from NTC to NTC non-VSAT calls, making an STM call 18 times more expensive than a call on NTC (note that NTC had VSAT phones in only 7 out of 464 VDCs it covered in the EDR). Realizing that it was not at all possible to sustain such high tariffs, STM eventually reduced its local tariff to NPR 3 per minute at a loss of NPR 1.95 per minute (still 6 times NTC rates) and reduced long-distance charges to NPR 5 per minute with an operational profit of just NPR 0.25 per minute. After numerous rounds of lobbying and directives by NTA under pressure from the World Bank, NTC finally reduced the interconnection rate charged from STM to NPR 2.75 per minute for calls originating on STM and terminating on NTC and continued paying NPR 0.30 per minute for calls originating on NTC and terminating on STM.

The original interconnection charge was excessive. This obviously led to the unsustainable NPR 9 tariff, which then had to be brought down to a loss-making tariff. Internal World Bank communications indicate that the interconnection problem was present from the very beginning. STM had requested NTA to facilitate the interconnection agreement with NTC to which it received a positive response. However, NTC had insisted that they could interconnect STM along the same lines as United Telecom Limited (UTL, Nepal) (the fixed Wireless Local Loop [WLL] operator) which meant STM paying for 16 E1 lines even though their requirement was for just a single E1 line. Furthermore, NTC had objected to providing interconnection at two locations (Kathmandu and Biratnagar) even though the license condition had provided this facility to STM, which was anyway key to reducing back-haul costs to make the operation sustainable. In an early letter to the World Bank, STM called this issue a 'show stopper.'

The independent certification consultant identified a number of interconnection problems that STM was facing. Based on discussions among NTA, STM, and NTC, the regulator had agreed that NTA would immediately mediate between STM and NTC in order to negotiate a fairer interconnection and revenue sharing agreement, and hold regular meetings with STM and NTC to ensure that technical interconnection issues are resolved in a timely manner. They had further agreed to hire a consultant to assist NTA develop an interconnection, pricing, and tariff regime to solve the problems faced by STM and NTC. But, there were no concrete results.

A decision that warrants some attention is why the NTA and the Consultants to the Bank agreed to the maximum rates proposed in the RFA (NPR 9 per minute) as 'reasonable.'[14] The consultants had mentioned that since neither they nor the NTA had NTC's actual costs and interconnection rates, the proposed tariffs had been 'benchmarked adequately and should provide some comfort to potential applicants.'

However they had noted that the problem was going to arise with NTC's reaction to interconnection. In order to deal with this impending issue, they had suggested that NTA be provided with 'convincing arguments to support the proposed tariff levels'.

It is clear that NTA had been unable or unwilling to prevent NTC from imposing unfair and potentially detrimental interconnection charges on STM. This resulted in a negligible volume of calls being originated on the STM network and a minimal termination of 'local' calls to the network. Even after the reduction in call rates (to levels that were six times that of NTC), STM reported that during July–August 2005, the average use per day among its 174 operational sites was only 0.36 minutes per day. NTA must take major responsibility for letting the interconnection and tariff issues drag on for so long without finding a solution.[15]

The real question is why, after all the evidence from Latin America, did the NTA and the World Bank not pursue a cost-based asymmetric interconnection agreement favoring the regional telecommunication service operator in Nepal? The Latin American evidence is that it is only through such an interconnection agreement that a significantly high incoming revenue structure for rural networks has been made possible thereby making them sustainable.

Technology and Network Roll-out Requirements

The Latin American successes hinged upon complete freedom to use any technology of choice as long as the quality and service parameters were met. A salient feature in almost all LCS auctions in Latin America was the association of the winning bidder with suppliers of specialized rural telecommunications technology, particularly VSAT technology. While this was a success from the point of implementation, sustainability was becoming an issue with evidence emerging that these new entrants were motivated by creating a new market for their principals' equipment. The evidence suggested that many of these operators lacked adequate knowledge in the business of supplying telecommunications services.

In the Nepali case, the RFA was technology-neutral to the extent that it let the applicants decide on 'any appropriate wireless or wire-line technologies in the provision of the regional telecommunication service.'

In terms of network roll-out, the RFA gave the freedom of choice to STM to prioritize the VDCs in a manner that was most suitable to them. The RFA simply mentioned that 50 percent of the VDCs were to be covered within nine months and 100 percent within 18 months. NTA and the World Bank did not require any order in which the VDCs or districts should be covered. The outcome of the above two conditions was that STM proposed a VSAT solution, on which it was selected as the lowest subsidy bidder and it started the roll-out with the easiest, or most accessible, VDCs in the beginning and left the difficult ones for later.[16] It must be noted here that STM is a large VSAT manufacturer based in the US. At the time STM applied for the smart subsidy, it had wide experience in manufacturing and installing VSAT networks. It had supplied and installed equipment in Bolivia, Argentina, Venezuela, Mexico, Brazil and Thailand as well as Nepal.[17]

In this context several questions have been raised. One is whether STM selected the best technology solution. There is more than one answer to this question. As far as the ease of installation and quick deployment is concerned, VSAT technology seems to be the most suitable for the difficult mountain terrain of the EDR, and perhaps even for some of the more difficult hills where transportation is a problem. This is borne out by the fact that in just over a year STM completed the installation and commissioned regional telecom services in 542 sites in 271 VDCs. These installations, however, were concentrated in 10 out of the 16 districts in the Terai (109 out of 208; 52.4 percent) and the Hill region (162 out of 256; 63.3 percent) while the remaining six remote districts in the mountains were not touched (0 out of 70; 0 percent). However, STM's position is that had there been smooth operation of the project it would have completed its obligation of installing and operating 1,068 PCOs in the 534 VDCs on schedule.

Given delays in roll-out due to a variety of reasons, mostly beyond the control of STM, they are unable to maintain the network on a profitable basis. In this background, the issue is whether using a hybrid solution comprising a less expensive technology in the Terai and a VSAT solution in the more difficult hilly and mountainous districts would have been better (see Appendix 2, Table A2.2 for technology cost guidelines). STM asserts that prior to proposing a VSAT technology they studied in detail the exiting infrastructure, and geo-demographic and socio-economic conditions of the EDR and concluded that a pure VSAT solution was more economical than a hybrid solution. In interviews STM stated that they would have needed a subsidy amount twice that of the actual winning amount; that is, approximately USD 24 million. The argument was that the EDR was not large enough to sustain a multi-technology solution.

But there are opposing views. These become relevant in the context of the practical problems STM is facing on the ground. For instance, when 345 locations out of 542 are out of commission, a possible solution to sustain the operation would be to expand service within profitable VDCs by adding more PCOs in those areas. But research revealed that the VSAT equipment used by STM can only serve an area of 4–5 km and, thus, additional VSAT terminals need to be installed for new locations beyond this perimeter. Given the average cost of at least USD 11,000 per VSAT terminal (derived by dividing the USD 11.865 m subsidy by 1,068 locations), the expert view is that it is uneconomical to use this technology to expand within the VDC without any subsidy. The irony is that while STM is losing money because many of their PCOs have been closed down in 'unsafe' areas, they are unable to expand the service within the 'safe' areas due to high per line costs.[18] Had STM used a hybrid WLL and VSAT solution, it may have had a greater chance of increasing revenues by expanding within 'safe' VDCs.[19]

If the objective of giving absolute freedom in the choice of technology was to motivate the licensee to use either one type of technology or a combination of best possible technologies to make the project the least expensive in capital layout as well as recurrent maintenance and operational costs, then the evidence does not suggest the outcome was optimal. In terms of coverage, if perhaps some priority areas were indicated—not necessarily in terms of particular VDCs, but even in terms of difficulty of access or districts within the EDR—it may have been possible to achieve a more balanced roll-out.

The Latin American licenses were designed in a way that winning bidders were able to provide additional unregulated services to strengthen their business case. In addition to the mandatory public payphones or call offices, most operators started provision of services to homes and businesses very early on. Some even added other data communication services. One operator who had obtained a license to provide 1,800 public payphones had expanded the network to over 18,000 lines. In Nepal, NTA and the World Bank relaxed midway the stringent license condition of restricting service provision outside of the identified 534 VDCs by amending sections of the license to allow STM to provide optional services to meet new demand outside of the listed VDCs. The World Bank clarified that this should be done with the understanding that it would not affect the meeting of roll-out milestones, and that no subsidy would be paid for the provision of extra services. However, STM is not keen in providing either more than the two mandatory lines or providing additional services in any significant number of VDCs either in the list or outside. It is possible that partly the reason for this is the VSAT technology they have deployed where adding terminals is expensive, and without the subsidy it is likely that STM is not convinced of sustaining more lines.

International License

Another serious issue is with STM's international license. By license condition, STM was restricted to use the international gateway and other international facilities of NTC until January 1, 2004. However, thereafter, upon application, STM was to have the right to obtain a national license to provide international services using its own international gateway upon payment of the license fee equal to that of NTC. According to STM it has not been granted the international license since its application in April 2004, which if granted would have helped them tide over the serious sustainability issues caused by the unstable security situation within Nepal. The World Bank on numerous occasions has requested NTA to comply with the license condition of providing STM with an international license. STM complained that its request has not been entertained while NTA claims that STM has not made the required payments. STM had requested an extended payment plan for the license fee because of the deteriorating security situation taking a tremendous toll on its bottom line.

It was the responsibility of the NTA to be more proactive in this situation and make necessary mid-course corrections. But it seems that NTA was only interested in sticking to the rules, irrespective of the changed circumstances.

Service Quality and Service Availability

Besides standard quality criteria, STM was bound by a number of service-availability criteria. The key availability criterion was that each

PCO had to be open and available to make local, long-distance, and international calls during reasonable daytime and afternoon hours, for a minimum of eight hours, every day of the week. The monitoring of service quality and availability is something that the research found to be wanting. Discussions with independent evaluation consultant PlanetWorks revealed that the difficulty in fulfilling the requirements was particularly due to the security issues and the remoteness of sites.

Be that as it may, during a field visit to one of the sites at Bhaudaha in the Morang district, STM's PCO was closed because that day was a government holiday. Interviews with the local people revealed that the service quality and maintenance was not at all satisfactory. Local people were of the view that the STM PCO should be open from early morning hours because people leave home early to reach their work places which are usually far from their homes. However, the PCO opens only from 1000 to 1700 hours which does not serve that purpose, nor satisfy the license condition that the PCO should open for a minimum period of eight hours a day on all days of the week. In the case of the above example, the PCO is run by the VDC, a semi-government office which maintains office hours. It would have been better had the PCO operated from a private house or business where it would have been accessible to villagers outside 'office hours.' Discussions with PlanetWorks indicated that there are a number of technical issues that needed to be solved to make the service-quality monitoring more efficient. Among the recommendations were that NTA purchase a Geographic Information System (GIS) based system to assist in mapping of VDC sites, storing data, and undertaking analysis.

Was STM prudent in selecting its 'partners' to operate the PCOs and creating the right incentive structure to satisfy the service-quality and availability criteria? The selection of the partners could have been better. It appears that the normal practice is for a representative of STM to visit a village, shortlist a few potential candidates, and, thereafter, select a person to operate the PCO, all on the same day. It was also revealed that for a person to obtain the right to operate a PCO, STM requires them to deposit NPR 35,000 which would be refunded in three years time (NPR 15,000 forfeited if discontinued in 1 year; NPR 10,000 forfeited if discontinued after 2 years, and so on). Once the right to operate a PCO was obtained, these people have to make advance payments (prepaid cards) of NPR 7,500 through banks, which in some cases involves a two to three days walk from the VDC. Discussions revealed that many of these PCO operators were in dire financial difficulty because the PCOs were non-operational or yielded meager revenues.

Certain improvements in the design and a more conducive security environment would have helped STM keep to the implementation plan. However, the primary reason for the current problems which threaten the completion and sustenance of the program is the weak regulatory environment.

NTA's weaknesses were known. All stakeholders were aware of the capacity issues NTA was facing prior to going ahead with the regional telecommunication service. In this context, the World Bank had, in 2004, held extensive discussions on the performance of NTA in a multi-operator environment and recommended that NTA institute processes to improve its regulatory functions. However, even towards the latter part of 2005 the situation at NTA remained unchanged with serious lack of capacity. Interviews with its Chairman and senior officers revealed NTA was severely understaffed and ill-equipped. The regulator's decisions are not free from the influence of the Ministry;[20] there is a clear need to revise staff remuneration to attract the right kind of people for the senior and middle management positions that remain vacant. Even the vacancy for the fifth position of the NTA board, which made obtaining a quorum for meetings difficult, was only filled in August 2005 after much pressure from the World Bank.

Conclusion

While it is true that the Nepali smart subsidy project has been able to provide some rural communities with telecommunications services, the real question is whether the solution is optimal and whether the project can be sustained in the medium to long term. The answer is not straightforward, but inclined to the negative. This chapter shows that unless the right regulatory conditions are in place, particularly with respect to cost-based asymmetric interconnection agreements and effective regulation of incumbent's anti-competitive practices, success of the regional telecommunication service provider, who was empowered by almost USD 12 million of smart subsidies, is unlikely.

This conclusion leads to revisiting the wisdom of separating the 'access gap' and the 'market efficiency gap' in the literature, particularly in terms of sequencing smart subsidy projects and market liberalization programs. The findings indicate that perhaps it would be more useful to consider addressing rural connectivity issues from an integrated and continuous regulatory-subsidy angle instead of separate solutions for the two gaps.

The Nepali smart subsidy projects may fail without a favorable telecommunications regulatory environment. Another important conclusion is that such projects should have built-in mechanisms for dynamic mid-course corrections. The case of Nepal highlights this point very well where a debatably unexpected security problem has caused havoc in the implementation and sustainability of an already weak project.

Recent action by NTA, at the strong insistence of the World Bank, particularly with the new interconnection ruling and the awarding of the international license are perhaps the most positive steps taken to change the downward direction of the project thus far. It is hoped that the NTA will be encouraged in continuing its good work towards creating a more favorable regulatory environment which will ultimately decide the fate of this project to provide telecommunication services to the rural population of the EDR of Nepal.

NOTES

1. The conceptual framework of the two gap dichotomy is developed in Navas-Sabater, Dymond and Juntunen (2002). There are others who refer to the same dichotomy with reference to a 'regulatory gap' and an 'affordability gap'.
2. Dividing the country in to three terrain regions of mountains, hills, and terai was also considered. The key feature was the possibility of using different technologies in the three geographically different regions. However, that was abandoned in favor of the administrative regions.
3. As per the Request for Application. Consultants to the Bank were Canadian consultancy firm, McCarthy Tetrault Inc.
4. However, the RFA was not clear on how the selection would be made in case there was more than one identical lowest bid.
5. However, a somewhat revised plan was actually implemented.
6. Telecommunications Consultants India Limited (TCIL) from India.
7. In some of the Latin American projects, the incumbents were allowed to bid, but did not necessarily win the LCS auctions. However, in India the incumbent won the majority of LCS auctions, the reasons for which are discussed in Chapter 9.

8. All telecommunications facilities, including Internet services, were completely shut down for seven days. Mobile phone operations were suspended for three months and even then only select post-paid connections were reconnected. Prepaid connections were activated only after five months. Even at the time of the research, private FM radio stations were prevented from airing news; newspapers were prohibited from publishing news deemed to be anti-state or reporting anything about the Maoist insurgency.
9. Documentation at the World Bank showed that six potential bidders were present at the pre-bid conference.
10. STM tariff structure is discussed later in the chapter.
11. NTC claims it is ready to commence the service. The commissioning of the service and the installation activities were stopped by a court order.
12. Samarajiva (2002) explains the necessity for such a cost based asymmetric interconnection regimes as follows: 'Traditionally integrated monopolies that supplied voice telephony charged for the service of call origination and offered call termination as a bundled "free" service. Because each "free" call reception was accompanied by a revenue-generating call origination elsewhere on the network, this made sense in an integrated environment. However, the economic viability of connections tended to be measured solely in terms of origination revenues. Those who do not originate many calls (a group that includes most of the poor) appear "uneconomical" though they may be generating income for the overall network through the reception of calls. This perception may be changed through regulatory design that ensures the implementation of cost-oriented interconnection based on measured compensation, as opposed to the simpler sender-keeps-all regime. Because costs are higher in geographical areas where the network is less dense, cost orientation requires that termination rates in low-density parts of the network, such as rural areas, be higher than in high-density, urban areas.
13. Ibid.
14. Internal documentation of the World Bank.
15. After the research was completed, NTA reported that on October 18, 2005, it had given a directive to operators on the new interconnection rates, but implementation is awaited.
16. STM license was granted on November 21, 2003; roll-out of 50 percent of VDCs completed by January 14, 2005.
17. STM Telecom Sanchar Inc. is a consortium consisting of (a) STM Communication Services Inc., USA, (b) STM Network Inc., USA, (c) SAMART Communication Service Co. Ltd, Thailand, and (d) Apollo Investment Private Limited, Nepal.
18. Rural Telecommunications Service (RTS) in the EDR called for installation of 1,068 PCOs in 534 VDCs spread over 28,456 sq km. Not all VDCs are in the remote inaccessible areas. In fact, 416 PCO locations, that is, 39 percent of RTS areas are in the flat land or Terai region. Just to contrast, NTC's technology distribution in EDR is as follows: wire-line 102; radio and wire-line 108; VHF 245; and VSAT 7 for a total of 464 VDCs covered.
19. Given here is a rough estimate made available to us by local experts and presented here as relevant information. However, the authors do not take responsibility for the accuracy of same. All 416 locations in the Terai region can be easily covered

by WLL technology. Even if only 10 percent of the remaining stations, that is, 65 (10 percent of 1068–416) stations are covered using WLL technology locations with an integrated technology would turn out as follows. Using the per line cost of USD 11,110 per VSAT terminal from the ongoing project and assuming a cost of USD 600 per line using WLL technology, the project cost could have come down to USD 6,810,170 which is USD 5,054,830 less than the actual subsidy awarded. If exchange cost is included this cost goes up by another USD 250,000.

Cost scenario with integrated WLL-VSAT technology (amounts in USD)

Total no. of stations	Stations using WLL	Stations using VSAT	Unit cost per station using WLL	Unit cost per station using VSAT	Total cost with WLL stations	Total cost with WLL stations	Overall cost
1,068	481	587	600	11,110	288,600	6,521,570	6,810,170

20. It should be noted that the Chairman of NTC is, at the time of writing, the Secretary to the Ministry of Information & Communications; this is a clear conflict of interest.

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9

Universal Service Obligations: To Incumbents

Payal Malik

Introduction

This chapter critically analyzes the design and implementation of the Indian Universal Service Obligation (USO) program for telecom. The purpose is to outline the anomalies of the current USO regulatory and policy regime for the provision of rural telephone subsidy and discuss the Telecom Regulatory Authority's (TRAI) proposals to ameliorate these flaws. First, it is important to assess whether the current USO scheme created the least possible distortion to an otherwise well functioning market, and second, whether it provided a level playing field for operators bidding in an auction to receive the USO subsidy. This is a major consideration in evaluating a subsidy mechanism, as the Indian economy is replete with examples of misdirected and market distorting subsidies. India cannot afford to repeat these mistakes with Information and Communication Technologies (ICTs) as well. This chapter points out that greater rural connectivity is possible because of new technologies like mobile and Voice over Internet Protocol (VoIP) telephony, but only if there is a regulatory regime that mandates open access to backbone infrastructure. This regulatory measure is a precondition for effective use of subsidies in the absence of which entry into the rural telecom markets will be constrained. Constraining entry will make universal service unattainable. It will become no more than a tool used by the incumbent to serve its narrow interests.

This chapter is organized as follows. The second part briefly documents the Indian telecom growth story after the liberalization of the sector including the key policy and regulatory developments. The third part surveys the theoretical literature on USOs including the issues of financing and disbursement. Following the documentation of design and implementation of the Indian USO scheme including the auction design, policy and related issues are discussed in the fourth part. The key issues of India's universal service program are then analyzed. Some proposals for an effective USO policy are described in the conclusion. They address the market efficiency gaps so that maximum benefits from competition and the new technologies may be exploited to achieve connectivity targets and minimize distortions caused by the subsidy mechanism. In this section some of the recommendations of TRAI on the growth of telecom services in rural India[1] are also discussed.

Performance of the Indian Telecom Sector

The telecom sector's growth has become a benchmark for other infrastructure sectors in India, which are attempting to replicate the telecom 'success' story (Figure 9.1 provides a snapshot of the regulatory and policy developments in the sector that facilitated this growth). Despite the overall achievements, many rural areas in India remain unserved by any telecom network, fixed or mobile. This is evident in the wide disparities in the rural and urban direct exchange lines (DELs). As of September 30, 2005, the total urban DELs were 34.2 million and rural DELs including Village Public Telephones (VPTs) were 13.8 million. Moreover, the overall penetration of 12 telephones per hundred inhabitants at the end of January 2006 does not reveal the huge gap between the urban and rural penetration rates of 31 and two telephones per hundred inhabitants, respectively.[2]

Most of the rural DELs installed by Bharat Sanchar Nigam Limited (BSNL), the public sector incumbent, have been funded by the government through license fee relief. Other licensees did have contractual obligations for the installation of DELs and a certain number of public phones in the villages. However, not a single operator has met this commitment. As against their commitment of establishing public phones in about 98,000 villages, they have in fact covered only about 12,000 villages. They opted instead to pay the penalty amount of INR 530 million[3] (USD 11.8 million) as specified in their contracts.

