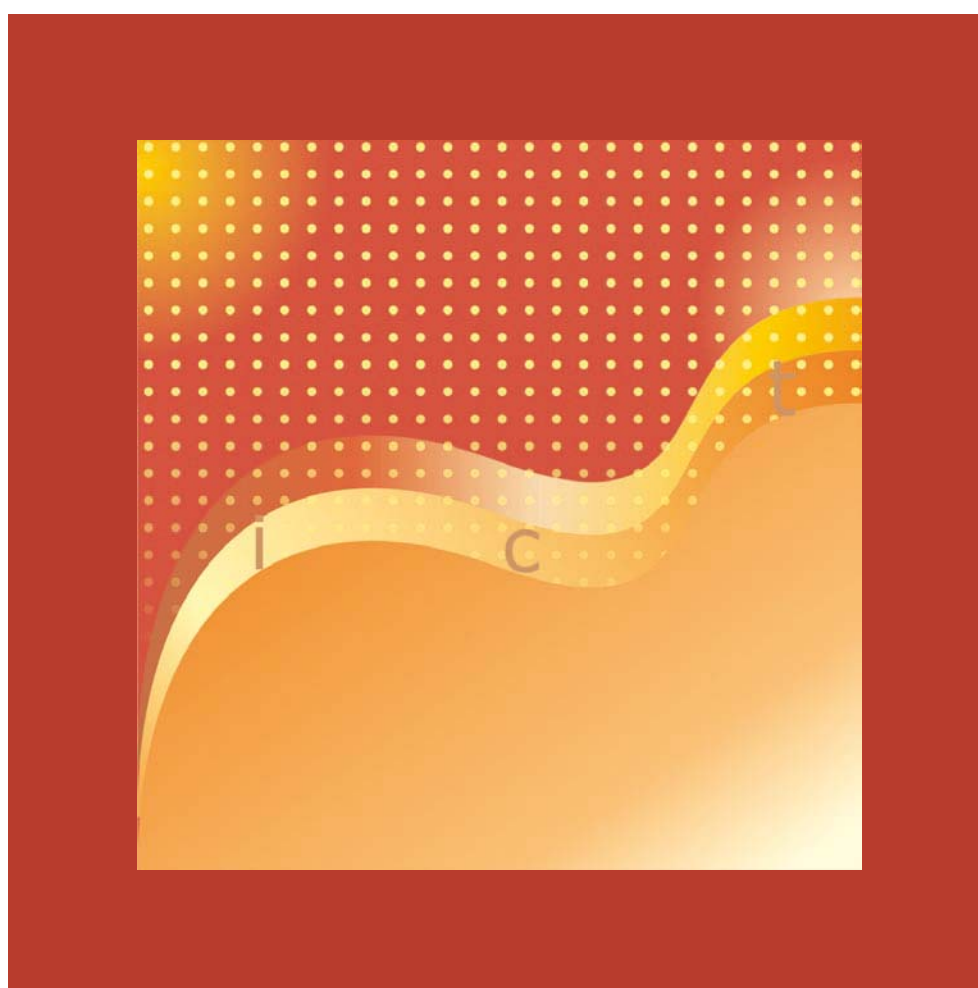


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Science and technology for development:
the new paradigm of ICT

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Chapter 6

MOBILE TELEPHONY IN AFRICA: CROSS-COUNTRY COMPARISON

A. Introduction

Mobile telephony is the most important mode of telecommunications in developing countries. While Internet access has become a reality for many businesses and public institutions, and for individuals with higher levels of education and income, for the vast majority of the low-income population, mobile telephony is likely to be the sole tool connecting them to the information society in the short to medium term.

In 2002, UNCTAD's *E-Commerce and Development Report*