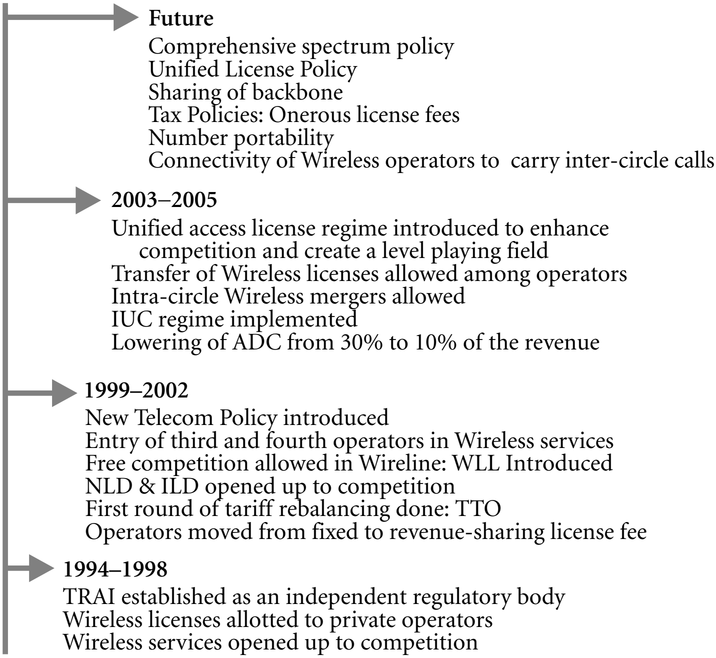

Figure 9.1
Regulatory and Policy Development of the Indian Telecom Sector

Source: Malik and de Silva, 2005.

As in many developing countries, telecom growth in India has been fueled by wireless growth. The subscriber base of 80.61 million wireless service users (as on January 31, 2006) has far outstripped the subscriber base of 49.21 million fixed service users. In the absence of empirical data on the percentage of all wireless subscribers that do not have fixed access (either at home or at work), higher subscriber base and, hence, the number of telephones per hundred inhabitants does not necessarily translate into higher access. There is no reliable data to ascertain the extent to which mobile networks are actually reaching households that do not have any access to telecommunications or are simply expanding access opportunities to households that are already part of the network. It may not be wrong to conjecture that the early mobile network expansion mostly served the already connected.[4]

While a conducive regulatory and policy environment can improve network expansion, it is recognized that rural telephony and extending telephony to the poor are subject to some forms of market failure. If the market fails on account of network externalities then there is a case to intervene in the market to serve the specific groups of people who have a low ability to pay. Provision of rural telephones and their maintenance may be expensive in many cases. The terrain is tough, demand and ability to pay is perceived to be low, and consequently, the service has to be subsidized to some extent, though demand surveys are beginning to qualify this conclusion.[5]

This chapter reviews the current subsidy mechanism for expansion of rural telephony in India, which is the Universal Service Obligation Fund (USOF), a non-lapsable fund created through a statute to finance network expansion in high-cost rural areas. Disbursements from this fund are made through competitive least-cost subsidies.

Literature on USO

There are several rationales for imposing universal service obligations. It is argued that electricity, water, and telecommunications services are necessities. Hence, purely on equity grounds these services should be readily available to all. This argument can be supplemented with the idea that poor communications is one of the principal impediments in the path of not only rapid economic growth but also development in its broader sense, including poverty alleviation. Under such circumstances USO can be seen as a special case of redistributive pricing. USO is a tool used by policy makers to redistribute these essential services through subsidized prices instead of using other redistributive fiscal measures such as taxation and direct transfers.

In that sense it is quite akin to policies of public provisioning of private goods or policies that use direct transfers to achieve redistributive goals. The basic rationale for these policies is that some essentially private goods like education, child and health care are too important, on grounds of equity, to be left to market allocation alone. Markets will exclude people with a low ability to pay, hence these services have to be provided either free of charge or at subsidized prices (Cremer et al., 1998).

More importantly, in addition to the equity objective, there may be significant positive network externalities associated with communication and an unregulated market would fail to incorporate these externalities leading to under coverage of the network. USO is then justified to correct for market failures. USO policies are, however, second-best solutions; in the absence of necessary information to implement more efficient policies, like direct transfers, policy makers opt for these policies.

Even if such market failures exist, the government should intervene only when the expected benefits of doing so outweigh the potential costs. That is, the government should try to correct a market failure only when the risks of 'government failure' are low (Crandall et al., 2004). Moreover, it is possible that the operators will inter-nalize these externalities and expand their network s*uo moto.*

Whether USO is justified on grounds of equity or efficiency, a good subsidy design will ensure that subsidies are at most on the margin. It is, for instance, not necessary to subsidize the majority of infra-marginal customers who would join the network without any inducement. In this respect, targeted programs are much better than uniform subsidies. Moreover, USOs are blunt instruments. For instance, in the Indian context, USOs are aimed at the rural customers and a USO to cover high-cost rural areas might benefit high-income rural consumers at the expense of low-income urban consumers.

Policy makers and regulators have to be careful with USOs since they tend to be used by market players to extract too many concessions. Ironically, the existence and scope of USO could also be an outcome of regulatory capture (Cremer et al., 2001).

There can be situations where the incumbent operator may pressure the policy maker to maintain a stringent USO as this may allow the incumbent operator, as the largest provider of universal service, to treat it as an instrument to seek privileges and as an anti-competitive tool. If the implementation of the USO leads to market inefficiencies, the whole purpose is undermined.

The last point is important as recent research has shown that USOs have important strategic implications and affect the way firms compete against each other. The design of the USO and its financing mechanism may alter the very nature of competition in the sector. It can affect the viability of the existing operators as well as affect entry to the industry. Thus, it is important that countries should distinguish clearly between universal availability and universal service guarantees. The former is promoted by encouraging investments and removing entry barriers.

Only universal service should be explicitly linked to possible costing and financing requirements. The European Commission in its 1999 review recognized that universal service, and in particular universal service funds, are a real cost and a form of cross-subsidization, and, therefore, should not be used unless necessary. Other than France, no other European Union member state has an explicit universal service fund. The 1999 review mentioned the possibility of abolishing the authorization of universal service funds or, conversely, establishing 'pay or play' schemes for universal service support. It also stated that the approach towards universal service should be technologically neutral, enabling any technology to be used to provide services. It is important to maintain incentives for competing networks and/or technologies to provide universal service (Hoernig and Valletti, 2002).

Competition and universal service requirements based on cross-subsidies are contradictory. Under these circumstances universal service policies gain new dimensions. First, they must be redefined to pursue the previous goals of guaranteeing a basic service in the new environment. Second, their design must explicitly address their impact on competition. One aim of the policy maker should be to devise policies that are 'competitively neutral,' that is, not influence competition and let the market determine the efficient allocation of services.

One of the commonly used methods of granting subventions is placing companies in competition through a system of reverse bids, allowing considerable savings to be made as the bidder requiring the lowest subvention is the winner.

In the light of this discussion, the universal service strategy can be envisaged as focusing on two separate 'gaps,' addressed with quite different mechanisms (Navas-Sabater, Dymond and Juntunen, 2002) and discussed in Chapter 8:

- The market efficiency gap.
- The access gap.

Issues in the Finance and Disbursement of Universal Service Funds

In the past, monopoly operators were expected to assume the costs of meeting a country's universal access objectives. These operators had to finance the delivery of essential telephone services in uneconomic regions through cross-subsidies, which were transferred from profitable market segments (for example, international, long-distance, business users, urban) to less profitable market segments (for example, domestic, local, residential users, rural). Cross-subsidies were seldom successful even under monopoly in serving universal service objectives. Their continuation in newly competitive environments created serious problems. After reforms, most countries undertook tariff rebalancing, the main component of which was the elimination of the cross-subsidies to introduce competition in potentially competitive markets such as long distance. In the absence of traditional funding sources to finance their access objectives, an increasing number of countries have turned to universal service funds to be administered in a competitively neutral and transparent manner.

Financing these funds causes distortions and regulators should try to minimize losses of allocative efficiency. Financing the cost of universal service through general taxation would cause the least distortion. The second best method, in the presence of budget constraints, is raising revenues through universal service taxes. The taxes are recovered from within the sector. Ideally, the tax should be raised from the broadest possible base in order to minimize the impact of the financial burden falling on end-users. Universal service taxes of this kind are more transparent in comparison to access surcharges as the financing of universal service is clearly separated from issues such as (marginal) cost of access and the financing of the network's fixed costs, which may affect the determination of access charges.

The choice between funding from central budgets as opposed to universal service tax also depends to a great extent on the efficiency of the tax system. Once introduced, these obligations become permanent because of the political difficulties in eliminating them; therefore, they should be small and funded out of general revenues—not through a tax on telecom services—to minimize the cost to the economy. However, tax-generated funds have competing claims and communications may not be a priority of the national governments.

There are large information asymmetries relating to the real costs and benefits of implementing rural public access telecommunications projects between the Universal Service Fund (USF) administrators and the telecom operators. Therefore, competitive bidding approaches have been used to determine the actual subsidy amount to be disbursed for each project. Competitive bidding has the advantage of reducing the total funding required to meet universal-access objectives. The actual winning bid amounts awarded in Latin American programs were generally well below the maximum subsidy amounts calculated by USF administrators. In Chile, over the period 1995–1999, the average winning subsidy was about 50 percent of the maximum subsidy offered. Similarly, in Peru, in 1999–2000, the average winning subsidy was about 25 percent of the maximum subsidy offered. In the first set of projects auctioned in Colombia in 2000, the average winning subsidy was 45 percent of the maximum subsidy offered.

One benefit of using auctions to assign USOs is that the regulator need not calculate net costing. It also provides a means of testing whether or not a net universal service cost of serving uneconomic areas exists. However, it may be difficult to have sufficient participants bidding against the incumbent (in many cases entrants would need to use alternative infrastructure or access to the incumbent's infrastructure assets), in particular if serving the areas is considered to be uneconomical (Hoernig and Valletti 2002). In practice, only operators with the wherewithal and willingness to invest in costly infrastructure in the area in question are likely to participate in the auction.

A critical precondition of the success of auctions, that they should be genuinely competitive, may be violated in practice. Another problem may be the asymmetry of information between the incumbents and new entrants, for example, concerning the costs and benefits of serving specific groups of customers. Under such circumstances an important regulatory issue is whether or not the incumbent is under any obligation to lease its infrastructure to potential universal service providers. An important precondition for these auctions to be truly competitive is that the regulator should put in place an effective access regime in place prior to the auctions. Even if it is legally and practically feasible to do so, it may still put the incumbent in an advantageous position when bidding against operators relying on transfer or lease of assets from their competitor (Cremer et al., 2001).

Universal Service Obligation in India

Universal service was one of the main objectives of the National Telecom Policy (NTP) '99. Keeping in line with NTP '99, the government sought the recommendations of TRAI on the issues relating to USO. It is important to point out here that the regulator has only recommendatory powers that the Department of Telecom (DoT) may consider in formulating or implementing the relevant policy on the issue of USO. In many instances, the policy maker, ithat is, DoT, has ignored or not fully incorporated the recommendations of TRAI. For instance, the TRAI recommendations on broadband licensing and unified licensing have not been operationalized.

TRAI defines USO in the Indian context using the following three parameters:

- Availability: Provision of telephone services whenever and wherever required even in remote and rural areas.
- Accessibility: Non-discriminatory tariff in the service area regardless of the geographic location. Non-discrimination in terms of service quality and price (imposing a uniform pricing constraint).
- Affordability: Telephone service to be priced so that it is affordable to most users.

Based on the recommendations, the Universal Service Support Policy was framed and came into force on April 1, 2002. The Policy is framed under the Indian Telegraph Act 1885 as amended by Indian Telegraph (Amendment) Act, 2004 (No. 8 of 2004) and the rules framed thereunder. On January 9, 2004, the USOF was granted a statutory non-lapsable status with the passing of the Indian Telegraph (Amendment) Act, 2004.

Universal service/access funds can differ in their management. While some funds are administered by government ministries (for example, Colombia), others are administered by regulators (for example, Peru), or by special agencies (for example, South Africa). The common perception is that funds administered by independent regulators and agencies are less likely to be influenced by government or political interests. In India, the USOF is administered as a separate administrative organization set up as an attached office of the DoT, even though options of an Independent Authority/Regulator were considered for administering the fund. The universal service fund is based on an assumption that competition among private providers will not generate service in rural areas without subsidies.

The resources for meeting the USO are generated through a Universal Service Levy (USL), which is a percentage of the revenue earned by the operators under various licenses. The USL presently is 5 percent of the Adjusted Gross Revenue earned by all the operators except pure value-added service providers like Internet service providers, voice mail, and e-mail. In addition to this, grants and loans from the Central Government from time to time may also be used to fund USOs. However, all transfers to the USOF, even of the funds raised through the USL, are through appropriation by the Parliament.

Previously, the collections from USL went to the Consolidated Fund of India. Despite operators having contributed toward the fulfillment of the universal service obligations, network expansion was slow because the funds were not released. Giving a statutory status to the USOF has expedited the disbursements, thereby effectuating the universal service policy.

By March 2005 INR 72.54 billion (almost USD 1.6 billion) had been contributed to the USOF. Table 9.1 documents the disbursement schedule till March 2005. Only 25 percent of the amount collected has been expended and an additional INR 12 billion has been pledged for 2005–2006 (41 percent has been deployed or pledged). The USOF has been successful in speedy implementation of projects from the date of its inception. TRAI has recommended a speedier disbursement of funds as USO disbursements and the Access Deficit Charge (ADC)

Table 9.1
Disbursement Schedule for the USO Funds in India

Year	Amount Collected	Amount Allocated and Disbursed
2002–2003	INR 16.53 billion (USD 367 million)	INR 3.00 billion (USD 66 million)
2003–2004	INR 21.43 billion (USD 476 million)	INR 2.00 billion (USD 44 million)
2004–2005	INR 34.58 billion (USD 768 million)	INR 13.14 billion (USD 266 million)
2005–2006	INR 35.33 billion (USD 785 million)	INR 17.67 billion (USD 392 million)
2005–2010	INR 375.41 billion* (USD 8 billion)	INR 179.36 billion (Almost USD 4 billion)

* Estimated.

requirements are linked. With smooth and early disbursement of USO funds, the amount of ADC funding required will keep going down because under the TRAI methodology the ADC funding requirement decreases as USO funding increases.

In order to disburse the collected funds, a least-cost subsidy auction mechanism has been adopted. The bidding process for the provision of rural direct household exchange lines (RDELs) in 1,685 net high cost specified short distance calling areas (SDCAs) is summarized in Appendix 3. The USOF Administrator has estimated that an additional 6.6 million rural DELs will be installed in these 1,685 SDCAs by the year 2007, which will be eligible for support from the USOF. As per the present agreement, the amount of support from USOF for the new rural DELs beyond March 31, 2005 will be around INR 110 billion (USD 2.4 billion) for the period of commitment. An additional amount of around INR 26 billion (USD 577 million) is likely to be required for the additional DELs which were installed in these SDCAs from April 2002 to March 2005. Table 9.2 provides the results of the various USO projects.

In addition, rural DELs, which had been installed prior to April 1, 2002, are being supported by the USOF. The support is the difference in TRAI prescribed rental and the actual rental, and is for the period since the ADC became effective. The amount of support from the USOF for projects other than rural DELs will be around INR 33 billion (USD 733 million) for the commitment period ranging from five years for Rural Community Phones (RCPs) and VPTs in uncovered villages to seven years for existing VPTs including Multi-Access Radio Relay (MARR) replacements. The present commitments end in 2010–2011. Besides the 6.6 million DELs in 1,685 SDCAs, additional rural DELs will be installed in the remaining SDCAs (which presently do not qualify for USOF support but will be eligible at the time of merger of the ADC and USO regimes in 2008).

Thus, including the existing 13.6 million rural DELs, the sector may not even reach the targeted four rural telephones per hundred inhabitants by the year 2010, after providing a subsidy (including VPTs) of around INR 170 billion (USD 3.7 billion). In fact, if all rural DELs installed after March 31, 2002 are to be provided USOF support so as to reach the target by 2010, then the total support amount including support for VPTs. will be around INR 250 billion (USD 5.5 billion).

Table 9.2
Status of Various USO Projects in India

Project	Implementation Dates	Comments
Operation and maintenance of VPTs[1] in the revenue villages identified as per Census 1991. Approximately 520,000 villages.	March 2003	This includes support for 9,171 VPTs installed by the six private basic service operators (BSOs) and remaining 509,775 VPTs installed by BSNL. This provides coverage of more than 90 percent of the villages where VPTs are to be provided. Firms participating in this auction bid exactly the benchmark.
Replacement of Multi Access Radio Relay (MARR) Technology. VPTs installed before April 1, 2002. 180,000 MARR VPTs.	September 2003	Since the VPTs were mainly BSNL's, the subsidy went to BSNL with a zero cost reduction. Bid exactly the benchmark.
Provision of additional rural community phones (RCPs) in areas after achieving the target of one VPT in every revenue village (2nd VPT). 46,253 RCPs.	September 30, 2004	Out of 300 Secondary Switching Areas (SSAs), BSNL was the successful bidder in 184, Reliance Infocom won 97. Competition between two service providers in only 115 SSAs. The competitive bidding has resulted in bringing down the cost of the project by about 17 percent from the reserve price
Provision of VPTs in revenue villages as per Census 1991 without any public telephone facility. Number of villages covered: 66,822	November 10, 2004	BSNL emerged successful for 12 service areas where six companies participated, BSNL had one-to-one competition with Bharti Cellular Ltd (BCL) in three service areas—Andhra Pradesh, Orissa, and Uttar Pradesh (West), comprising

(*Table 9.2 continued*)

(*Table 9.2 continued*)

Project	Implementation Dates	Comments
		6,221 VPTs. As a result of the competition in these three service areas, there was a reduction of 15–20 percent in the overall subsidy to be given for VPTs in the nine service areas BSNL was the sole bidder. Hence, BSNL emerged the winner in all the Service Areas.
Provision of RDELS in specified short distance charging areas.	March 15, 2005	The project covers 274 SSAs, competitive bidding in 215 SSAs, BSNL emerged the most successful bidder winning in 171 SSAs across 19 states, Reliance Infocom emerged the winner in 61 SSAs spread across 15 states while Tata Teleservices got the project in 42 SSAs across nine states, competitive bids have brought down the cost of the project by 60–75 percent.

Source: Collated from the economic press and interviews with USOF officials.

Note: Village Public Telephones.

Key Issues in India's Universal Service Program

Eligibility for Support

An issue which requires attention in the Indian context is whether the USOF should support individual/private rural telephones or should support be restricted to payphones. The USO policy had identified the implementation of USO into two clearly identifiable streams:

- Stream-I: Provision of Public Telecom and Information services; and
- Stream-II: Provision of household telephones in identified Net High Cost Areas (rural/remote)

While universal service is a realistic policy objective in many industrialized countries, universal access is the more practical goal in most developing countries. Universal access policies seek to increase access to telecommunications services on a shared basis such as at the community or village level. Universal access programs typically promote the installation of public payphones or public call offices in rural or remote villages or low-income urban areas with the aim of providing a basic and initial connection to the public telecom network. The Indian universal service policy has gone beyond access and has incorporated some elements of universal service by taking on the onus of providing household telephones. Rakesh Mohan, a part-time member of TRAI at the time, in a dissent, favored restricting USO to public telephones as he feared that private rural connections may go to well-off families, which did not deserve the subsidy. As discussed earlier, universal service levies are distortionary as they tax current consumers. It also has strategic implications in that the overextending of the universal support is detrimental to competition and hampers market-based solutions to problems of network extension.

Setting the Benchmark

The USF determined the benchmark for the least-cost subsidy by obtaining capital-costs data, mostly from BSNL. They were the costs for bulk procurement of the latest technology-based equipment in purchases currently under finalization and in that sense were 'forward looking.' These costs were not linked to optimal network designs based on geo-coded data specific to each service area but were based on the incumbent's norms of network design. This was quite different from what the regulator had recommended. TRAI had pointed out:

> To ensure that BSOs [basic service operators] do not over estimate the cost figures of providing an optimal VPT connection, the USF Administrator should quickly develop proxy cost model(s) to assess the most optimal cost of providing VPTs based on their location, technology employed, and distance from the nearest exchange.

Scope of USO

According to the eligibility requirements for participation in the auction, operators were required to bid either for all the eligible SDCAs in a service area or for all the eligible SDCAs in one or more of the Secondary Switching Areas (SSAs) in the circles for which they held a license for running basic/cellular/unified access services. Thus, only those operators who had the infrastructure to carry the traffic to all the SDCAs in a given SSA could participate in auctions. This policy, consciously or inadvertently, stimulated entry by only large companies by mandating a circle-wide license. This impeded the entry of small and medium entrepreneurs who might have exploited available technologies to evolve creative solutions for rural connectivity. A superior alternative policy for enhancing telecom penetration in rural areas is a 'niche operator'[6] license, which would be allocated to operators providing service only in rural areas. These operators would be allowed to connect to the nearest exchange of BSNL or of another existing BSO. They may be allowed to offer other communication services, such as cable television and Internet access.

Until recently only fixed wire line and wireless in local loop (fixed WLL) connections qualified for support from the USOF. Restricting the subsidy support to these technologies meant that bidding was not technology neutral.

In the absence of ex-ante competition, discovery of the appropriate subsidy amount through the auction may have been imperfect. The narrow, technology-centric approach followed so far has not fully exploited the advantages of a well designed auction which would reveal carriers' valuations of the USO and determine the number of USO providers endogenously.

In most Latin American cases, mandatory services were defined in a manner that allowed many different technologies to be used. Satellite, radio, cellular, and wire line technologies, some times in combination, have been employed successfully to provide services.

Restricting participation in the auction to operators already present in the SSAs favored the incumbent that was omnipresent. This condition excluded many potential bidders and thereby attenuated competition for the market. The provision of the below-cost service by the incumbent, enabled by the subsidy, will discourage new firms from entering and preclude competition in the market. The Chilean model—which has become the blueprint for subsidy auctions—allowed existing as well as new operators, subject only to minimal legal requirements, to bid.

The importance of ensuring incentives for competing networks and/or technologies to provide universal service has been overlooked in the current framework. Wireless communications are extending the limits of the marketplace and reaching out into areas unserved by the fixed network, often at a lower cost. Recently, DoT announced that it is in the process of amending the Indian Telegraph Act to extend the USOF support to cellular mobile services (both Global System of Mobile [GSM] and Code Division Multiple Access [CDMA]).[7] The government is at present giving USOF support to only fixed-line operators that offer services in rural areas. Over-specification in law is inadvisable in a rapidly evolving technology environment. Although this correction has been proposed, the previous auctions have yielded large rents for the incumbent.

In an industry characterized by rapid technological change and innovation, economic analysis of a problem should not focus too narrowly or exclusively on the best use of society's resources from the standpoint of today's technology and resource availability, that is, static economic efficiency, but should be viewed from a dynamic perspective. The government should, at the most, set basic minimum standards of service that any claimant of the fund should meet. Moreover, the proposed amendment should be flexible enough to allow emergent technologies such as Worldwide Interoperability for Microwave Access (WiMAX).

The arguments which defend this sequential approach to USOF disbursement are that the private operators by and large had reneged from their roll-out obligations by paying the contractual indemnities. Only five basic operators were functional in mid-2002. They were not yet equipped to take up a scheme of this dimension covering the whole country as it would have tied up too much of their resources. Even though the private operators had built some backbone facilities, their networks were not as widespread as that of the incumbent. Funds had started accruing in the USOF; if they remained unspent, there would be understandable criticism of the whole scheme. The target to connect every village in the country had already been pushed back several times from 1999 to March 2002 and the politically acceptable revision of the target could not go beyond March 2003.

So here was a stark choice between waiting for the market to mature so as to discover the prices through competition and going ahead with the current USO scheme, howsoever imperfect it was, so that the population in the most backward regions (equivalent of the entire population of the US) would have one slender link of connectivity to the outside world.

Issues Related to Infrastructure Sharing

The commercial, legal, and regulatory implications of the fact that the incumbent had a massive network already in place were not taken into account while designing and implementing the auction. TRAI in its consultation paper on rural telephony acknowledged the existence of a widespread fiber-optic network within the country, amounting to 670,000 route km. However, the critical questions are whether the geographical coverage is adequate, whether all of this fiber is lit and in use, and whether there is an effective, non-discriminatory, and cost-based access regime for the use of this capacity by all operators, especially the new entrants. In contradiction to this, the eligibility requirements for participating in the auction specified that the sole responsibility to set up infrastructure for providing rural household DELs in the identified SDCAs was solely that of the bidders.

Unless such a regime is in place, it is extremely difficult for operators without large subscriber bases in the rural areas to enter those markets in a cost-effective way. Indeed, if such an access regime does not exist, it may even be possible to conclude that it constitutes an anti-competitive barrier in the rural markets. Unless the fiber is actually used, this merely amounts to vanity investments by the incumbent (LIRNE*asia*, 2004).

TRAI also notes that BSNL already has 30,000 exchanges, which are connected by fiber. This implies that an average of four to five exchanges per block[8] is connected by fiber. In addition, private operators like Tata, Reliance, and Bharti have laid their own new networks. Leased-line providers like Railways, Power-Grid, and Gas Authority of India Ltd (GAIL) have also laid large optic fiber networks. Most of this capacity has not been lit. It is evident that by using the existing infrastructure, it would be possible to connect the entire country without sizeable incremental investment. Lighting a fiber optical network is only 20 percent of the costs of laying down the network. For extending backhaul to each village, wireless connectivity including Wireless Fidelity (Wi-Fi)/WiMAX or, in some cases, just tapping existing fiber could be considered.

Thus, there are enough existing resources in India to launch widespread major Internet, broadband, telephone connectivity, and e-Governance projects. However, this has to be done in the most economically viable and efficient manner. It is essential under these circumstances to have regulatory certainty on how the incumbent will be asked to share its infrastructure and the efficient way of doing the same. This is very important as there are significant costs to consumer welfare that a subsidy laden universal service program can cause.[9]

The auction would have led to minimal distortions in the market only if all the bidders had non-discriminatory open access to the essential facility, that is, the backbone infrastructure. This kind of access regime is a precondition for the existence of competitive markets across infrastructure sectors, including telecom. However, BSNL was the only operator with infrastructure in place; it foreclosed fair participation by refusing to lease out its infrastructure on cost-oriented and non-discriminatory terms. Not surprisingly, the incumbent won 75 percent of the auctions.

Issues of infrastructure sharing do not lend themselves to 'cookie cutter' solutions and the regulator indeed has to tread carefully in these matters. Many trade-offs are involved and the final solution has to keep in mind the incentive structure that regulation will produce. Our view is that it all depends on the details and on the presence of alternative infrastructures (for example, cable). In the US, mandatory unbundling did not work as they did 'too much,' so entrants could just sit on the incumbent's network. The European perspective is that some unbundling is necessary; otherwise it will never be possible to create competition. However, at some stage entrants must build their own facilities. This is sometimes referred to as the 'ladder of investments.'

Unbundling is the first step up the ladder. Unbundling should be one of the several tools within a pro-entry policy that will hopefully lead to facilities-based infrastructure competition (on either a wholesale or vertically integrated basis). Once this demand is realized and facilities based competition emerges, mandatory asymmetrical unbundling should, in theory, no longer be necessary.[10]

Precaution should be taken that unbundling should not be used to create a static incumbent-centric perpetual resale model, where everybody purchases their primary input from a single monopoly provider. Unbundling can be viewed as a two-stage process. In the first stage unbundling should be used to stimulate new alternative non-incumbent demand. In the second stage new facilities-based entry should be encouraged to serve this demand.

However, Chapter 7 shows that in many areas, especially in rural and underserved areas, demand and supply are not in line with the threshold demand essential for cost-effective new facilities. In such scenarios, different forms of policy and regulatory intervention become necessary. The study points out that even for a well-endowed entrant like Reliance, the demand in unserved areas may not justify the rollout of backbone. The appropriate policy tool for an efficient universal service program is to divert scarce subsidy funding to the creation of the new infrastructure and create reasonable access policies.

Market 'Efficiency' Gaps

The sustainability of universal service rests on removing regulatory barriers to competition, which in turn depend on a liberal and a minimalist licensing regime. Constrictive licensing creates artificial scarcity and allows the licensor to enjoy monopoly rents. The solution, as has been pointed out by TRAI, is to convert most of the licenses to authorizations. The entry of more firms is the *sine qua non* of the universal service. Though the regulator has tried to address some of the restrictive licensing issues in its recommendations to DoT on unified licensing, the policy maker is yet to announce its decisions.

Attempts have to be made to alter the structure of the industry in such a way as to make entry profitable and, therefore, viable competition more likely. One way to make entry profitable is to change the industry structure so that there is a stand-alone infrastructure company, which sells loop and other network services to all the service providers on a non-discriminatory basis in direct competition with the incumbent local exchange carrier. This will create incentives for the incumbent to divest its backbone from its access-services marketing functions voluntarily, because it will find it more efficient. It is not unreasonable to conceive an industry structure where a new entrant is not a service provider but a provider of infrastructure network elements that would, therefore, act as a competitive and ubiquitous alternative wholesale distribution company. This will create incentives for the incumbent to put its own infrastructure for third party use when under competitive pressure rather than under regulatory fiat (Naftel and Spiwak, 2000).

Another important regulatory barrier to entry is the endogenous cost of doing business on account of the onerous burden of various license fees and taxes. Ironically, a large portion of the license fee goes to fund the universal service fund (See Appendix 3, Table A3.1). Substantial portions of the gross revenue of private operators go to the universal service fund. Not only do these huge contributions impose a significant dead-weight efficiency loss on consumer welfare, but also act as a major entry deterrent, especially to small players. This discourages initiatives for rural telephony from local cooperatives and small businesses that reflect a locally based private/public demand pull model of network development.

Conclusion

The WTO reference paper on telecommunications states that:

> Any member of the WTO has the right to define the kind of universal service obligation it wishes to maintain. Such obligations will not be regarded as anti-competitive per se, provided they are administered in a transparent, non-discriminatory and competitively neutral manner

and are not more burdensome than necessary for the kind of universal service defined by the member.

Unfortunately, Indian universal service policy has been biased toward the incumbent though the approach followed in selecting the universal service provider was a transparent multi-layered reverse bidding process. The reserve or benchmark price was calculated using the cost data of the incumbent and the least quoted subsidy bidder below the reserve price became the successful universal provider of a particular service area. The competitive bid process has led to a significant lowering of the benchmark subsidy rates, bringing them down to 65–70 percent in the case of RDELs. However, there have been concerns that in the absence of network competition the incumbent has leveraged its vertically integrated status even in a transparent disbursement mechanism.

The incumbent had an edge over its competitors as it had a large amount of backbone network in place and it has been able to make entry by the new entrants into rural markets unviable even with subsidy. As noted in this chapter rural connectivity could have been seen as on opportunity and not as an obligation, if not for this structurally imbalanced situation. If the essential facility had been shared for extending access, the viability concerns of the new entrants would have been limited to access network costs. In the current design, the new entrant has to factor in the costs of laying the backbone when deciding whether or not to enter rural markets. Infrastructure sharing was not mandatory in the early years despite excess capacity in the backbone infrastructure.

This research suggests that in future the universal service policy should address access to the backbone. The advantages are twofold:

1. The costs of universal service will be lowered yielding greater coverage for the same costs.
2. Universal service will be competitively more neutral, avoiding market abuse by the incumbent.

In such a scenario universal service costs will be largely driven by the cost of access technology.

Moreover, if the access technology is not predefined, various technological options to minimize costs can be chosen. For example, it is irrational to build a circuit-switched infrastructure in India when VoIP is cheaper by at least 70 percent. Given the multifunctionality of this technology, the costs can be spread over diverse voice and data services.

It is, therefore, important that universal service is accompanied by regulation which imposes special obligations on the dominant operator and enforces compliance, which in turn will counterbalance its market power. The premise of this open-access approach is that optimal operations of IP networks dictate the separation of the transport layers (physical and logical) from the higher layers (applications and content) to create maximum growth through competition in all other layers. In order to make it possible for small-scale 'plug and play' operators to interconnect with much larger operators, open access provision is a very important regulatory intervention. Only then can local networks co-exist as infrastructure providers alongside more traditional operators. The regulator or the policy maker in India cannot ignore this logic and premise, if it is to address the problem of the digital divide effectively.

Second, certain other steps like lowering the tax burden on the operators can reduce the endogenous costs of telecom business and make rural entry a viable business opportunity. This measure will also encourage other small private-sector operators, with not so deep pockets, to provide innovative and cheap solutions for access as long as they have access to the state-owned incumbent's already-developed trunk fiber. If the state is serious about diversifying network participation then it should see that narrow ministerial considerations do not impede such regulations. Once these regulatory design elements are in place, the private sector and competition will ensure availability of affordable service.

TRAI has made progressive recommendations by shifting subsidy provisioning away from VPTs and individual phones to infrastructure. The most important recommendation is that once this infrastructure is created, then all new and existing infrastructures would be mandated to be shared on reasonable terms, with adequate incentives for sharing. This will ensure that no single operator as an owner of a large network can exploit its monopoly position. This proposed regulatory intervention is mandated by standard economic doctrine, which teaches us that sunk costs should be irrelevant for allocation decisions at the margin. After all, bygones are bygones. Moreover, there are no private property rights issues involved as BSNL is a public entity and its infrastructure essentially belongs to all citizens.

According to the TRAI recommendations, the scope of the subsidy should be expanded to include 'niche' players and not merely the large licensed players. Thus, small and medium service providers may also participate in the rural telephony market. The assumption is that once the huge sunk cost component of the infrastructure is shared, the market will take over and the urban telephony model can be replicated. This is a step in the right direction of making universal subsidy support more transparent and less distortionary. South Korea has achieved extraordinary results through public funding of backbone networks. Increasing realization that the lack of cheap long-haul capacity was stifling the provision of connectivity, especially by new entrants, led to understanding that creation and availability of backbone access was the *sine qua non* of an efficient universal service policy.

Notes

1. *Recommendations on Growth of Telecom services in rural India: The Way Forward.* Available at www.trai.gov.in
2. See also, Figure S3.1 in Introduction to Section 3.
3. USD 1 = INR 45 in March 2006, or INR 1 = USD 0.022.
4. But recent studies have shown that mobiles are going into households as a first and only phone according to research from Philippines and Sri Lanka. See for example, Carlos Salazar (2006) and Samarajiva (2006).
5. See Chapters 1, 2, and 3.
6. The concept has been introduced by TRAI, in its recommendations to the MC&IT on Unified licenses, January 13, 2005. Available at www.trai.gov.in
7. However, TRAI has made a submission to DoT that based on the WTO definition of basic services and in the presence of Unified Access Service License (UASL) providers, the Telegraph Act need not be amended to include cellular service providers as recipients of universal service subsidy.
8. A 'block' is a subdivision of a district. In the Indian federal set-up for administrative purposes, the nation is composed of states and each state is divided into administrative sub-units: districts and then blocks; a block is further subdivided into towns for urban areas and villages for rural areas.
9. TRAI has recently recommended that Universal Service Fund disbursements be used for building infrastructure. In addition, it has made a very progressive recommendation that all newly constructed and already existing infrastructure be shared on open and non-discriminatory terms.

10. From a transaction cost perspective, a more efficient alternative would be to impose mandatory divestiture of the incumbent's loop plant from its marketing arm, rather than imposing stringent price, conduct, and structural regulation on the incumbent for infrastructure sharing. This option may however be politically difficult.

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10

Access Deficit Tax?

Harsha de Silva

Introduction

This chapter continues the universal service discussion begun in the previous chapter. Whereas Malik considered the design and implementation of a universal service fund, this chapter addresses an explicit regulatory intervention intended to support universal service in India: the Access Deficit Charge (ADC). It seeks to identify the key generalizable principles emerging from a critical analysis of the Indian experience.

The ADC is an amount given to an operator to compensate for the difference between the actual cost of providing a particular service and the mandated lower tariff for providing the service to a class of subscribers, usually rural. Even though theoretically defensible, implementations of ADC programs have proved problematic. Several countries have tried out ADCs at different stages of their telecom development process, but few have persisted, with most either discontinuing ADCs or amalgamating them with other less market distortionary programs.

Most of this chapter deals with the Indian experience of ADC, a controversial program that has been criticized for its bias towards the incumbent. We consider its rationale and analyze if, and to what extent, the initial objectives have been met. The analysis lays bare several inconsistencies between the original intention and implementation. Starting from the calculation of ADC, which was too complex for practical application, the chapter identifies a series of weaknesses in India's ADC implementation, indicating that ADC, at least in its Indian form, is not the most appropriate tool to achieve the universal service objectives. But it is conceded that the Indian ADC implementation perhaps has provided some 'affordability benefits' to a certain population segment (Moonesinghe et al., 2007). The technology bias of the Indian scheme made the ADC a means to tax private operators to subsidize the incumbent and precluded the emergence of 'local' innovative technology in rural areas while distorting the market.

Starting with a fundamentally irrational base decision, the Telecom Regulatory Authority of India (TRAI) tried to design a workable ADC, and things could have been much worse if a different organization, which was less consultative and had less expertise, tried it. Given the benefits a better structured intervention could bring to the rural population, a radical restructuring of ADC is proposed. Since this research was disseminated in multiple forms (inter alia to the TRAI), several of the recommendations have already been implemented.

The second part of this chapter examines the background of the Indian ADC and how it was structured. Then its implementation and the issues faced are discussed. Thereafter, the many dynamic changes the ADC went through are documented and suggestions for improvement are proffered. Finally, the key generalizable principles are presented.

Background on ADC and its Indian Incarnation

While there are a number of definitions of access deficit in telecom, it generally refers to the difference between the actual cost of providing a given telecom service and the mandated lower tariff for providing that service to a class of subscribers (Intven, 2000).

Traditionally, this deficit was internalized. Monopoly providers used cross-subsidies between profitable urban or long distance segments and unprofitable rural segments (due to the mandated, lower-than-cost-tariffs) to offset revenue differentials between the two. However, the opening up of markets to private sector participation resulted in significant reductions in long distance revenues to former monopolies, reducing the margins available to cross-subsidize access deficits.

The Indian case was no different. Given the evolving competitive market structure, TRAI amended the Interconnection Usage Charge (IUC) regime for origination, transit and termination in January 2003. The ADC was included in the origination and termination usage charges and was made payable to all basic service operators (BSOs) with the intention of keeping the rental and local calls affordable both in rural and urban areas.

The challenge was to determine a per-minute ADC. How much should it be? How should it be calculated? In the absence of actual cost data, TRAI used a proxy model to arrive at an amount. However, the incumbent Bharat Sanchar Nigam Limited (BSNL) protested, saying it should be much higher. Thereafter TRAI used BSNL data along with their detailed submissions to revise the calculations.

Based on these calculations, TRAI proposed that INR 249-259 per month per direct exchange line (DEL) be recovered through ADC. Based on the above, the per minute ADC was calculated to be INR 1.00 for local calls and INR 1.00 plus the carriage charge for long distance calls. But given tariff ceilings on local calls of INR 0.80, INR 1.00, or INR 1.20 per local pulse of two minutes duration, the portion of access deficit not covered by the local calls had to be recovered from long distance calls. Therefore distance categories were set as the following: up to 50 km, 50 to 200 km, 200 to 500 km, beyond 500 km, and international long distance calls. Accordingly, TRAI specified that for all BSOs, fixed line calls, either at one or both ends of the call, would attract ADC. However, TRAI noted that the absence of inter-carrier charge billing systems may cause difficulties in implementing the stipulated settlements. Therefore, in the interim period, it provided for two alternative models; one gave uniform ADC for inter-circle calls above 50 km and the other a differential ADC based on distance.[1]

The result was a set of ADCs based on type of originating technology, type of terminating technology, on whether the calls were inter or intra-circle, and the distance band. The final ADC amount within India ranged from either zero, INR 0.50, INR 1.25, or INR 2.00 per minute. ADC for incoming and outgoing international long distance calls were set at INR 5.00 per minute.

Based on the above calculation, the total amount of funds to be paid to fixed line BSOs through the ADC regime was estimated to be INR 130,000 million per year. This amounted to an extraordinarily high 30 percent of total revenue of the telecom sector at the time. Was such a high ADC sustainable?

Any design of ADC should be simple, transparent, justifiable, and most importantly distortion-free. The original Indian design lacked almost all of the above elements.

Implementation of ADC

As the implementation commenced, it became obvious that a non-level playing field had been created by bringing in complex and confusing calculations to determine multiple ADC amounts based on technology and distance. The problem was exacerbated by the use of unsubstantiated historical cost data from the incumbent.

In any case, TRAI pushed ahead with implementation. But the fixed-line tariffs submitted for approval by the incumbent BSNL showed that they were below the levels required to cover the IUC plus ADC amounts, that is, they were in effect below the costs embodied in the ADC regime. Even though this was the case, TRAI was 'forced' (in their own words) to accept these lower tariffs of the incumbent on the grounds that the proposed below-cost prices were necessary to survive in business, and hence were not predatory. Consequently, other BSOs also had to reduce tariffs to below-cost levels, thus, necessitating a re-examination of the entire regime.

Table 10.1 provides a comparison of the IUC plus ADC charges set by TRAI and the actual applied tariffs in the case of intra-circle tariffs.

Implementation did not proceed as smoothly as planned; instead it created a number of negative consequences for competition. In effect, the ADC was a mere levy on emerging private operators to prop up the fixed-line incumbent who was finding it difficult to compete in the market. In attempting to safeguard the fixed-line incumbent, the ADC created a fixed wire line bubble that would have burst unless continuously supported by ADC (or some other subsidy).

Implementation Solutions

TRAI was now in a difficult position with criticisms being leveled at them from industry as well as user groups. Facing the criticisms in a constructive manner, they considered how the mistakes could be rectified.

Table 10.1
Actual vs. Applied Tariffs for Intra-circle Calls in India

Comparison of Tariffs and IUC plus ADC Charges as Applicable under the IUC Regulation of January 2003

	(Intra-circle)							
	>500 km		200–500 km		50–200 km		0–50 km	
	IUC + ADC under Uniform ADC Regime	Applied Tariffs	IUC + ADC under Uniform ADC Regime	Applied Tariffs	IUC + ADC under Uniform ADC Regime	Applied Tariffs	IUC + ADC under Uniform ADC Regime	Applied Tariffs
F–F	5.10	2.40	4.75	2.40	2.45	1.20/2.40	0.70	0.40
F–W	3.60	2.40	3.25	2.40	1.95	1.20/2.40	0.95	0.80
F–C	1.20	2.40	1.20	2.40	1.20	2.40	1.20	2.40
W–F	3.50	2.40	3.15	2.40	1.85	1.20/2.40	0.85	0.80
W–W	2.00	2.40	1.65	2.40	1.35	1.20/2.40	1.10	0.40
W–C	1.00	2.40	1.00	2.40	1.00	2.40	1.00	2.40
C–F	1.20	1.80	1.20	1.80	1.20	1.80	1.20	1.80
C–W	1.00	1.80	1.00	1.80	1.00	1.80	1.00	1.80
C–C	0.80	1.40	0.80	1.40	0.80	1.40	0.80	1.40

Source: TRAI (2003f).

F: Fixed or WLL-F Wireless Local Loop (Fixed); W: WLL-M (WLL Mobile); C: Cellular

ADC Calculations should be Forward Looking, not Historical

Industry suggested that instead of relying on historical cost data, TRAI should conduct its analysis based on Forward Looking Long Run Incremental Costs (FLLRIC), taking account of new, costeffective technologies.

TRAI agreed that the calculation should be based on FLLRIC, but ruled that it would not be wise to shift from historical costs abruptly. The argument was that BSNL had provided the bulk of rural services and supported low-paying subscribers. TRAI was of the view that with BSNL deploying new technology and lower-cost equipment, parts of the existing high-cost network would be gradually replaced by such equipment reducing the need for high ADCs. It decided to continue with historical pricing, but be current, as much as possible, in the prices and obtain costs from other BSOs as well.

While acknowledging the difficulties in implementing an FLLRIC regime, it is evident that TRAI's decision was biased towards protecting the interests of the incumbent. It did not promote competition using emerging technology.

ADC Calculations should be Adjusted for Various Concessions Granted by the Government to BSNL

Considering the reimbursement of various license fees and other concessions granted to BSNL by the government, TRAI admitted the error and made several changes in the calculations. These revisions alone caused the estimated access deficit to be revised downwards dramatically to around 10 to 12 percent of the sector revenue from the original 30 percent.

Mahanagar Telephone Nigam Limited and Private BSOs should not be Given ADC in Light of Their Presence in Urban Areas and Unmet Roll-out Obligations

TRAI concluded that a number of BSOs, including Mahanagar Telephone Nigam Limited (MTNL, the government-owned incumbent in the major metropolitan areas of Mumbai and Delhi) continue to incur some access deficits, but that they were much smaller than the amounts calculated using their own cost data. TRAI also noted that many BSOs had not met their roll-out obligations, particularly for village public telephones (VPTs). TRAI observed that most of the rural DELs were provided by BSNL, which also provided connections to a relatively large number of low-paying users. It also pointed out that, in general, in other countries ADC is paid only to the incumbent and not to newcomers.

TRAI decided to implement a limited form of the IUC regime for non-BSNL BSOs, that is, they would retain the relevant ADCs for calls originating from them. The ADC that was to be collected at termination by fixed-line BSOs other than BSNL was, hence, removed.

ADC Base is too Small: Capture ADC from All Calls from Everyone

Given the large amounts of ADC to be recovered from long distance minutes involving fixed lines, the ADC per minute on fixed wire-line calls had to be large since the number of such minutes was a small proportion of the total minutes used (estimated at 22 percent).

Cellular and Wireless in Local Loop with Limited Mobility (WLL-M) service providers lowering tariffs for long distance calls reduced the demand for long-distance calls using fixed lines, which in turn would have meant a further increase in ADC per minute if collected only for fixed-line long-distance minutes. Therefore, the purpose of prescribing ADC to compensate BSOs for providing affordable service was in fact being defeated.

Hence, TRAI decided to apply ADC to all access providers barring intra-circle WLL-M and cellular calls, thus making the base larger. This ruling meant that it was immaterial whether one used BSNL services at all to originate, carry or terminate a call within (or outside) India; an ADC had to be paid to the incumbent on every call made except for WLL-M and cellular intra-circle calls.

ADC Funding should not be Permanent

The industry felt that with rapid changes in technology and reduction in equipment costs, the amount of funding required for ADC would decline.

TRAI agreed. It observed that over time it may be possible to do away with the ADC regime by merging it with the Universal Service Obligation (USO) regime. The implicit argument was that ADC was a kind of 'infant industry subsidy' being paid to the incumbent through a tax on its competition which would be removed when it was ready to compete in the open market. The issue, however, was whether the incumbent had not already recouped the historical costs through 50 years of monopoly.

Uniform and Differential ADC Schemes too Complicated to Implement

ADC calculation depended on distance in one scheme, and was independent of distance in the other. With the choice of scheme left to individual operators, a chaos ensued when operators in the same circle started adopting different schemes. Industry representatives argued that this difference was being misused by national long distance (NLD) operators to terminate cellular to fixed inter-circle long distance calls through points of interconnection with other cellular networks in terminating circles, depriving the BSOs of termination charges.

The two methods of calculating ADC were replaced by the escalating-by-distance methodology.

Review Possible Reduction in the Amount of ADC for International Long Distance Calls to Address Grey Traffic

The industry argued that the INR 5 ADC for incoming international traffic was too high and created incentives to bypass it.

TRAI reduced the ADC on international long distance (ILD) to INR 4.25 per minute, with further decreases promised over time.

BSNL Felt Discriminated by Common ADC to All Fixed Operators

BSNL argued that the ADC of private BSO was only INR 174 per month per DEL, whereas the ADC of BSNL was around INR 269 per month per DEL and it was unfair to provide non-BSNL basic fixed-line operators the higher BSNL figure.

TRAI revised the original IUC (and ADC) regime in October 2003, as depicted in Table 10.2.

Having made substantial revisions to the ADC regime, TRAI assured that it would soon review both the quantum and the beneficiaries of the ADC regime. TRAI suggested that it may consider funding ADC, based on a percentage of the annual revenues of operators, and that the ADC may be merged with the USO regime in three to five years.

By the revisions, TRAI agreed that the earlier formulation was detrimental to the very service provider it sought to protect (BSNL). In the earlier regime, 92 percent of the ADC revenues were being contributed by BSOs (primarily BSNL) and the ADC as a percentage of their revenues was about 40 percent. Instead of helping BSOs, particularly BSNL, the earlier regime could have driven them out of business.[2] These revisions were implemented in February 2004.

Growth Momentum

While ADC was being debated, the Indian subscriber base was steadily expanding. However, as seen in Figure S3.1, the number of urban telephones per hundred inhabitants (fixed plus mobile) was 14 by end 2003 (at the time these revisions took place); the rural areas hardly saw any growth, moving from 1.2 at end 2002 to just 1.5 at end 2003. Most future growth was seen as coming from mobile, the sector that was being taxed by ADC to fund the fixed sector, which was not projected to grow rapidly.

Further Problems and Solutions

While urban and mobile growth were accelerating relative to rural and fixed line growth, the February 2004 implementation of the revised ADC regime ran in to trouble at the outset.

TRAI observed that only 'very few' settlements had taken place. It appeared that most operators had not raised relevant invoices and their call patterns seemed suspicious; some showed no ILD calls at all. The data reconciliation problem had been exacerbated because of BSNL's failure to complete its billing system upgrade on schedule.

After two attempts to improve the calculation, including extensive consultations, TRAI had learnt its lesson. It stated that 'experience

Table 10.2
Revised Indian ADC Regime (2003)

Access Deficit Charges (in Rs per minute)	Local	Intra-circle Calls		Inter-circle Calls			ILD
	Local	0–50 km	>50 km	0–50 km	50–200 km	>200 km	ILD
Fixed–Fixed	0.00	0.00	0.30	0.30	0.50	0.80	
Fixed–WLL(M)	0.30	0.30	0.30	0.30	0.50	0.80	4.25
Fixed–Cellular	0.30	0.30	0.30	0.30	0.50	0.80	
WLL(M)–Fixed	0.30	0.30	0.30	0.30	0.50	0.80	
WLL(M)–WLL(M)	0.00	0.00	0.00	0.30	0.50	0.80	4.25
WLL(M)–Cellular	0.00	0.00	0.00	0.30	0.50	0.80	
Cellular–Fixed	0.30	0.30	0.30	0.30	0.50	0.80	
Cellular–WLL(M)	0.00	0.00	0.00	0.30	0.50	0.80	4.25
Cellular–Cellular	0.00	0.00	0.00	0.30	0.50	0.80	

Source: TRAI, 2003f.

suggests that it would be useful to evolve a simpler method of collecting ADC which does not involve distance-based and call-based ADC, and may also be subject to easier verification.'

TRAI proposed an interim regime from October 2004 to September 2005 based on revenue-sharing. However, the industry was unwilling to accept it. A number of stakeholders, primarily BSNL, opposed it on the grounds that it would increase rentals and local call charges. The argument was that the proposed ADC revenue-share regime would involve an additional imposition over and above the existing license-fee revenue share. This additional increase in rental and local call charges was shown to take place because the revenue share would not compensate for the existing asymmetrically high ADC contribution levied on ILD and NLD traffic.

In this background, TRAI once again revised the ADC to include the following salient features:

- Continue with a per minute ADC, but at a much reduced rate: with the number of minutes available for funding ADC increasing because of higher-than-anticipated subscriber growth, the required ADC amount could be collected with a lower charge per minute. Note, however, that this increase was driven by more minutes originating from cellular phones.
- Maintain the total ADC amount at the level notified in October 2003 for both BSNL and other fixed-line operators.
- The ADC regime simplified for domestic long distance calls by applying one figure to all calls.

TRAI had to grapple with the ADC to be levied across the board versus the ADC on ILD, given the competing objectives of reducing domestic call charges, reducing or eliminating grey market ILD calls, and ensuring that the benefits do not flow to foreign carriers and consumers at the cost of domestic consumers and operators. The assessment was based on the premise that for funding a given ADC, any reduction in the per-minute ADC charge on ILD calls would require an increase in the ADC on domestic calls. Likewise, any increase in per-minute ADC on ILD calls would result in a lower ADC on domestic calls. TRAI selected what it called an 'appropriate balance'; while specifying the new ADC with higher priority given the objective of reducing domestic tariffs to meet domestic consumer interest, and spurring sustained growth with supplementary measures (monitoring and penalty) to address the grey-market problem.

These changes resulted in a uniform ADC of INR 0.30 per minute for all calls across the nation (with the continued exception of intra-circle WLL-M/cellular to WLL-M/cellular), as depicted in Table 10.3.

Under the new ADC regime, all operators had to collect the now lower INR 0.30 ADC (with the intra-circle WLL-M/cellular to WLL-M/cellular exception) and pass it on to BSNL. Non-BSNL fixed BSOs were allowed to retain originating ADC as before.

With this reduction of ADC, primarily on international calls by 41 percent and on long distance calls by 61 percent, mobile subscriber bills on international calls fell by 11 to 24 percent while long distance call rates fell by 16 to 27 percent. Immediately after the announcement, BSNL claimed that it would incur a loss of about INR 12,500 million annually (calculated as INR 3,000 million from outgoing international traffic, INR 1,700 million on incoming calls, and INR 7,800 million from the reduction of ADC on long distance calls).

TRAI's objective of protecting the incumbent in the transition was achieved with a lower per-minute ADC, but a larger volume, given the massive increase in minutes, primarily from cellular.

Final Consultation

The final consultation, inter alia, dealt with the justification of ADC on rural and urban fixed wireless lines, the applicability of ADC to non-BSNL fixed line operators, and a revenue-share methodology for ADC prior to unification with the universal service obligation fund.

Should ADC be Applied only to Rural Wire-lines?

From the beginning of the ADC regime, TRAI did not consider ADCs a 'rural subsidy' and the deficit was calculated as an average of all fixed lines in both urban and rural areas.

Table 10.4 illustrates the role played by BSNL in the provision of rural fixed lines in rural India (as at end September 2004).

TRAI noted that in the context of ADC the rural versus urban distinction was less meaningful than the implications of the network's distribution of urban/rural lines in terms of costs and revenues. Also,

Table 10.3
Further Revised Indian ADC Regime (2003)

	Local	Intra-circle Calls		Inter-circle Calls					ILD		ILD	
	Local	0–50 km	>50 km	0–50 km	50–200 km		>200 km		Outgoing		Incoming	
ADC (in Rs per minute)	Prevailing & New	Prevailing & New	Prevailing & New	Prevailing & New	Pre-vailing	New	Pre-vailing	New	Pre-vailing	New	Pre-vailing	New
Fixed–Fixed	0.00	0.00	0.30	0.30	0.50	0.30	0.80	0.30				
Fixed–WLL(M)	0.30	0.30	0.30	0 30	0.50	0.30	0.80	0.30	4.25	2.50	4.25	3.25
Fixed–Cellular	0.30	0.30	0.30	0.30	0.50	0.30	0.80	0.30				
WLL(M)–Fixed	0.30	0.30	0.30	0.30	0.50	0.30	0.80	0.30				
WLL(M)–WLL(M)	0.00	0.00	0.00	0 30	0.50	0.30	0.80	0.30	4.25	2.50	4.25	3.25
WLL(M)–Cellular	0.00	0.00	0.00	0 30	0.50	0.30	0.80	0.30				
Cellular–Fixed	0.30	0.30	0.30	0.30	0.50	0.30	0.80	0.30				
Cellular–WLL(M)	0.00	0.00	0.00	0.30	0.50	0.30	0.80	0.30	4 25	2.50	4.25	3.25
Cellular–Cellular	0.00	0.00	0.00	0 30	0.50	0.30	0.80	0.30				

Source: TRAI, January 6, 2005.

Table 10.4
Provision of Rural Fixed Lines in India by Operator and Technology

Percentage Distribution of FWT Lines in the Total Fixed Subscriber Base of Fixed Operators and Percentage of Rural Lines in Total Fixed Lines Provided by Fixed Operators as on September 30, 2004

Service Provider	Name at the Circle/Service Area	% of Fixed Wireless Lines in Operator's Fixed Lines	% of Rural lines in Operator's Fixed Subscriber Lines
BSNL	All India (except Delhi and Mumbai)	2.60	35.20
MTNL	Delhi and Mumbai	1.09	0.00
Bharti	Delhi, Madhya Pradesh, Tamil Nadu, Karnataka, Haryana, Chennai	3.46	0.08
Tata	Maharashtra, Mumbai, Andhra Pradesh, Tamil Nadu, Chennai, Karnataka, Delhi, Gujarat	77.39	0.23
Shyam	Rajasthan	18.49	3.37
HFCL	Punjab	24.53	0.45
Reliance	All circles except Assam and North East	97.27	0.66
Total		7.70	26.93

Source: TRAI, 2005b.

the complexity in obtaining and authenticating data for calculating cost-based rural ADC, particularly with respect to non-BSNL operators, was a major practical problem, given that investments were lumpy and not necessarily clearly demarcated as urban or rural.

Why should Operators other than BSNL not Receive ADC?

TRAI was of the view that access deficit compensation 'did not arise out of any legal right but out of consideration of smoothening the transition process during competition, that is, providing support during the transition period, when costs of access are not fully recovered from the revenues from access line monthly rentals under the existing tariff regime due to competition in the market and other factors'.

TRAI calculations indicated that considering the total areas of operation, the access deficits of non-BSNL fixed line operators were much lower than BSNL's, if not zero.

Why should WLL-F be Treated Similarly to Fixed Wire-line?
For ADC purposes, calls to and from WLL-F (Wireless Local Loop-Fixed) had always been treated the same as calls to and from fixed lines. In fact, fixed wireless lines had become the primary method of expansion of the non-BSNL fixed line operators, as seen in Table 10.4. But, the question had arisen whether WLL-F could be equated to fixed because WLL-F deployment was similar to mobile services.

TRAI accepted that the access deficit of WLL-F was negligible and that misuse in terms of physical movement of WLL-F phones was taking place. But given the inability to distinguish calls originating from fixed lines and WLL-F, it concluded that the regime should be maintained until the technical problem was solved. In the meantime, TRAI directed that WLL-F phones be locked (to a particular section of the base station) to limit physical movement of the phone.

Should a Revenue-share Scheme be Introduced to Calculate ADC?
Another recurring issue was the shift to an ADC regime based on revenue share. Here, a crucial factor was the large transition that would be required if the ADC amount per minute for international calls was computed as a revenue share. TRAI was, correctly, of the opinion that the transition would be easier if the corresponding per-minute amount was lower and could be distributed more easily over a larger base of minutes and revenues. This would become possible as the increased subscriber base would generate a larger number of minutes-yielding ADCs, even as the ADC rate decreased. Thus, the 'large transition' could be avoided.

Unresolved Issues with ADC

The ADC, even after repeated revisions, continued to be conceptually complicated, discriminatory, technologically biased, and opaquely calculated. Some issues that require remedial action are discussed here.

ADC has a Specific Objective that does not Include Any 'Rural Obligations'

The government and TRAI are on record that ADC is required to make basic telecom services affordable to the common man. Some in the industry have interpreted this at different times to be a 'subsidy' required to provide access to rural and remote areas of the country where revenues do not cover the cost of providing such services because rentals are fixed by the regulator at levels below cost.

From November 5, 2003, urban tariffs were forborne by the regulator, that is, are not regulated. Thus, *ipso facto*, ADC was perceived as compensation for below-cost tariffs in rural areas. Moreover, given that urban tariffs for basic services had been left to market forces, TRAI should not have allowed urban fixed lines to attract ADC.

But ADC had a far broader rationale; to give the incumbent sufficient time to recoup its stranded costs. Otherwise, a substitution of technologies may have occurred, penalizing the incumbent for its previous choice of copper for the local loop. It would also drive up demand for scarce spectrum, improperly priced, and therefore, difficult to manage properly.

The objective of ADC must be made very clear as not including a rural obligation. It has a rural bias because the access deficit is higher in rural areas because of affordability constraints and regulated below-cost tariffs. Also, it must be made clear that ADC is based on the overall access deficit.

BSNL is Provided ADC for High Historical Costs, so other Fixed Line Operators do not Qualify for ADC

If the access deficit is defined for fixed lines, a strong case is made for providing ADC support regardless of whether the service provider is BSNL or not. However, TRAI contends that ADC is there to smoothen the transition to competition for BSNL.

The counter argument is that BSNL was created out of the Department of Telecom (DoT) after enjoying decades of monopoly profits and that the transition to a competitive market should by now be complete. For DoT's provision of services in rural areas prior to 1995–1996, private operators cannot be penalized.

TRAI contends, however, that BSNL does not have any accounts for the period when it was a unit of DoT and that it can be assumed that BSNL did not earn monopoly rent that would have covered its large and costly rural roll-out obligations. However, this argument is suspect because the outcomes, not only of universal service, but of roll-out in general were poor as evidenced by long waiting lists. Also, it is widely believed that the incumbent is burdened by large organizational inefficiencies which are being subsidized by ADC.

The Existing ADC Regime Reduces Incentives for Lower-cost Technology Solutions in the Rural Areas

The continuation of ADC in the current format also needs to be reconsidered because of its technology bias. BSNL has, for a long time, provided rural services using wire-line technology. However, the cost of providing the same service using wireless technology is lower, as is being observed by non-BSNL operators. Even though BSNL was free to deploy new wireless technology after private operators were allowed to adopt WLL as an access technology in 1998, it did not do so in a significant manner, as shown in Table 10.4.

But, ironically, ADC is calculated based on the historical cost of providing the more expensive fixed wire-line services. The question then is whether TRAI should penalize operators for deploying latest technologies vis-à-vis BSNL's choice of older and more expensive technology. The present mechanism compels private operators to compensate BSNL for its 'wrong' choice of technology. Some stakeholders go as far as to argue that BSNL should refund the ADC for all DELs it added after October 2000. If BSNL were to increase deployment of wireless technology, the costs that need to be supported by the ADC would diminish.

The present ADC regime stifles the introduction of lower-cost technology by new operators in rural areas where market driven lower tariffs may not provide sufficient revenue to make such solutions viable on top of ADC to be paid to BSNL for their high-cost and subsidized solutions. In effect, the present ADC regime precludes the emergence of niche networks using innovative technologies in rural and remote areas.

Is the Argument Supporting ADC for Basic, Stand-alone Services Valid?

Many in the industry argue that internationally accepted pre-requisites for establishing an ADC regime have not been satisfied in India: the service must be stand-alone, the tariff must be fixed by the regulator, and revenue from the service must be below costs.

Whether the service provided by BSNL is a stand-alone product or a part of a bundle of other services—such as long distance, international and value-added services—is questionable. In fact, it is alleged that BSNL is using common infrastructure for its fixed and mobile services in remote and rural areas, thereby spreading the capital expenditure and revenue recovery over a wider range of services. This provides BSNL with an advantage over its competitors.

But at a broader level, the question is why only basic services? At the time ADC was initiated (2002–2003), basic telecom service providers who had cross-subsidized rural low revenue areas from high long distance tariffs, were no longer able to do so because of eroding margins in the long distance segment. The ADC was designed to cover the gap between tariff and costs. The emphasis on basic service operators was because the number of fixed-line subscribers far exceeded the mobile subscribers at that time, and the available forecasts showed dominance by the incumbent basic service operators (BSNL and MTNL) for the next few years. However, circumstances have changed. The growth of fixed and mobile subscribers during 2004–2005 in comparison to earlier years is shown in Table 10.5.

The number of mobile subscribers exceeded the number of fixed subscribers by end 2004, weakening the rationale for placing an emphasis on basic telecom services.

Therefore, there may be merit in eliminating the bias towards fixed wire-line access services. However, this would reorient the ADC objective from that of protecting BSNL to network development in rural areas.

Table 10.5
Growth in Indian Fixed and Mobile Subscriptions

Service	March 2003 (millions)	March 2004 (millions)	March 2005 (millions)	Percentage Growth 2004–2005
Fixed including WLL-F	41.48	42.58	45.9	8
Mobile including WLL-M (CDMA + GSM)	13.00	33.58	52.17	55
Total	54.48	76.16	98.08	29

Source: TRAI Press Release, Growth in Telecom Services 2004–2005.

Does the ADC Regime Encourage Parallel Markets?

Many experts feel that the ADC on international calls should continue on a per-minute basis until the overall ADC requirement declines significantly. However, this requires the policing of bypass. The main problem with the ADC scheme is that it rewards those who can evade its pricing and payment rules. Rapid technological development and convergence have made prohibitions of some types of bypass of ADC regulations unenforceable. ADCs will encourage the use of technologies that do not have to pay ADCs or pay ADCs for only one part of the service, such as can occur when a mix of packet and switched technologies are used. The use of VSAT, private networks, call-back, and possibly off-peak transmission over cellular and fiber infrastructure owned or leased by mobile operators, are other examples of ways the rules can be, and are, avoided.

ADC Needs Greater Calculation Transparency

BSNL continues to argue that many errors have been committed in calculating ADCs payable to BSNL and that compensation is due. This amount is said to be some INR 64,650 million which is in addition to the arrears due to BSNL of approximately INR 110,000 million, because their billing systems could not accurately identify ADC-eligible calls.

Related to this point is the transparency of calculating the ADC. There have been complaints that TRAI has been unwilling to share data and methods. Responses to the consultation paper point out that under the Act, TRAI is required to ensure transparency while exercising its powers and discharging its functions. They point out that having issued the Access to Information Regulations in March 2005, which upholds the rights of all stakeholders to have access to the information obtained or received by the TRAI, the Authority has not been forthcoming with certain information, referring to the VSNL vs. TRAI vide Appeal No. 5 of 2005 decision of 28.4.2005.

Private operators further argue that with BSNL being the beneficiary of the subsidy, it should face scrutiny and justify the quantum being claimed, more so because it is a fully state-owned enterprise.

Difficult to Implement

Implementation of the ADC regime continues to be onerous. Having started in December 2001 and having issued the first order in May 2003, the implementation was revised and re-implemented in February 2004 (delayed from December 2003), and again in February 2005. But, as of mid-2005, the implementation problems continue.

Way Forward with ADC

While conceding that BSNL has been and continues to be the principal provider of telecom services to rural users of India, it has been established that the current ADC regime provides an undue competitive advantage to BSNL and subsidizes inefficient technology at the expense of its competitors.

To meet the objectives of the Government of India and TRAI, the simplest solution would be to merge the ADC and the existing USO on simple, technology-neutral, revenue-sharing principles. Disbursements from the combined fund could be made to compensate for mandated 'below cost' services being provided by any operator in any location (depending on where tariff ceilings are in place).

Conclusion

This chapter sought to critically analyze the Indian experience, provide recommendations for Indian regulation and identify generalizable principles for adoption of ADC elsewhere.

The analysis suggests that, notwithstanding the many explanations TRAI has provided to industry, India's ADC appears to be a politically-motivated tax levied on private operators to protect the incumbent, its employees and its copper-wire access network during a very long transition to competition. Based on this irrational foundation, TRAI has tried to design a workable ADC. The results would have been much worse if a different organization, which was less consultative and had less expertise, had tried it. Through repeated consultations and revisions, TRAI succeeded in grinding away at the most pernicious parts of the scheme.

ADCs have sustained BSNL's high cost operations, not due solely to its high-cost access network that TRAI refers to, but also due to its bloated staff and inefficient processes. The reason why ADCs have not more seriously harmed private operators has little to do with TRAI's purported safeguards. The damage has been minimized because the massive growth in the mobile sector generated a large volume of minutes which allowed a reduction in the ADC rate.

ADCs appear to have created a fixed wire-line bubble that would burst unless continuously supported by ADC or some other form of subsidy. But such subsidies cannot be sustained for long without distorting the entire market. What happens when the ADC is phased out completely? If BSNL has then 'grown up' to face a competitive market, well and good; if not, does it mean that taxes extracted from private operators to keep BSNL afloat were a complete waste?

The following generalizable principles emerge from the discussion in this chapter.

Clearly Articulate the Objective of ADC

If the implementation of an ADC is being considered, the objectives of such a program must be clearly articulated and industry buy-in obtained. In the Indian case, the ADC was and continues to be considered as a politically motivated tax levied on private operators to keep the incumbent afloat. This has created an environment of animosity, which is harmful to progress.

Ensure that the ADC Design does not Distort the Market, and does not Penalize Efficient Technology and Reward Inefficient Technology

Any ADC should not end up distorting the existing and potential market by penalizing the use of innovative, low-cost technology to serve rural communities; the very places the ADC is intended to serve. Calculating the ADC based on the historical cost of providing expensive fixed wire-line services gives this result.

ADC Calculations should be Kept Simple

For an ADC regime to succeed, its calculations must be kept simple. When the calculation is complex, practical problems of implementation multiply. Complexity also creates opportunities for evasion of payment, which has a corrosive effect on the entire sector.

ADC Calculations should be Justifiable and Transparent

One of the important lessons from the Indian case is that it does not pay to use accounts of only one player in the market when there are multiple players. Any ADC calculation should be based on justifiable cost figures and must be transparent.

Do not Introduce an ADC if its Objectives can be Met by an Existing Program

The most important generalizable principle is that countries need not introduce ADC if the objectives of such program can be met otherwise, particularly by a universal service obligation or fund. There is little value in multiple programs attempting to meet the same general objective; in fact, they can work at cross purposes. In the Indian case, the simplest approach would be to merge the ADC with the existing USO on a simple, technology-neutral, revenue-share basis.

Notes

1. India has 21 telecom circles. Intra-circle means calls within a circle and inter-circle means calls between circles.
2. TRAI notification, October 29, 2003, p. 73.

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Section 4
What Could be…

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Introduction

The preceding sections presented rich evidence on different aspects of connectivity assembled by a team of researchers bouncing ideas among each other and with policy makers, regulators, and operators. Some of the evidence has already been incorporated in policy, for instance, the reduction of Indonesian leased-line prices by 50 percent and the inclusion of mobile operators among the potential beneficiaries of Indian Universal Service Obligation funds.

The team hopes that their research will be read by other scholars and cited in literature. But even more, they hope that their ideas will be used to improve policy and regulation in the Asia-Pacific and elsewhere; they hope that this book will contribute to the advancement of LIRNE*asia*'s mission 'to improve the lives of the people of the Asia Pacific by facilitating their use of information and communication technologies; by catalyzing the reform of the laws, policies and regulations to enable those uses; and by building Asia-Pacific-based human capacity through research, training, consulting and advocacy.'

It was thought that responses by three professionals approaching the subject from three widely different vantage points would add greater value to the reading experience than a lengthy summary and conclusion from the team itself. LIRNE*asia* is known for having a viewpoint, but not necessarily one viewpoint. Yet, on the whole, those who are part of the LIRNE*asia* team tend to share a greater skepticism of the capabilities and good intentions of governments and place greater weight on the value of broader participation in solving the problems of connectivity. The objective of LIRNE*asia* is to challenge the ossified orthodoxies that have held back the realization of human potential in the Asia-Pacific, not to build another orthodoxy. It was thought that the considered responses of 'outsiders' who did not necessarily share the core values of LIRNE*asia* would sharpen the debates and enhance the value of the book for readers. Of course, by the time the book was completed, the outsiders had become valued colleagues.

This section begins with a lengthy engagement with the research presented in the book by Mahinda Herath, the General Manager of Regulatory Affairs at Sri Lanka Telecom Limited, the Sri Lankan incumbent controlling 78 percent of the fixed market, acting as the third-place attacker in the mobile market, and dominating the data market. Understandably, Herath does not agree with many of the conclusions drawn by the researchers. But the disagreements are not very deep. For example, he defends the Indian policy makers for limiting access to universal service funds to fixed operators, essentially the Indian incumbent. But he does not disagree with the recent decision to include mobile operators within the scope of universal service disbursements.

Rajendra Singh, former Secretary of the Telecommunications Regulatory Authority of India, assisted by Siddhartha Raja of the University of Illinois at Urbana-Champaign in the USA provides a focused reflection on the challenges facing regulators as they seek to serve the next billion, in his engagement with the ideas presented in the book, especially the findings on what teleusers at the BOP want. This reflective practitioner sees users as participants in the innovation process, co-inventing the products and services of the ICT industry. Singh sees the enormous dynamism introduced into the system by the broadening of participation in the design, production, and consumption of ICT products and services by liberalization as liberating, despite the fact that it makes his job so much harder to do than in the good/bad old days when a customer could have any telephone he/she liked in the same standard black and at the same standard price.

The literal last words come from Visoot Phongsathorn, Deputy Director of the Thai-German Programme for Enterprise Competitiveness' Business and Financial Services Component: 'Solutions may lie in unexpected places. Let markets lead you there.' Phongsathorn is an outsider to telecom; the closest intersections between his world and the subject matter of this book being in driving reforms of public utilities within the Thai government and in an abiding interest in transactions and transaction-costs, both in theory as well as in practise. He advocates with Singh the importance of policy and regulatory humility: regulators' main tasks are to let telecom markets move forward with as many unpredictable results as the people outside government are willing to allow. Phongsathorn has a high tolerance for unpredictability, a necessary outcome of the minimally structured decentralized decision-making processes he so passionately promotes.

That, possibly, is what this whole enterprise is about: decentralized decision-making processes enabled by the lowering of barriers to participation in the business of co-innovating the ways in which we connect with other human beings. And for what end? To participate more fully, and unpredictably, in society, the polity and the economy.

11

High AMPU from Low ARPU

MAHINDA B. HERATH

INTRODUCTION

Telecom operators around the world have long considered serving low-income markets as risky. Achieving profitability on the back of low-average revenue per user (ARPU) customers was considered nearly impossible, resulting in the gap between urban and rural areas widening progressively. With the reluctance of established players to roll-out rural networks, policy makers were compelled to encourage such roll-out through subsidies packaged in various forms. Critical analysis and debate on subsidy schemes seek continued refinement of such schemes, so that the intended beneficiaries can be served, not only efficiently, but also effectively and transparently.

The world's poor have been benefiting from micro-financing schemes for more than three decades, in very diverse cultures and economies. Quite naturally, telecom related micro-finance schemes aimed at providing access and services to the rural masses have evolved, especially in Africa, the Indian subcontinent, and Latin America. The Grameen Village Phone in Bangladesh and its adaptations in Uganda, the Communication for Empowerment (CoE) project in Brazil (Pontes, 2003), community owned networks in Peru, and the n-Logue business model in India are some examples for such operations. Most of these operations are based on franchise business models and multi-stakeholder partnerships (MSPs), with access to services facilitated through micro-finance. These operations served as an eye opener to some telecom companies (henceforth telcos) in realizing that there is money to be made at the bottom of the pyramid (BOP).

Today, ARPU is a widely accepted metric for measuring the success of a telco. Over the past decade, the industry has expressed dismay at declining ARPUs. Part of this dismay stems from the assumption that declining ARPU will lead to declining profits. However, the successes achieved by Grameenphone type franchise operations and some telcos in low-ARPU climates have punctured this correlation.

The focus has now shifted from ARPU to AMPU (average margin per user). AMPU is the difference between the revenue generated by a user and the cost of serving that user. AMPU can be either negative or positive and, therefore, low-ARPU need not preclude a positive AMPU. Greater the AMPU, the greater the profit and the enhancement of shareholder value.

Analysts and strategists who seek to develop high-AMPU business models that work in low-ARPU climates need a sophisticated understanding of the essential drivers and enablers that can make their models successful in tapping the riches at the BOP, including:

- A deeper understanding of customer behavior in low-income markets; to meet demand-side expectations and economic considerations, including affordability and ownership issues.
- Major cost factors that affect AMPU, in particular, those that operators can control.
- Key technological enablers and cost-efficient technology solutions.
- Transferable lessons from proven 'low-ARPU' business models.
- Regulatory reforms and preconditions conducive to growth and economic benefits to the society, including taxation and subsidization.

The research presented in this book sheds much light on the drivers and enablers from a regional perspective, and will be useful to analysts and strategists designing business models that work in low-ARPU climates. Lack of research findings based on regional data and applications have always posed a challenge to regional telcos in the past, as their extrapolated business models, adopted from the developed world, have often fallen short.

Demand-side Expectations in Low-income Markets

In developing low-ARPU business models, a sophisticated understanding of customer behavior in low-income markets is essential. For telcos the basic unit of analysis is the customer. Telcos need to determine whether or not current and prospective customers add value. The key to understanding customer economics, especially in low-ARPU climates, is to disaggregate customer behavior to identify the leading indicators of customer value that ultimately drive shareholder value. Christensen and Raynor (2003, pp. 74–75) argue that 'the functional, emotional, and social dimensions of the jobs that customers need to get done constitute the circumstances in which they buy'. Unfortunately, many telcos use aggregated metrics to measure customer value, although such measures do not always get to the real reason a customer 'hires' the service.

What Do Users at the BOP Want?

The 'micro' analytical approach adopted in the study reported in Section 1 could serve as a further step towards disaggregating and understanding customer behavior in low-ARPU markets. The researchers seek to shed more light on 'functional, emotional, and social dimensions' associated with 'hiring' telecommunication services by users at the BOP.

The study represents people who earn less than US dollars (USD) 100 per month in 11 localities in India and Sri Lanka. Random purposeful sampling has been used to select a limited number of households within larger purposeful samples of priori heterogeneous localities, and Kish grid techniques have been used to select respondents to ensure against age and gender biases. As explained by Patton (1990), while random purposeful sampling adds credibility to a sample, when the potential purposeful sample is larger than one can handle, the technique is not recommended for generalizations or representativeness. In fact, the researchers state 'that admitted that the data does not represent India and Sri Lanka as wholes, only the "financially constrained" within the enumerated localities'.

The researchers have further stated that the issues of consistency and replicability will be addressed in the new study while a control group consisting of the financially 'unconstrained' will also be studied, in order to make more robust comparisons. Accordingly, while awaiting more representative and replicable findings from the new study, analysts and strategists could draw inferences from the present findings to develop business models for low-ARPU environments.

The research yielded a number of thought provoking findings. The finding that 99.7 percent of Sri Lankans and 88 percent of the Indians at the BOP approached for the research had used a telephone during the previous three months is startling and challenges the conventional inferences drawn from the metric 'teledensity' (the number of telephones per one hundred inhabitants). Amongst the BOP users that have been sampled, almost two thirds (58 percent) do not own the phone that they use. Additionally, 31 percent of fixed owners and 7 percent of mobile users allow non-family members to use their phones. These findings challenge the conventional metrics for telecom access.

The above set of findings has implications for telcos, given that one connection serves more than one user's needs. The inadequacy of the number of telephones per hundred inhabitants as the sole basis for forecasting potential service usage in a low-ARPU climate is amply demonstrated here. Other metrics like average MOU (minutes of use) per subscriber require attention.

The finding that phone ownership doubles as income moves from the 'below USD 50' to 'USD 50 to 100' segment seems to corroborate the contention of Nokia (2003) that halving the total cost of ownership (TCO) is the key to doubling the penetration and quite naturally opens up for discussion the issues related to TCO, and specifically, the cost of handsets—considered by many mobile operators to be the major barrier in serving low income groups.

Mobile handsets for low-income segments should satisfy three major expectations: affordability, usability, and widespread availability. Handset makers and the GSMA have been working on getting the cost down below USD 30 to help enough potential users overcome the 'handset barrier'. To that end the GSMA, through their Emerging Markets Handset (EMH) initiative, contracted Motorola to develop an 'ultra-low cost' mobile handset. Motorola has got the price down to less than USD 30 during 2006.

The EMH initiative rests on generating economies of scale for the low-cost handset supplier, through assured high volume purchases. In the initial phase, nine operators joined the collective tender process: AIS (Thailand), Bharti (India), Maxis (Malaysia), Globe and Smart (the Philippines), Telenor (Bangladesh, Pakistan, Kazakhstan, Russia, Ukraine), Turkcell (Turkey), Orascom (Africa, Middle East, Bangladesh, Pakistan), and GSMA board sponsor SingTel (Singapore). Each of the operators committed to purchase at least 500,000 handsets, thereby assuring sale of 6 million handsets in the first six months. In the second phase of the EMH initiative, GSMA allowed any GSM operator in an emerging market to participate. Mobile operators in developing countries have already bought or ordered more than 12 million mobile phones through the initiative. The operators involved in the second phase are: AIS, Bharti, BPL, Globe Telecom, Hutchison Essar, IDEA Cellular, MTN Group, Orascom Telecom, Telenor, and Vodacom. This ultra-low cost segment will potentially include 1.5 billion people (GSMA, 2005).

The usability expectations of such ultra-low cost handsets include functionality, power consumption and device longevity. Trade-offs in terms of handset design and functionality are unavoidable. Some argue that features such as color screens, built in cameras, and additional applications like WAP and MP3 are superfluous in emerging markets. On the other hand, others doubt whether such no-frills phones would be accepted even by 'financially constrained' users. They argue that a handset is an 'aspirational' item for the target user. Somewhat relatedly, the present study has established that 'symbolic' factors (such as 'fashion' or 'improved social status') feature in the user's choice, especially among newer adaptors. However, all agree that features such as a rugged exterior, strong radio frequency reception, and extended battery life are essential in such handsets.

The above requirements compel manufacturers to take a different approach to issues such as battery life and alternative power sources, especially in areas with unreliable electricity supply. Motorola's C115—the handset designed for phase 1 of GSMA's EMH initiative, for instance, is said to have a two and a half week standby time and eight hours of talk time—the longest in the world at the moment.

Widespread availability is the other requirement to lower the 'handset barrier'. Issues like operator-led distribution versus grey markets, as well as availability of recycled, refurbished or second-hand handsets, are important. Though the present study does not venture deeply into these aspects, the finding that 33 percent of Indian respondents used second-hand handsets indicates the potential of recycled, refurbished or second-hand handsets. The comparatively low use of second-hand handsets among the Sri Lankan respondents suggests further investigation of regulatory and/or trade barriers and logistic capabilities.

Supplying ultra-low cost handsets is not enough. Users must be able to afford the service. What is important is the TCO—which includes both handset and service costs. PMN Publications (2005), a UK-based research and consultancy firm specializing in mobile telecoms industry, states that 'realistic' monthly ARPU may be as low as USD 5 to 6 in emerging markets but even at these ARPU levels, the cost of buying a USD 40 mobile telephone and paying for wireless service in the first year would represent about 23.6 percent of per capita GNI in the 'low income' countries (as designated by the World Bank), 7.2 percent in 'lower middle income', and 5.5 percent in 'middle income' markets. However, there is a danger of viewing these figures from a first-world viewpoint, where the mobile handset is a very personal device, and to argue that it may not be economic to provide individual mobile services at the BOP. A wide range of alternative options for making mobile telephony available through group purchasing and micro-loans have been tried out successfully in countries like Bangladesh (discussed in Chapter 5), India, the Philippines, and Uganda.

Furthermore, while fixed and public-access users perceived the cost of telecom services to be affordable, the majority of mobile users perceived the cost to be either 'high', 'very high', or 'extremely high', especially amongst respondents in the Sri Lankan samples. Only 23 percent of mobile users have found mobiles to be affordable, compared to 56 percent and 59 percent of fixed and public access users, respectively. This sends a clear signal, especially to mobile operators, that they should develop calling plans responsive to these wishes. In India, for example, rates have plummeted to as low as Indian Rupee 1 (US cents 2.2) per minute for long-distance calls ('OneIndia' Tariff plan).

Wireless, especially cellular mobile, is the preferred technology in deploying network infrastructure in new growth markets because of the low level of initial investment, scalability, relatively simple technical deployment, low-cost, open standards, and the adaptability to both voice and data. However, a majority of mobile users at the BOP perceive the cost of mobile access to be high. Nevertheless, users are still willing to spend a considerable amount of their incomes on telecom services, even when they find the cost of these services to be high (64 percent of 'financially constrained' mobile users at the BOP spent at least USD 4 per month on mobile communication, which is at least 4 percent of heir monthly income).

The willingness to spend considerable amounts on mobile communications, in spite of the perception that mobile communication is costly, stems from convenience factors rather than limitations in access to other modes. Of the mobile users surveyed, only 24 percent have stated that the reason for using mobile communication was because they had no other choice. In fact they have cited convenience factors such as 'ability to access at any time' (71 percent), mobility (63 percent), and ease of use (61 percent) as the reasons for choosing mobile communications.

Knowledge that the 'financially constrained' are not driven solely by price but give considerable importance to convenience indicates that there could be a market for some premium services in such segments, provided the services add value.

In tailoring calling plans, whether basic or premium, telcos need to understand the applications that those at the BOP look for. The research shows that relationship maintenance is a priority. Such use includes keeping in touch with friends and family as well as sending news and messages. What is striking is that instrumental use is low, except for a small percentage who make business transactions and enquiries on the phone. However, the reasoning of the researchers that 'what the respondent broadly categorizes as "keeping in touch" might well have instrumental aspects also' due to 'a significant barter economy in existence at this level of society' may not be the only contributory factor towards the 'close to non-existent' instrumental use. Non-availability of applications and content and the lack of consumer education could be another major reason. Therefore, telcos, while promoting packages aimed at social usage, should also develop applications and content aimed at instrumental uses aspired to by the 'financially constrained'.

The research has estimated that the share of income spent on telecoms by the 'financially constrained' is in the range of 1–4 percent for fixed access users and 4–8 percent for mobile access users. The share of income spent on telecom services by the 'financially constrained' is far higher than the 2–3 percent rule-of-thumb generally used in developed countries and compares well with the 10 percent figure suggested in other contemporary research studies. This is good news for telcos as ARPUs amongst the 'financially constrained' may even reach USD 8 to 10 per month. The ARPU may increase further, should the telecom services provided to the 'financially constrained' result in improving their well-being and uplifting their spending capacities over time—as recent research (Ureta, 2005) has shown that expenditure on communications has a positive elasticity when a country moves from 'least developed' to the 'medium developed' status.

Strategies on a Shoestring

The 2005 study reveals that teleusers at the BOP are constrained in strategic use of telecom services. A majority of the 'financially constrained' have access to a phone for a limited period of time during the day and at specific places, thereby denying them the freedom to choose the kind of a phone/access mode to use and the freedom to 'mix and match' modes.

Table 11.1 recaps on the strategies available for users to manage their telecom expenditure and adoptability of such strategies by 'financially constrained' users, together with some observations of the author. This summary table would be a useful guide to telcos in the region, for targeting the low-ARPU market of 'financially constrained' users.

Apart from the accessibility limitation, the other reason that has been given for low use of 'strategies' by the 'financially constrained' is their low level of use of telecom services. The researchers point out that many, or all, of the few calls that the 'financially constrained' make are non-discretionary or unavoidable, thereby preventing them from being 'strategic' in their use. However, even among the 'financially constrained', the 'heavier' users are more 'strategic' than the 'lighter' users. Therefore, since expenditure on communications has a positive elasticity as income gradually increases up to certain levels (Ureta, 2005), one could expect to see the 'financially constrained' users becoming more 'strategic' as their income increases over time.

Access for All: Key Enablers, Effective Solutions

Connecting the 'financially constrained' and keeping them connected largely depends on the ability of telcos to develop and implement

Table 11.1
Adoptability of Available Strategies at the BOP

<table>
<tr><th>Strategy</th><th>Adoptability by the ‘Financially Constrained’</th></tr>
<tr><td>Avoid investment in a phone and instead use one’s neighbor’s facility or a Public Call Office (PCO).</td><td>Study reveals that 58 percent of ‘financially constrained’ sampled do not own the phone they use. However, it is unclear as to whether this is a ‘long-term’ strategy intentionally adopted by the ‘financially constrained’ or merely an outcome of their constrained finances.</td></tr>
<tr><td>Keeping calls short; terminating the call if a certain charge or time is exceeded.</td><td>There appears to be concern for keeping calls short by 21 percent and 17 percent of fixed and mobile respondents, respectively. They disconnect their phones if a certain amount of call charge or time is exceeded.</td></tr>
<tr><td>Use of calling rate differentials between ‘peak’ and ‘off-peak’ time bands/days to save on communication expenditure.</td><td>Use of this strategy by the ‘financially constrained’ appears to be very low, mainly due to access limitations of both the caller and the called party.
<table>
<tr><th>Users who….</th><th>Fixed Users</th><th>Mobile Users</th></tr>
<tr><td>…do not make their calls on any special day (for example, weekends or public holidays).</td><td>81 percent</td><td>73 percent</td></tr>
<tr><td>… do not make their calls at any special time of day.</td><td>77 percent</td><td>58 percent</td></tr>
</table></td></tr>
<tr><td>‘Multiple modes’ strategy—creative use of differential rates or options available across different modes of access (fixed, mobile, etc.), to minimize expenditure.</td><td>A majority of the ‘financially constrained’ do not own a telephone and therefore do not have the freedom to choose the access mode. In fact, only 31 percent of those sampled in the LIRNEasia study had access to multiple modes.</td></tr>
</table>

(*Table 11.1 continued*)

(*Table 11.1 continued*)

Strategy	Adoptability by the 'Financially Constrained'
Use of prepaid services to reduce entry barriers (initial investment/deposits, proof of creditworthiness, lengthy paper work, waiting time for connection, etc.) and to control expenditure within a predetermined budget.	Eighty-three percent of mobile users studied were using prepaid mobile connections. Fifty-seven percent of these prepaid mobile users had cited 'immediate connection' and 37 percent 'easier to obtain' as the reasons for their choice.
Use of low value top-ups of any desired amount (USD 1 or less, but above a threshold), rather than a fixed denomination determined by the value of a card.	Although it has been suggested that this is a facility which could help 'financially constrained' users, the surprising finding is that a majority of respondents tend to purchase charge cards of values higher than USD 2 (or even USD 5) and many of them maintained 'plenty' of credit in their prepaid balances. The findings suggest that the choice of prepaid packages may not be driven by the ability to pay up-front for the connection, but perhaps other reasons, such as the convenience of being able to get connected relatively easier, without having to produce proof of one's place of residence, etc.
Creative use of the technical features of mobile communications, for example, CLI, the ability to 'beep' and call back, 'missed call culture' (where the number of times the phone is made to ring has a specific meaning) and SMS—to reduce costs and/or to transfer them to their higher income relatives, such that they can have access without incurring much expenditure.	The BOP survey does not reveal significant occurrences of such phenomena. Even in Sri Lanka, where a Receiving Party Pays (RPP) regime is in force, evidence of such creative use is insignificant. However, the study reveals that of the SMS users, that is, 40 percent of mobile users in Sri Lanka, 88 percent use the service as a means to 'minimize communication expenditure' (non-familiarity with the Roman script amongst the 'financially constrained' is found to be relevant).

In an RPP regime (as in Sri Lanka), switch-off mobiles to avoid incoming calls and associated costs. (To use the phone more like a calling device rather than a calling and receiving device.)	Of the mobile owners studied, 43 percent stated that they switch their mobiles off at certain times, with no significant differences between the corresponding percentages of respondents in Sri Lanka (RPP regime) and India (CPP regime). More interestingly, the study reveals that this strategy is mostly used to conserve the battery power or to avoid being disturbed, rather than to minimize cost (less than 30 percent of owners stated cost as a reason).

Source: Author, Chapters 1 and 2.

high-AMPU business models that work in low-ARPU environments. In this context, it is necessary to identify the major cost factors, especially those which operators can control.

Key Technological Enablers and Cost-effective Solutions

Demand density and distance from the center are the two key parameters that need to be considered in determining the access technology suitable for serving a particular locality or community, as shown by Figure 11.1, adapted from a presentation by Intelecon Research & Consultancy Ltd. (2002).

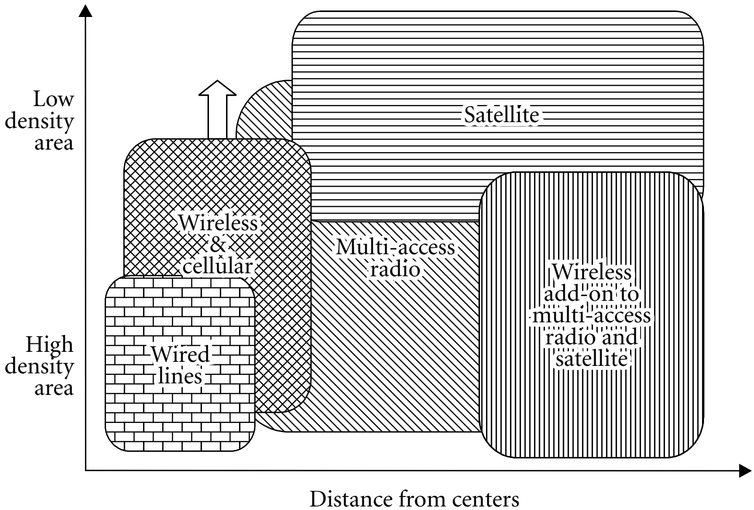

Figure 11.1
Access Technologies

Source: Author, adapted from Intelecon Research & Consultancy, 2002.

Wireless, especially cellular mobile, is the preferred technology in new growth markets. The key to keeping the BOP connected profitably (or achieving positive AMPU) is to reduce network costs.

Achieving the right balance between customer needs and network costs is essential in developing high-AMPU business models. As correctly highlighted by the Boston Consulting Group (2001):

Network design requires weighing the cost of functionality and new features against the value they provide to customers. Network engineers typically push for the most advanced technology available, while marketing departments want the best possible service. All too often, this dynamic leads to expensive solutions with far too many bells and whistles. Telcos need to make sure that the features they invest in are the ones that customers see as important—and thus worth paying for.

Technology at Work in Developing Countries: Patchwork Adoptions, Innovative Adaptations

Although there are effective technological solutions to control costs, the economic, social, technological, and regulatory circumstances in many developing countries hinder their deployment.

The result has been uneven adoption of technologies, leading to the coexistence of obsolete and state-of-the-art technologies, as against the normal smooth S-curve. This phenomenon of 'patchwork adoption of technology' (Garcia-Murillo, 2003) is evident not only in Latin America but in Africa and Asia. The resulting inefficiencies preclude achievement of least cost solutions.

Wi-Fi

Indonesia perhaps presents the most intriguing example of technology deployment in the context of patchwork adoption and innovative adaptation. The adoption of the relatively new technology Wi-Fi in conjunction with the conventional PSTN and leased line based services along with the innovative 'local' adaptations employed to condition the Wi-Fi technology, make the Indonesian experience unique. The findings on Wi-Fi 'innovations' in Indonesia in Chapter 6 make interesting reading not only for policy makers but also for telcos who strive to serve the BOP profitably.

As much as Mauritius and Macedonia, the first two countries in the world to offer nationwide wireless Internet access (with Singapore likely to join in the near future), the Indonesian case justifies recognition—not only for the extent of Wi-Fi coverage but also for the manner in which it has overcome numerous barriers.

The explanation that scarcity of infrastructure (the last mile and backbone) triggered the 'innovations' in Indonesia is acceptable. However, the argument that absence of regulations to unbundle the local loop and reluctance of incumbent and/or monopoly operators to invest (in order to safeguard their monopolistic profits) could cause such scarcities may not necessarily hold in many a developing country. In fact, this is a common misconception among some policy makers, and is conceived through undue reliance on solutions designed to address specific scenarios in developed countries. Unlike in the developed world where last mile infrastructure is abundantly available for unbundling, the problem in the developing world is the scarcity of last mile infrastructure and inability (not reluctance) of incumbent operators to make adequate investments for infrastructure development.

It is common knowledge that many government-owned incumbent monopolies have to contribute all their earnings to the government and receive only a fraction of it back for reinvestment. Of course, one could argue that the government-controlled monopoly operator and the government are one and the same. However, in reality, the investment priorities and objectives of the government and the operator are distinct and separate. Even when such markets have been opened for competition with government-owned incumbents partially or fully privatized, 'blanket' application of asymmetrical regulation by regulators in some developing countries (supposedly 'to level the playing field' for new entrants) have effectively inhibited the incumbents from investing in infrastructure in a commercially prudent manner. For instance, attempts by Sri Lanka Telecom (the partially privatized incumbent of Sri Lanka) to deploy CDMA technology (to lower its access costs) were not allowed by the regulator for seven years, ensuring that its competitors entered the CDMA market first. Such policies may have been adopted to offer competitive advantage to the new entrants, as it is known that emerging technologies offer competitive advantages to new entrants over the incumbents (Clemons, Croson and Weber, 1996). On the other end of the scale, some policies have prevented new entrants from investing in infrastructure, as shown in Chapter 5.

Another question that arises is whether Local Loop Unbundling (LLU) can be 'the' solution to promote competition in emerging telecommunication markets? The problem in the developing world is not unbundling the local loop but 'building' more local loops. In fact, Spiwak (1999) states that 'if telecoms regulators truly want restructuring to work, then they must view unbundling in the correct context. Remember, what we don't need are more "competitors" or "choices" per se—what we need are more loops'. He further points out that 'as long as regulators do absolutely nothing to expand the already extremely constrained market for local loop facilities, then consumers will suffer in the long-run with the current "static, incumbent-centric perpetual resale model", because neither the incumbents nor new entrants will have any incentive to invest in new plant'. Another practical reality in the developing world is the status of their copper networks on the ground. A fair share of these are not in the condition to carry higher bandwidth technologies as ADSL2+ or a multiplicity of services over realistic distances, making LLU irrelevant to broadband applications.

Chapter 6 sends out three forceful messages to policy makers wishing to promote cost effective Information and Communication Technologh (ICT) roll-out in developing countries: liberate 2.4 and 5.8 GHz bands to facilitate Wi-Fi deployment, authorize infrastructure development by new entrants through facility-based licensing and reduce international-bandwidth and domestic leased-line costs.

Perhaps the most important message is that Wi-Fi deployment can be commercially viable and sustainable with private investment. This is good news for telcos developing innovative and profitable business models to serve the BOP. Of course, the Indonesian experience is not directly applicable in other developing countries as violations of regulations like the use of unauthorized frequency bands and unauthorized resale, etc., could be risky. Furthermore, the role played by the civil society in insulating such activists against crackdowns by authorities may be unique to Indonesia. However, if policy makers could remove the bottlenecks identified in Chapter 6, telcos could 'fine tune' the Indonesian business model to serve the BOP profitably.

Increasing Internet Adoption in Indonesia

Chapters 4 and 6 show that the progress made in the ICT sector in Indonesia is 'largely due to the untiring efforts of the Indonesian civil society'. The dynamics of the civil society's influence on ICT sector development is captured in the following schematic (Figure 11.2). This figure has been prepared by combining the schematic flows presented in Chapter 4 and a presentation by a co-author of the chapter.

Figure 11.2 depicts a structured model that could be used for ICT development elsewhere.

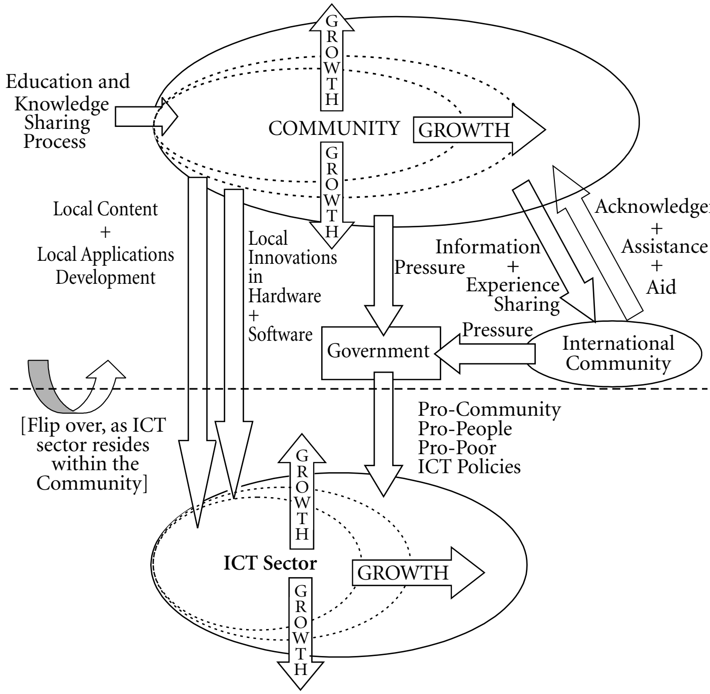

Figure 11.2
ICT Sector Development in Indonesia—the Dynamics of Civil Society Influence

Source: Adapted from Chapter 4 and http://sandbox.bellanet.org/~onno/ (Retrieved on September 4, 2006).

The key question that would then arise in relation to the Indonesian model is, 'Why does the Indonesian civil society appear to be more influential and effective than its counterparts in other developing countries?' The answer, as seen in Figure 11.2, is the effectiveness of ICT-related knowledge sharing processes in Indonesia. In fact, Purbo, in an interview with IDRC, insists that the major barrier is the education process:

> The barrier [is] actually not the tool. The barrier would be the education process: To educate the society to share the knowledge within the society, to encourage the society to produce their knowledge in local languages. That's a major barrier. So, it's not the tool, it's not the money, it's not the funding…. Of course, the government also creates some sort of barrier in the public regulation. [Governments] need to liberalize the

regulation to enable…low cost Internet access.[1] Dr. Purbo's method [of educating the community] is twofold; communicate with people through public speaking, articles, and books; and educate others to do the same.[2]

Lessons from Proven 'Low-ARPU' Business Models

Grameenphone type franchise operators as well as some 'regular' telcos have succeeded in achieving profitability with low-ARPU customers. At the 3GSM World Congress (February 2005), Bharti Tele-Ventures of India revealed that it was running profitable mobile operations on a monthly prepaid ARPU of USD 5. (During the quarter ended December 2004, Bharti Cellular had achieved Earnings Before Interest, Taxes, Depreciation, and Amortization [EBITDA] margins of 36.4 percent.) It was also reported that their business model would work with a monthly ARPU as low as USD 3.

For the first six months of 2004, Smart, a mobile operator in the Philippines, reported an EBITDA margin of 69 percent on an average prepaid monthly ARPU of USD 7. In Sri Lanka, the mobile operator Dialog Telekom posted a 54 percent EBITDA margin for the first nine months of 2005 on a blended monthly ARPU of USD 7 and an average prepaid monthly ARPU of USD 4 (nearly 80 percent of its customer base is prepaid).

The saturation of demand in urban areas has fueled interest in developing business models that could work in low-ARPU environments and tap the riches at the BOP. Suppliers and vendors of network equipment and handsets too have joined the bandwagon, seeking to keep their long-term business opportunities alive.

Learning from Grameen

Chapter 5 uses the conceptual framework of Transaction Cost Economics (TCE) and argues that it is 'a model of transaction cost minimization that has tremendous appeal in the context of the low-trust/credibility conditions that are often prevalent in countries with weak laws and governance capacities'. While attributing the success of the Grameen solution to its 'in-house' transaction cost minimization model (where all parts of the process remain within the Grameen 'family'), the chapter argues that technology plays a lesser role compared to the ability to understand the market and the associated transaction costs. These conclusions give rise to several queries regarding the Grameen solution and its replicability.

1. Can production cost be ignored in critically analyzing and learning from the Grameen model?

   Though the total cost of a firm is made up of both production and transaction costs, in the classical microeconomic modeling it was assumed that transaction cost was zero. However, empirical evidence in the US has shown that the transaction cost could even exceed 50 percent of the total cost (especially in the case of private sector).[3] With the emergence of TCE, both production and transaction costs are considered equally important. Therefore, viewing the Grameen model only in the context of transaction cost minimization, while ignoring the inherent production costs, would not ensure that any solution modeled on Grameen would deliver the optimum AMPU. In fact, a major criticism of the Grameenphone (GP) service is its high tariffs (Amin, Amin and Hussain, 2004) and inefficiencies in the utilization of technology. GP's use of cellular technology for fixed phone centers is neither efficient nor competitive over the long run (if not for the cross subsidy from urban users) and is more expensive than the fixed wireless local loop (WLL) systems used by its competitors (Cohen, 2001).
2. Can the success of the Grameen solution be attributed solely to 'in-house' cost minimization?

   In devising its solution, Grameen Bank (GB) formed two entities: Grameen Telecom (GTC), a wholly-owned non-profit organization to provide telephone services in rural areas, and Grameenphone Limited, a for-profit entity that provided a national GSM cellular service (in partnership with US, Norwegian, and Japanese companies) (Cohen, 2001). The 'in-house' model has enabled GP to minimize several transaction-cost components related to billing, collection and credit control (including creditworthiness assessment), but it is doubtful whether the resulting transactional cost savings could allow the rate discount of 50 percent currently enjoyed by GTC. Village Phone Operators (VPOs) account for only 3.85 percent of the subscriber base of GP, whereas the rest of the subscribers are mostly in urban areas. GP can discount the rate charged to GTC for a phone call, through cross-subsidy. In fact, analysts[4] have pointed out that 'Grameen Telecom's village phone venture as structured in

Bangladesh would not be feasible without access to the credit and bill collection services provided by Grameen Bank and the infrastructure and urban network provided by Grameenphone.' They further point out that:

> Village phones would be far less successful if GP were not able to discount by 50 percent the rate charged to GTC for a phone call, an underlying subsidy made possible by a transfer of profits from the more profitable urban part of the business to the rural sector—and a significant advantage unavailable to rural-only competitors. (Cohen, 2001)

This is a contention that is not rejected by the author of Chapter 5.

Regulation: To Stifle or Enable?

The challenge of expanding telecom networks to reach the whole population needs to overcome two separate 'gaps': the 'market efficiency gap' and 'the real access gap'.

High-AMPU business models seek to bridge the above 'market efficiency gap' by pushing the limits of commercial feasibility of conventional business models towards the 'affordability frontier'. However, success will greatly depend on the regulatory environment. If the environment is conducive, such models may be enhanced to bridge the 'real access gap' as well.

Chapter 8 investigates the conditions necessary to make 'smart' subsidies successful in bridging the real access gap in rural telecom services, taking Nepal's Eastern Development Region as the case.

The analysis defines 'smart' subsidy as 'the process used to provide the minimum required subsidy to bridge a defined access gap using a competitive bidding process, known as least-cost subsidy (LCS) auctions'. It is argued that in countries with poor governance frameworks, it is 'safer' to use the smart subsidy approach where only one number is evaluated, than a 'beauty contest', where the award is determined by an assessment of the applicant's ability to fulfill a given set of requirements. However, it appears that the LCS auction in Nepal has not provided the anticipated 'safeguards' against 'undesirable outcomes' of poor governance, as, (a) the decision to prevent the incumbent from bidding, (b) the use of rather 'liberal' eligibility conditions for potential bidders, (c) the decision to go ahead with the LCS auction, with only one eligible bidder on board (though it is reported that there were other potential bidders who had shown sufficient interest to participate in the process), (d) selection of a party with limited experience as a telecom operator, and (e) the strong 'technology bias' of the selected party (who actually was a large VSAT manufacturer). Chapter 8 makes a point that is normally not highlighted, but is of crucial importance, regarding the competence, impartiality and leadership of the government officials and consultants who drive the process.

Even without 'the poor governance issues', the Nepalese LCS attempt would have 'failed' due to reasons ranging from the unfavorable regulatory and politico-security environment, critical flaws in the design and implementation of the LCS process, failure to address sustainability of the project, and the lack of mechanisms for mid-course correction. However, the lessons learned from the Nepalese experience, together with the lessons from more successful Latin American and Indian experiences, indicate that three key areas are essential for the success of 'smart' subsidies: a conducive regulatory environment, a proper design and implementation process, and measures to ensure sustainability.

Regulatory Preconditions

The Latin American cases showed that sound regulatory framework is a precondition to make 'smart' subsidies work. A key to the failure in Nepal was the unfavorable regulatory environment. A favorable regulatory regime is a key ingredient not only in designing and implementing workable 'smart' subsidy programs but also in ensuring sustainability. Chapter 8 describes the good regulatory practices needed to make a 'smart' subsidy process work. The focus here is on the underlying objective of regulation.

The objective of regulation is consumer welfare, not limited to the short-run. In trying to achieve this goal, regulators devise various solutions, depending on the nature of the problem and the environment. The solutions may necessitate achievement of several sub-objectives. Therefore, achieving the same objective could necessitate achieving different sub-objectives in different environments. It is, therefore, futile to measure the regulatory success in terms of achieving sub-objectives such as implementing LCS projects, implementing LLU, facilitating a number of competitors or choices in the market, etc.

Design and Implementation of 'Smart' Subsidies

For any auction to be successful, there must be competition among bidders. As highlighted in Chapter 8, the use of lowest-cost technology is the key among the factors that could facilitate competition among bidders. High-AMPU business models that work in low-ARPU climates depend on the mobilization of cost-effective technology. In this context, 'technology neutrality' is essential to the success of a 'smart' subsidy. Other factors are: ways of attracting bidders with operational experience, assuring service-quality and availability obligations, and securing roll-out obligations and sustainability. The discussion here is confined to whether incumbent telcos should be prevented from bidding for LCS.

There appears to be reservations about the participation of incumbents in LCS auctions. For instance, in Nepal the incumbent was not allowed to participate. However, in some of the Latin American countries and in India, the incumbents were allowed to bid.

Allowing incumbents to compete in LCS auctions could enrich the outcome to the intended beneficiaries (the aspiring rural telecom user) in several ways. As presented in Chapter 8, incumbents' entry into the LCS process creates competition for the market; they will strive to defend their territories, while the new entrants will fight to gain a foothold in the demarcated license territories. The Latin American experience has shown that this competition (for the market) forced all the bidders to consider the most cost effective technology for the given geographic and socio-economic conditions, resulting in a reduced subsidy structure at the outset.

One reason for the failure of the business plan of the successful bidder in Nepal was the overestimation of demand and revenue. They have complained that accurate data was not made available to them. However, such problems would not occur if incumbents are allowed to participate. Incumbents are already in the business of providing services in the country, or more specifically in or around the intended areas for LCS. In most cases, this would allow the incumbents to utilize the subsidy more efficiently in rolling out networks, than an inexperienced, vendor-centric 'operator' experimenting with a business model based on inaccurate projections.

The usual argument against incumbents being allowed to participate in LCS bidding is that notwithstanding the monopoly profits and cross subsidies the incumbents enjoyed in the past, they have found it difficult to justify the extension of their networks to remote areas and if allowed to participate in an LCS program, they could resort to anti-competitive practices. However, it is up to the regulator to ensure that the process is so designed that it does not allow anti-competitive practices.

Sustainability of LCS Projects

Some literature[5] suggests that the role of a 'smart' subsidy is to kick-start rural telecom roll-out, without creating subsidy dependency. The obvious concern that arises out of this contention is the sustainability of a project. While the overall sustainability of the project may depend upon a number of factors, the bottom line is that the operation has to be viable at least in the medium-run. Successful rural LCS projects show that the key to viability is cost-based asymmetric interconnection arrangements.

The logic for implementing asymmetric interconnection is two fold; the rural telecom operator should be adequately compensated for the high operating costs and also for the low revenue yield (de Silva and Tuladhar, 2006, p. 45). Though many would agree that the cost of rural operations is high, and, therefore, the termination costs should reflect this reality, the need to compensate for low revenue yield could be debated. However, as pointed out by Samarajiva (2002), the usual perception that the economic viability of connections depends solely on the originating revenues—when call termination is offered as a bundled 'free' service—is wrong; each 'free' call reception is accompanied by a revenue-generating call origination elsewhere on the network.

Therefore, it is obvious that 'smart' subsidies coupled with cost-based asymmetric interconnection regimes could facilitate the development of high-AMPU business models that are sustainable—-to bridge the market efficiency and access gaps observed in rural telecom markets.

India's Universal Service for Telecom: Policy and Regulatory Gaps

India used a smart subsidy program to disburse funds for universal access through its Universal Service Obligation Fund (USOF). Between 2003 and 2005, the USOF ran five LCS auctions, handing out a total of

USD 500 million in subsidies. The fixed wire-line incumbent operator Bharat Sanchar Nigam Limited (BSNL) managed to win the majority of LCS auctions. Chapter 9 analyzes the design and implementation of the Indian universal service obligation (USO) program.

The Indian USO regime has produced mixed results as compared to the positive experiences in Latin America and the negative experience in Nepal. On the positive side, the costs of projects have declined over time; from bids matching exactly the benchmark value in the initial implementations, to 60–75 percent less from the benchmark value by March 2005.[6] On the other hand, the Indian process is criticized for restricting participation, as the design gave an advantage to the incumbent BSNL.

Technology Restrictions

The importance of maintaining technological neutrality in universal-service provision is undisputed. However, this 'theory' should be applied objectively and intelligently, without ignoring the available knowledge on the capabilities, limitations and applications of extant technologies. Chapter 9 states that until recently, only fixed wire lines and wireless local loop technology qualified for USO subsidies. A correction to this policy is now said to be in the pipeline: to support cellular mobile services (both GSM and CDMA) as well. The chapter recommends that the proposed amendment should also allow emerging technologies such as WiMAX.

However, the Indian approach of restricting USO fund support initially to fixed wire and wireless technologies, with GSM and CDMA services being brought in after three to four years and no support for emerging technologies such as WiMAX, is justified.

- The necessity for USO funding arises from the failure of incumbents to supply rural demand, despite their past monopoly profits and cross-subsidies. However, incumbents often have considerable infrastructure and capacity in place to support rural network roll-out, though the sharing of this infrastructure has become a subject of debate. Therefore, it would be beneficial to entice the incumbent to participate in rural roll-out, by providing USO funding support for wired lines, as the advantages of incumbents' participation would offset any disadvantages.

The approach of the Indian policy makers seems to have been based on ground realities, rather than on theories. This approach seems to have produced results; costs of projects have declined over time. Apart from including wire-lines, the other technology that was allowed initially was fixed WLL. In fact, fixed WLL was the most cost-effective solution at the time, as CDMA deployment was complicated for regulatory reasons.[7] It should be noted that WLL technology is more efficient than GSM technology, especially for fixed services. GSM towers can provide service up to 15–20 km, while WLL towers provide coverage up to 50 km. WLL provides better bandwidth for data transmission at lower cost and is more cost effective than VSAT technology (de Silva and Tuladhar, 2006, p. 38, footnote 37).

- The decision of late to fund cellular mobile (both GSM and CDMA) is a logical development, rather than a correction. With the completion of the unified licensing regime in January 2005,[8] there is no need to impose restrictions on technologies any further, justifying the application of the unified licensing regime to subordinate policies like USO. Furthermore, since 2003, several low-cost GSM solutions have been developed by suppliers.
- Certified WiMAX equipment appeared in the market only in late 2005. Therefore, WiMAX was not an option in the previous USO subsidy auctions.

Infrastructure Sharing

In the USO funded projects, the bidders were responsible for setting up infrastructure, despite the incumbent having a fair amount of 'shareable' infrastructure in place. This made it difficult for operators without a large subscriber base in rural areas to enter those markets in a cost-effective way; Chapters 7 and 9 point out that the incumbent refused to lease out its infrastructure on cost-oriented and non-discriminatory terms to the other bidders and leveraged its advantageous vertically integrated status to win a majority of the auctions. Therefore, it is stated that an important precondition to these auctions would have been an effective access regime.

In discussing solutions to the above impasse, Chapter 9 implies that the only concern is to facilitate provisioning of services through new entrants; the rights of incumbents to function as commercial entities, develop business strategies and implement long-term business plans are ignored. As much as the new entrants, the incumbents need to have strategies, plans, technology migration road maps and viable business models. Costs involved in laying telecom cables, be it copper or optical fiber, are high and escalating by the day. Optical fiber cables are deployed to cater for projected demand of up to 25 years. Whether the incumbent is government owned or not, the huge investments for such projects have to be secured through presentation of proper business plans, based on projected demand and technology migration plans. Because the world is moving towards IP based Next Generation Networks (NGN) and India has its own agenda for NGN migration,[9] BSNL would have had definitive plans for loading its fiber optic backbone over the next 25 years. In such circumstances, the disruption of BSNL's long-term business plans by mandating the sharing of its optical fiber backbone at 'reasonable' terms would discourage further investments in backbone infrastructure by the incumbent and by new entrants.

It is interesting to note the contention that 'there are no private property rights issues involved, as BSNL is a public entity and its infrastructure properly belongs to all citizens'. If that is the case, the question is whether the citizens would consent to hire 'their' infrastructure to private entities. By implication, the public has entrusted 'their' infrastructure to be managed by the incumbent BSNL. Whether the public approves of such disruption of long term business plans of the incumbent is an open question.

Chapters 7, 9, and 10 suggest that if the industry structure is changed to favor alternative ubiquitous distribution companies which sell infrastructure elements in direct competition with the incumbent, incentives will be created for the incumbent to offer its own infrastructure on competitive terms. The Indian regulator is seeking to resolve the infrastructure sharing impasse by recommending subsidies for infrastructure and mandating the sharing of infrastructure.

India's Universal Service for Telecom: Access Deficit Charge

Chapter 10 critically analyses the Indian Access Deficit Charge (ADC) experience to extract the key generalizable principles. The definition in

Chapter 10 is slightly different from the standard definition[10] of ADC; while the discussion here is based on the former as does not affect the arguments made.

Even though ADC is considered one of the mechanisms available for implementing universality policies, Intven (2000) consider it inefficient and akin to an anti-competitive cross-subsidy. They point out that while some regulators have rejected reform of ADC regimes, others are reviewing them. Since its inception, the ADC regime in India has been criticized by many quarters. Several stakeholders, including consumer organizations, have questioned its logic, pointing out that the objective of promoting universal service can be achieved through the USO Fund. Some even suggest that the ADC regime should be wound up, as was done in some other countries, rather than debate eligibility and other details (Agarwal, May 20, 2005).

The opponents point out that ADC was initiated when fixed subscribers outnumbered mobile subscribers and, therefore, any increases in their rental/tariff would have made basic telecom services unaffordable to many. However, they point out that circumstances have changed, with mobile subscribers now outnumbering fixed-line subscribers. Therefore, they argue that the rationale of ensuring affordable fixed services no longer applies (Agarwal, May 20, 2005).

ADC is a useful mechanism to protect incumbents during the transition to competition. As argued by Clemons, Croson and Weber (1996), dominant players enjoying near-monopoly positions (but often required to provide universal access) can be seriously damaged by 'cream-skimming' new entrants if cross-subsidy has to continue. On the other hand, if tariffs are rebalanced, the less attractive segments will face increased tariffs. Therefore, during the transition period to full competition, incumbents need ADCs to maintain below-cost tariffs in the less attractive segments while offering cost-based tariff in the attractive segments. Incumbents have been and continue to be the main providers of telecom services to the vast rural masses. The need to sustain those services without compromising affordability and quality of service cannot be denied. This is where the policy makers must balance the protection of the incumbent and the new entrant. After all, protection is extended to a new entrant not as an end, but as the means to safeguard the interests of the end-beneficiary—the general public. Similarly, during the transition period the incumbents too need protection, especially in view of the 'baggage' they carry. Of course, ADC mechanisms should be viewed as transitional and terminated once the desired objectives are achieved.

Chapter 10 traces the many changes in the ADC regime in India. It is possible to identify a trend to achieve simplicity and uniformity and to reduce the ADC progressively, taking advantage of the rapid growth in the number of minutes due to mobile growth. There appears to be convergence between the positions of Telecom Regulatory Authority of India (TRAI) and those advocated for in the chapter. ADC calculations have been made simple progressively and revenue sharing has been introduced for domestic traffic, though there are still some concerns on the methodology of reckoning revenue.[11] The need to merge ADC and USO has been accepted and a definitive time frame for abolishing ADC has been announced.

Conclusion

The theme of this chapter is the creation of business models that work in low-ARPU markets. The key to creating sustainable business models in such markets is to strive for positive AMPU. The sustainability of such models depends on continuous refinement. The BOP research can yield the inputs for such refinement.

Connecting the 'financially constrained' and keeping them connected depends on the ability of telcos to make a profitable business out of serving such segments. High-AMPU business models that can bridge the 'market efficiency gap' can be further developed to serve markets beyond the 'affordability frontier' if the regulatory environment is conducive.

Notes

1. Interview with Dr Onno W. Purbo, *Barriers to ICT Diffusion to Poor People.* http://www.idrc.ca/en/ev-46217-201-1-DO_TOPIC.html
2. IDRC Man on a Mission: Researcher Profile, Dr Onno Purbo. http://www.idrc.ca/en/ev-45872-201-1-DO_TOPIC.html
3. ENCYCOGOV.COM Statistics: Production costs v. transaction costs in the US GDP. http://www.encycogov.com/
4. Ibid.

5. Dymond, Andrew. Telecom & Information Services for the Poor: Towards a Strategy for Universal Access. Focus: The Two Gaps—Market and Access. http://www.InteleconResearch.com
6. Ibid., p. 11, Table 2.2.
7. CDMA is essentially a mobile technology, and therefore the cost efficiency drops when the technology is deployed to provide fixed or limited mobile services. Though the Unified Licensing regime in India came into force towards the end of 2003, it was not mandatory for operators to seek a unified license. Given this scenario, the division of voice operators as fixed and mobile continued and 'fixed only' operators was permitted to deploy CDMA—only to provide fixed and/or limited-mobility services.
8. In India, the Unified Licensing Regime was implemented in two phases. The first phase of implementation was in November 2003, and covered both fixed and mobile services. In the second phase, Unified Licensing covered all telecom services (commencing from January 2005). Under the Unified Licensing scheme, a licensee shall be able to provide any or all telecom services by acquiring a single license. As at present, migration to Unified Licensing is optional for service providers. However, this will become mandatory after five years. Further, from 2007, all new service providers will be licensed under the Unified Licensing Regime. (Further information on the Unified Licensing regime in India could be obtained from the TRAI website.)
9. TRAI has already published a comprehensive consultative paper on NGN deployment. The paper is available for downloading at the TRAI website.
10. An access deficit arise when an operator's average access charges (line rental and connection) are not set high enough to cover the long-run average incremental cost (LRAIC) of providing an access service (http://itu-coe.ofta.gov.hk/vtm/universal/faq/q10.htm). Note that in the strict definition of Access Deficit, only the line rental and connection charges (that is, traffic insensitive component) comes in to play whereas the traffic sensitive component, which is the usage charge, is left out of ADC.
11. See the report filed at http://www.tribuneindia.com/2006/20060224/biz.htm#1. Under the revenue sharing arrangement the ADC is being levied at the rate of 1.5 percent on the total earnings, excluding the revenue from rural operations. This means that the revenue from ILD traffic is not excluded for the reckoning of the revenue share. However, a 'per minute' ADC is still applicable for ILD traffic, creating a situation of 'double taxation'.

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12

Regulating for the Next Billion

Rajendra Singh and Siddhartha Raja

Samarajiva and Shields (1990, p. 229) argues that decisions about resource allocation in telecommunications are value-laden, where the 'interests of the potential beneficiaries may be articulated through their representatives in government or may be represented in the policy arena by third parties such as aid organizations or consultants'. Indeed, when policy makers and regulators around the world look at telecommunication regulation, they have in their mind certain judgments of what is good and bad for those who are in the parlance of our field 'traditionally underserved'. In this review chapter, we discuss some of the regulatory and policy implications of the findings of the work in this book. Specifically, we elaborate on the task of the regulator with relation to what users—the potential beneficiaries of regulation—want.

Learning about what users do with communications technologies ensures that regulation does not stray too far from the social activities it seeks to direct. Users are the most unpredictable group of technologists. Indeed, there is a small but influential body of research in the social study of technology that looks at users as the determinants of technology success (for example, Cowan 1990). In his work on the social history of the telephone, Fischer (1992, p. 21) employs a 'user heuristic' to 'discern how the average user reacted to and employed the technology'. von Hippel (2001) has suggested that user communities innovate and develop new products and techniques independent of involvement by traditional producers. In colloquial wisdom this concept finds expression in the adage that 'the customer is king'.

The question for us is how does the use of technology relate to its regulation? We contend that this is a central question when thinking about policy and regulation. Indeed, this is an especially important question when we think about connecting the next billion—the consolidated goal of many universal service or telecommunications development policies around the world.

The Public Interest

Most regulators and policy makers seek to act in the public interest. The 'public interest' itself is a nebulous concept, with many contending that it acts only as a mask for actions taken in the private or self-interest (Horwitz, 1989, pp. 22–23; Levine and Forrence, 1990). Noting these discussions, we will use this as the starting point for our brief examination of regulation, supposing that the public interest means giving users of communications technologies what they want, without impinging on the rights of other users.[1]

According to this definition, regulators and policy makers will have to know what users want. However, as Fischer (1992) and this volume show, it is difficult to predict what communication technologies will ultimately be used for. Hence, the users' wants will not find expression until the time that they can actually use and experiment with technology. This is where the regulator's job becomes difficult—it is not practical, from the standpoint of ensuring credible commitment or minimizing regulatory risk, to wait until a technology has diffused sufficiently for people to know how they want to use it.

In order to balance the public interest by giving users what they want, with the need to ensure a stable and predictable regulatory environment, it is essential that regulators learn from experience and create, more than specific rules, the right regulatory environment within which technologies can diffuse, and where innovation—whether by users or producers—can flourish.

Which Users?

A concern with the definition of the public interest is to define exactly which users we look at (or not) when we make policy. In the context of development, it is also important to include, as this book has, non-owners (Chapter 2) to understand how they can be brought into the fold of the 'haves' of the information age. In this determination, we segment users into two groups: one is those who can influence directly the development of telecom infrastructures and services. The second is those who cannot—what we call the underserved, marginalized, or outsiders. In this, it is important to understand that the second group can influence telecom development, but not directly.

The first group includes business users, who have had tremendous influence in the development of infrastructure and services (Schiller, 2000). Another part of this group is high-end users—both high-revenue and 'high-tech'. As Castells (2000, p. 72) pointed out in his epic study, networks connect valuable places. Thus, users 'at the top of the pyramid' will find service following them. The second group includes users who the first few chapters in this volume identify as those at the 'bottom of the pyramid'. In some cases, these users follow services—going to community or shared telephone or Internet connections, while in other cases, these users do not need or find a use for Information and Communication Technology (ICT) services. Within this broad segmentation, there are further segments of users—and in fact, there are an infinite number of characteristics and needs. Yet, it is possible for regulators and policy makers to look at data like that provided in this volume and make decisions, even if value-laden, about where they need to invest time and effort. Regulators in developing nations need to invest significant time and effort on the second group of users.

Regulating Users through Technology Regulation

A regulator has to deal with both supply- and demand-side issues. On the supply-side, telecom regulators are involved in three fundamental types of issues: interconnection, resource allocation, and revenue management. On the demand-side, however, the task of the regulator is typically indirect, especially since there is no way to order users to do something. However, as Chapters 8 and 9 argue, there are market efficiency and access gaps that regulators typically seek to overcome. The regulator can, through control on the supply of ICTs, ensure that telecom services reach the underserved (universal service), that they are affordable (subsidies), or have some minimum standard (quality of service and interconnection).

To return to our earlier question, it is now important to consider how regulation and use of technology connect. Let us consider the case of supply-side regulatory control of revenue management, and the specific regulation on the calling party pays (CPP) and receiving party pays (RPP) regimes. Chapter 2 discussed how an RPP regime results in people avoiding incoming calls. Going back to the earlier days of the telephone, in 1881, the National Capitol Telephone Company complained to AT&T that flat rate pricing of calls had 'led to the transmission of large numbers of communications of the most trivial manner' (Fischer, 1988, p. 48). Today, as Chapter 1 finds, these trivial social conversations are the 'second most important use of telephones'. Our point here is simple: the regulation of technology constrains and conditions its use. However, the lesson from this is very powerful and often overlooked—that regulators can effectively change the fortunes of technologies, and we need to be careful in our actions.

Another popular and instructive example is the success of Wi-Fi. As Bar and Galperin (2004, p. 53) point out, the success of Wi-Fi is partly due to of the lack of regulatory overhead, especially in that the technology used unlicensed spectrum. Neto, Best and Gillett (2005, pp. 73–90) surveyed license-exempt spectrum in Africa and found that 'the significant diversity in regulations across the continent inhibits economies of scale and may discourage large entrants. Furthermore, the lack of clarity and enforcement discourages innovation and small entrepreneurs.' We, thus, cannot expect African wireless entrepreneurs to spring up as community wireless projects and entrepreneurs have mushroomed in the USA, UK, and elsewhere (Neto, Best and Gillett, 2005, pp. 73–90). The absence of regulation of spectrum, which is a resource allocation choice (Raja and Bar, 2003), has directly resulted in users' innovations relating to Wi-Fi technology in ways not initially planned (Sandvig, 2004). These and other examples illustrate how understanding use can ensure that regulators make better policy.

Regulation for the Next Billion

In an earlier section we noted that regulators are often interested in users who are 'traditionally underserved'. Here, we will tie the different threads developed in this review chapter to arrive at some conclusions that will be useful for regulators to keep in mind when making or suggesting policy, or making rules for the ICT industry.

A key take-away for us from the social study of technology is that users matter—not just as users, but also as producers and innovators. They often will take a technology that was supposed to do one thing and turn it into something completely unexpected. If the public interest involves giving consumers what they want, regulation and policy should allow such innovation and production, and accommodate it in the development of technology. Of course, users are often unable to change the technical system of an ICT infrastructure. A recent exception is the diffusion of Wi-Fi community networks. Yet, the majority of user innovations might involve changes in use and not structure, like making a business technology such as the telephone into a social communication tool.

Innovation often challenges regulatory structures. From the innovation of the radio-to-phone, Carterfone, ultimately leading to the break-up of Ma Bell (Brock, 2003), to Skype in the Internet age, and Wi-Fi in a liberalized spectrum management environment, new technology has not only brought benefits to users, but has led to paradigm shifts in regulation and law. In a recent statement, the Hong Kong telecom regulator (OFTA) wrote that the regulator was not in favor or against convergence, but wanted to create the right conditions for market forces to play out and allow the smooth introduction of convergence as and when the market demanded it (Au, 2006). Such forward-looking action by regulators can ensure that innovation is not perceived as a problem or a 'disruptor' as much as an expression of both producer and consumer desires.

With respect to regulation for the next billion, this volume has significant findings that throw light on how users and non-users who form part of the next billion use ICTs. First, shared access is an important means of access. Communities are able to support ICT services better than lower income individuals and form a more attractive collective revenue source for service providers. The success of the public call office and village public telephone programs in India, recorded in Chapter 1, indicates that these modes of access are valuable in bridging the 'access gap'.

Innovation is getting more attention from policy makers around the world. Given the use of converged IP technology to provide a range of services, and with end-to-end networks now in place, users and technologists are able to develop and quickly deploy new and interesting technologies to better serve their needs and requirements. Such decentralization of innovation is apparent in the moves made in many countries towards spectrum-as-commons regimes, the debates on open network access, and the increased use of open source software to control and use media. These developments alter greatly the mechanisms of control of technology. Regulators need to recognize that technology is now open to decentralized innovation—often leading to benefits for users. Innovation will come through in a competitive and incentive-structured environment, where innovators will benefit, monetarily or otherwise, from their creativity.

A regulatory environment that allows entrepreneurship, flexibility, and competitive behavior will bring to all users—within and without ICT networks—the best possible services that serve their needs, and hence the public interest, the best.

Note

1. This is an approximate Pareto-optimal definition—the public interest will be maximized when the sum of all users' utilities is maximized without harming other users' utilities.

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13

…Through the Markets

Visoot Phongsathorn

> Competition is valuable only because, and so far as, its results are unpredictable and on the whole different from those which anyone has, or could have, deliberately arrived at. Further, … the generally beneficial effects of competition must include disappointing or defeating some particular expectations or intentions.
>
> F.A. von Hayek (1978)

A Reflection

The experiences recounted in this volume are very telling. Markets work. They may not work exactly the way we expect them to do. They may not work exactly the way we intend them to. They may not work the way we want them to. But they always work. And when they do not work the way we expect, the way we intend or the way we want, we conveniently claim that markets have failed. Market failure is the favorite excuse for those of us in the development profession to do something. This can also be said of those who are in the regulatory profession. It rings true far and wide throughout the various branches of government. We have been so conditioned with a vision of an ideal market, a perfectly competitive market, a market where social welfare is maximized. But is this vision a mere mirage? What do we really know about social welfare? What do we really know about what people want?

Do we know that users, even the most financially constrained among them, do not want the cheapest communications services? Telecom regulators across the globe are still busy finding ways to lower fees for low-income subscribers. But do low-income users really care?

Chapter 1 of this volume reports that low-income users care more about convenience and privacy than price per se. Chapter 2 reports further that many low-income users do not even engage in short-term cost minimization. Long-term decisions on how to communicate are much more important to them than short-term cost minimization. There is no way any telecom regulator will know this *ex ante* because the users themselves do not do so *ex ante* either.

People use communications services for a variety of purposes. Some just like to talk. Some do it because it brings other benefits. Keeping in touch with relatives living abroad, as reported in Chapters 1 and 3, for instance, secures financial support in the time of need. Lancaster (1966) and Becker (1976) describe this in terms of 'household production function'.

$$U = u(Z_1, Z_2, \ldots, Z_n)$$

where,

U = utilities
Z_i = $z_i(x_i, t_i, E)$
x_i = market input
t_i = consumer's own time input
E = environmental variables

Do we realistically believe that this calculation goes through the mind of a caller every time he or she is making a new call? This formulation is only useful to researchers making an *ex post* evaluation of consumer behavior. For the consumers themselves, decision making is heuristic at best (Langlois and Cosgel, 1998). Trial and error and copying are probably better descriptions. So when serving a previously unserved market, nobody knows what the consumers want, not even the consumers themselves, let alone the regulators.

So is there any role for the clueless regulator to play? Of course, there is. Telecom regulators' main tasks are to ensure that the telecom market moves ahead with as many unpredictable results as the people outside the government are willing to allow. The stress here is on people outside the government, whether they are in the business sector, the household sector or the civil sector. The market has to be driven by these people, not by the government. Subsidies are not 'smart' simply because they are competitively tendered out, as recounted in Chapters 8 and 9.

People outside the government are willing to push forward the access frontier, and they do so with less efficiency-razing distortions than what the government normally creates. Examples abound, only a small number of which are recounted in this volume.[1]

A Guiding Principle

Those of us who are working towards the ideal of universal communications services can do very well by drawing an inspiration and guidance from Ludwig Erhard. Erhard is best remembered by his courageous abolition of price controls in post-World War II Germany. For 12 years, Adolf Hitler had printed money freely, flooding the German economy with Reichsmarks in order to build his war machine. He had avoided inflation by resorting to authoritarian wage and price controls, enforced by the Gestapo. The Nazi regime was defeated, but the Nazi command economy lived on. Wage and price controls were then in the hands of the occupying military governments. Reichsmarks were aplenty. Goods were scarce, and they changed hands largely by bartering. Reichsmarks could buy nothing except for goods rationed by the military governments. The Anglo-American military government's solution to this was to replace Reichsmarks with Deutschmarks. On announcing the new currency, Erhard, the then Director for Economic Administration of the Anglo-American occupation zone, declared all decrees controlling prices invalid; much to the surprise of the Anglo-American military government. Economists had all along been advising the military government in favor of price controls. However, the American Military Governor stood behind Erhard and endorsed his declaration. That was the beginning of the German Economic Miracle.

Two months after lifting the price controls, Erhard promised prosperity for all at the Christian Democratic Union meeting. He also declared competition to be the most promising means to achieve and secure prosperity. To him, income redistribution was not a valid alternative route towards prosperity for all. He had a deep-rooted faith in human dignity. 'Freedom for the consumer and freedom to work must be explicitly recognized as inviolable basic rights by every citizen. To offend against them should be regarded as an outrage against society,' wrote Erhard (1958). 'No individual citizen must be powerful enough to suppress individual freedom, or, in the name of false freedom, to be able to limit it.'

Erhard's philosophy would later become known as *Soziale Marktwirtschaft* (social market economy in English). Central to *Soziale Marktwirtschaft* is *marktkonform (*Eucken, 1952; Müller-Armack, 1947, 1978; Röpke, 1937, 1942). The present day's jargon for *marktkonform* is 'Making Markets Work'. Whether we want to secure prosperity for all or simply deliver communications service to all, Erhard would demand that we do so by making markets work.

A Toolbox

Googling the term, 'Making Markets Work' leads to over 66,000 search results at the time of writing. There is no shortage of toolboxes for 'Making Markets Work'. The industry standard toolbox, if we can call economic development an industry, will contain tools aiming at reducing 'transaction costs' of doing business. How well a market works depends largely on supporting services and institutions (Figure 13.1).

Supporting services determine the 'search' costs that enable a transaction. Poor roads and traffic congestion increase 'search' costs. Lack of price reference, central registry, brokerage service, market intelligence and a whole host of information services increase 'search' costs. Inaccessibility of third-party technical and business advice also increases 'search' costs.

The term 'institution' is used here as it is used in New Institutional Economics or Transaction Cost Economics. Here it means the rules of the game, rather than an establishment, a body or an organization. It is very much the same as what is called 'market order' in the language of *Soziale Marktwirtschaft*. Institutions determine 'contract' costs. In any transaction where laws and regulations are not very clear or specific concerning rights and liabilities of the parties to transactions, either the parties have to spell-out their rights and liabilities in a contract or bear risks associated with the ambiguity. This adds costs to the transaction. When the attributes of the product or service being sold are not subject to an industry standard or code, the buyer and the seller will have to establish them bilaterally. This adds costs to the transaction. Informal institutions also play a large part in determining transaction costs.

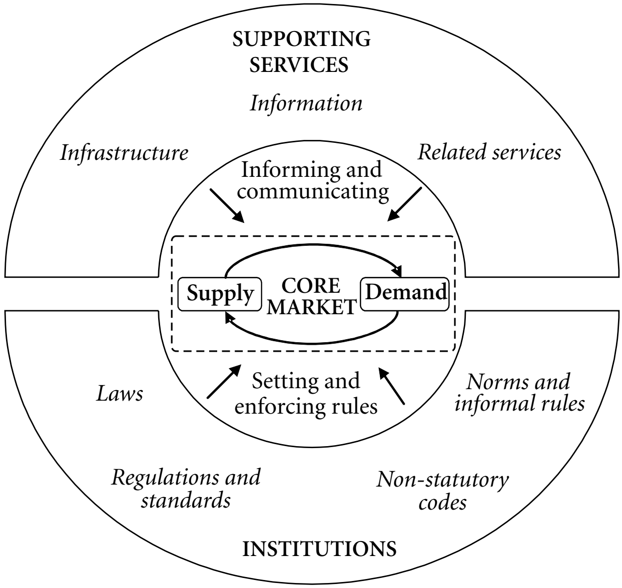

Figure 13.1
How Markets Work: Institutions, Supporting Services, and the Core Market

Source: Springfield Centre[2].

How well a market works also depends on supply and demand themselves. It is obvious that a market cannot work as well as it can if its suppliers are constrained from improving their capabilities whether by inappropriate laws and regulations, inaccessibility to finance or anti-competitive conduct by their competitors, suppliers, or potential customers. The same can be said of consumers of intermediate products and services.

As markets are interlinked, 'Making Markets Work' toolboxes often come with tools to map these interlinked markets into a chain. This chain of interlinked markets is often called 'value chain', 'supply chain' or 'sub-sector'. As such, 'Making Markets Work' toolboxes are often labeled 'value chain analysis', 'value chain mapping', 'supply chain analysis', 'supply chain mapping', 'sub-sector analysis', and 'sub-sector mapping'. As with 'Making Markets Work', there is no shortage of articles on these toolboxes in cyberspace.

Conclusion

Make markets work for universal communications services, please. Do not force incumbent service providers to assume universal service obligations; they are all too eager to accept such responsibilities, as they are a good excuse to foreclose their markets. Do not throw away money subsidizing policy-driven services; chances are that we in the government do not really know what users really want. Work with the markets. Tweak the rules a bit to make it easier for providers to serve previously unserved markets. Focus on clarifying property rights, not on more command and control. Make it clearer what the rights of new-entry service providers to access dark fiber are. Make it clearer what the liabilities of the incumbent refusing to interconnect the new-entry service providers are. Investigate what services are supportive to the introduction of connectivity to the previously unconnected; if their markets are weak, find ways to strengthen them. Remember that markets are interlinked. Solutions may lie in unexpected places. Let markets lead you there.

Notes

1. See Chapters 1 and 2 for the role of the household sector in pushing forward the access frontier, Chapter 4 for the role of the civil sector, and Chapter 5 for the role of the business sector.
2. From 'making markets work for business and income growth' training programme;
   Glasgow; July 2005. The diagram has also been used in the paper: 'Comparative Approaches to Private Sector Development—a MMW perspective' (A working paper for the Employment & Income Division of SDC); Marieke de Rujter de Wildt; David Elliot; Rob Hitchins—April 2006.

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Appendices

Appendix 1

Background and Methodology: Survey of Telecom Use at the Bottom of the Pyramid

The findings reported in this book are based on a subset of findings of a larger knowledge, attitude and practice study of the telecom usage patterns and behaviors of a sample of 'financially constrained' 'users' in 11 localities in India and Sri Lanka, conducted by LIRNE*asia*. Face-to-face interviews were conducted in both countries with a total of 3,199 respondents in April and May 2005. Seven localities were surveyed in India and four in Sri Lanka (Table A1). With the exception of Colombo (Sri Lanka) and Mumbai (India), interviewees were spread across urban and rural areas of each locality. The questionnaire was translated into, and conducted in, five local languages (Hindi, Malayalam, Oriya, Sinhala, and Tamil).

Table A1.1
Distribution of Respondents among Localities Studied in the Survey of Telecom Use at the Bottom of the Pyramid

Country	Localities (State/Province): Urban/Rural	Number of Respondents
India	Cuttack (Orissa): Urban, Rural	300
	Dehradun (Uttaranchal): Urban, Rural	295
	Gorakhpur (Uttar Pradesh): Urban, Rural	300
	Kasargod (Kerala): Urban, Rural	300
	Mumbai (Maharashtra): Urban, Rural	304
	Neemuch (Madhya Pradesh): Urban, Rural	300
	Sivaganga (Tamil Nadu): Urban, Rural	300
Sri Lanka	Badulla (Uva Province): Urban, Rural	311
	Colombo (Western Province): Urban	206
	Hambantota (Southern Province): Urban, Rural	301
	Jaffna (Northern Province): Urban, Rural	282
Total		3,199

For the purposes of this study, the 'financially constrained' were defined by two parameters; first, those with household income levels of approximately USD 100;[1] second, socio-economic levels. In Sri Lanka those belonging to socio-economic classification[2] (SEC) groups 'B', 'C', 'D', or 'E' were included in the sample. In the Indian sample, a different, but comparable socio-economic classification was used. Socio-economic classification of the 'financially constrained' in India according to the natural distribution of population is divided among urban and rural settings, each consisting of different SEC groups. In urban India the 'financially constrained' can be classified as SEC 'B', 'C', 'D', and 'E', while rural 'financially constrained' in India can be classified as 'R1', 'R2', 'R3', and 'R4' based on the profession and type of dwelling of the chief wage earner (*pucca* and *kuchha* house). In this study, this division was followed for the socio-economic classification of Indian users.

Respondents over 18 years old were chosen from within selected households[3] based on Kish sampling techniques[4] to ensure random sampling as well as adequate representation of gender and age groups as in their actually existing ratios.

India and Sri Lanka are located in South Asia, the largest concentration of poor people in the world. Both countries have experienced rapid telecom growth within the past five years. In addition, India and Sri Lanka have differing mobile termination regimes: India is a Calling Party Pays (CPP) environment (from 2003), similar to the regime in fixed where the service of receiving a call is bundled together with call origination, which is charged; Sri Lanka is a Receiving Party Pays (RPP) environment, where one has to pay for both origination and reception, though many consumers now enjoy significant quantities of free incoming minutes under various packages. It was hoped that this study might bring out the differences, if any, in telecom use among the 'financially constrained' in the two environments. The seven different localities in India and the four in Sri Lanka were selected, not to represent the two countries, but to capture the diversity within the two countries, taking snapshots of 11 very different markets, in terms of telecom access, economy, population, and geography. For this purpose, the 'Indian' sample was further divided into two 'regions' for some of the analysis: 'Northern' India (Dehradun, Gorakhpur, and Neemuch) and 'Southern' India (Cuttack, Kasargod, Mumbai, and Sivaganga). The rationale for grouping the locations was the broad similarity in the socio-economic qualities of the locations. This was done in an attempt to preserve some of the diversity of the locations, as well as to split the sample more evenly for comparison.

Limitations

The findings from this study are not representative of India and Sri Lanka as wholes. A true representation could only be obtained through pure random sampling according to the natural distribution of the population in the countries, rather than purposive sampling of the localities which was undertaken. However, the individual locality samples are representative of the 'financially constrained', as defined by this study.

Respondents were asked to indicate their monthly income for the purpose of analysis, including income from all sources, which means that the income reported would have been that for the household. While respondents were asked to consider income from all sources, it is still plausible that the income group indicated does not reflect true income levels; irregularities in remittances, which can account for substantial portions of income in developing country households, where large sums of money are received at irregular intervals for special occasions or emergency situations, could result in some income being unreported. Furthermore, such transfers may not even be considered as 'income' per se by the respondents.

For the kind of information that this survey sought to elicit, a questionnaire containing many more open-ended questions would have been optimal. However, given the size of the sample as well as the depth of the questionnaire, this was not practical. For this reason, the questions were closed-ended, but respondents were given many non-exclusive options to choose from.

The survey asked respondents about their calling patterns, in terms of average number of calls made and received per month, etc., to what destinations and for what purpose. It is recognized that the accuracy of this information is problematic because it is based on recollection. Thus the data obtained is only an indication of and not necessarily an accurate representation of individual calling patterns. Real calling patterns can only be obtained from billing records; this was not done in this study for privacy reasons. In any case, the option of analyzing billing records exists only for a small percentage portion of the sample, the 26 percent of fixed phones owners and the 2 percent of post-paid mobile owners.

There is also over representation of 'unemployed' persons and 'housewives' in the sample. This could not have been avoided unless quota sampling was adopted by occupation categories.

One significant weakness of this study is that it does not study the financially 'unconstrained.' Sound conclusions about the behavior of the financially constrained can only be made if the financially 'unconstrained' are studied in comparison, that is, through a sample which also covers the SEC A's, and those with monthly incomes household over US dollars (USD) 100 per month. The study also does not look at non-users amongst the financially constrained, and how their non-use is associated with financial constraints. Furthermore, it is not possible to say whether behavioral patterns identified in this study are also relevant to the financially constrained in more developed markets, or are unique to the financially constrained of South Asia alone, without studying comparable data for those markets as well.

This research has served as a pilot from which LIRNE*asia* has increased its understanding of telecom use by the financially constrained, as well as identified areas that can be improved upon in the research, which has helped shape LIRNE*asia*'s 2006–2007 research in this area to better understand this use, in a larger group of countries in South and Southeast Asia.

Appendix 2

Supporting Information for Chapter 8

Table A2.1
Rural Telecoms Service (RTS) Maximum Tariffs and Default Interconnection Rates in Nepal

Service	Intra RTS Call originated & terminated on RTS system	Outbound STD Call originated on RTS and terminated on NTC[b]	Outbound ISD Call originated on RTS and transited by NTC[b]	Inbound STD or ISD Call originated on NTC or other network, terminated on RTS	ISD originated on RTS system after January 1, 2004—and not interconnected with NTC
Basic RTS Consumer Tariff [a, d]	9.0 NRs (USD 0.117)	9.0 NRs (USD 0.117)	Prevailing NTC ISD Rates, including surcharge rates (e.g., 30/60 NPR per minute) as per the NTC Tariff (see Annex 13 to RFA for RTS)	0 (zero)	Maximum prevailing NTC ISD tariff
Supplementary RTS Consumer Tariff [d]	0 (zero)	Equal to the corresponding NTC STD termination charge as per GI[e]		0 (zero)	Maximum NTC surcharge rates

Interconnection (termination) Charge payable by RTS to NTC[b]	N/A	The corresponding NTC STD termination charge as per GI[e]	NTC's prevailing ISD tariff minus 25% of the collection rate as per Clause 9.4.3(a) of the GI[f]	N/A	N/A
Interconnection (termination) Charge Payable to RTS[c]	N/A	N/A	N/A	Same as interconnection (termination) charges payable to NTC (under GI or future rules)	N/A

Source: Annex 17 to RFA for RTS.

Notes: [a] All tariffs are in rates per minute, unless otherwise indicated.
[b] Paid to NTC or other operator, unless different rate is mutually agreed.
[c] Payable by NTC or other operator, unless different rate is mutually agreed.
[d] Tariffs to be subject to price cap indexing after 2004 in accordance with Tariff Guidelines.
[e] Termination charges prescribed in Guidelines on Interconnection (GI).

N/A means 'Not Applicable'

Table A2.2
Technology Cost Guidelines of Nepali Least Cost Subsidy Auctions

Technology	Density/Application	Geography/Distance from Telephone Exchange	Cost Range per Line Including Accessories
Cable direct from urban switch	High and clustered (suburban communities)	Max 5 to 10 km radius	USD 250 to 1,000
Rural exchange or concentrator with wire network	Low/medium and clustered (small town or large village with good affordability)	As above, may serve clusters (for example, 100 subscribers) located more than 10 km from nearest exchange	USD 1,000 to 2,000 including trunk system and building
Fixed cellular and wireless	Medium/high not clustered	Medium area (<30 km radius per cell)	USD 500 to 1,500 heavily dependent on users per cell
Multi-access radio	Low but clustered (for example, more than five users per location)	Wide area (radius of several hundred km)	USD 1,000 to 5,000 varies widely with terrain and clustering
VHF/UHF single links	Low, no clustering and no satellite alternative	Medium-long distance (>25 km)	USD 10,000 plus
Satellite VSAT (stand alone)	Low, but most economic with some clustering (for example, justifying 2 to 3 lines)	Very large area, long distance (>200 km)	USD 3,000 to 8,000 plus USD 0.05 to 0.10/min 'space segment'
Integrated VSAT/WLL	Low, but serving larger distant communities or clusters (typically 10 to 50 lines in vicinity)	Larger area, but economic at shorter distances (for example, 100 km)	USD 1,500 to 3,000 plus USD 0.05 to 0.10/min 'space segment'
Mobile satellite (MSAT and LEOs)	Low, with no clustering	Very large area and long distances	USD 1,000 to 3,000 plus USD 0.50/min 'space segment)

Source: The World Bank Discussion Paper, No. 432.

APPENDIX 3

Supporting Information for Chapter 9

Bidding Process for the Provision of Rural Household Direct Exchange Lines (RDELs) in High Cost Specified Short Distance Calling Areas (SDCAs) in India

(i) The bidding process has been structured as 'Multi-layered Informed Descending Bidding Process'. The pre-qualification bid along with EMBG and the first Financial Bid will be submitted by the bidders in separate sealed covers. The first Financial Bids of those who qualify shall be opened and shall be made public in the presence of bidders' authorized representatives, carrying such authority/document with them.

(ii) The bidders can offer less than or equal to the benchmark for the front-loaded subsidy. Offers higher than the benchmark for the front-loaded subsidy, or where all the specified SDCAs in an SSA have not been bid for, shall not be treated as a valid bid.

(iii) The lowest valid offer for an SSA will determine the reserve price for the front loaded subsidy for each SDCA in an SSA for the second round. If there are more than four pre-qualified bidders for an SSA, the highest bidder will be dropped and others will qualify for the second round of financial bidding. If pre-qualified bidders are four or less, all will qualify for second round of financial bidding. If there is only one bidder with a valid bid, then that bidder will be declared as the successful bidder and there shall be no further round of bidding.

(iv) The bidders, except those last dropped, shall submit a Second Financial Bid for the second round. The bid amount in the second round will have to be equal to or lower than the 'Reserve Price' for each of the SDCA in the SSA and the bidder(s) quoting above the Reserve Price shall be disqualified for further round of bidding.

(v) All the bidders who have quoted less than or equal to the 'Reserve Price' for the front loaded subsidy for each of the SDCAs in an SSA in the second round of financial bidding will be short-listed. If there are three or more such short-listed bidders in an SSA, except the highest bidder, the rest will qualify for the third round of financial bidding. In case there are two bidders, both will qualify for the third round of financial bidding. In case there is only one short-listed bidder, then that bidder will be declared the successful bidder and there will be no further round of bidding.

(vi) The lowest valid offer for an SSA will determine the Reserve Price for the front loaded subsidy for each SDCA within an SSA for the third round. The bidders, who qualify for bidding for the third and final round, shall be required to submit the third and final bid for all specified SDCAs within an SSA for which they have qualified in the previous round. The bidder of the final round of financial bidding with the lowest offer for an SSA will be declared successful for signing of the Agreement.

(vii) In case of a tie in the conclusive round of bidding, the bidder who quoted lower amount in the previous round for an SSA shall be declared successful for signing of the Agreement.

(viii) In the event of a tie in the previous bidding for selection, the process of bidding will continue until a successful bidder emerges on comparison.

(ix) The signing of Agreement as a result of bidding process will not be treated and taken as grant of fresh License under the Indian Telegraph Act, 1885.

(x) If the Agreement is not signed with the successful bidder for whatsoever reason, the Administrator may decide to continue with the present bidding process till it is completed and the Agreement is signed with the successful bidder.

(xi) In every successive round of bidding, the bidders can only lower or retain the front loaded subsidy of their last bid. Withdrawal or backing out of their last quoted front loaded subsidy will attract forfeiture of EMBG.

Table A3.1
License Fees of Various Kinds of Telecom Operators in India

Type of License	Annual License Fee (% adjusted gross revenue)	Annual License Fees Excluding Present Level of USO (% adjusted gross revenue)
Cellular Mobile*	Type A – 10%	Type A – 5%
Basic Service	Type B – 8%	Type B – 3%
Unified Access Service	Type C – 6%/5%	Type C – 1%/0%
National Long Distance	15%	10%
International Long Distance	15%	10%
Global Mobile Communication by satellite	10%	5%
VSAT	10%	5%
Infrastructure Providers Cat II	15%	10%
Radio Paging Service Providers	5%	0%
Public Mobile Radio Trunked Service	5%	0%
Internet Service Providers	0%	0%
Infrastructure Providers Cat I	0%	0%

NOTES

1. Approximately INR 5,000 in India and LKR 10,000 in Sri Lanka at the time.
2. A standard classification, based on occupation and education level of the chief wage earner.
3. A maximum of five households were selected starting from one 'starting' household that was randomly selected from the electoral list.
4. The Kish Grid is a random sampling technique to select one respondent from many eligible respondents in a household. In this case, names, gender, and ages of all household members using phones (in the preceding three months) were recorded (in descending order of age). Based on the number of eligible respondents in a household and the household contact number (nth interview of each starting point), a random number sheet was used to select one of the many eligible respondents. This ensures that respondents selected are not skewed to any gender or age, but are reflective of reality.

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Editors

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Previously, Ayesha engaged in research assistance on infrastructural reform projects at the Ministry for Economic Reform, Science and Technology of Sri Lanka, as well as social research at the A.C.S. Hameed Peace Foundation. She holds a Bachelors degree in Economics from the London School of Economics.

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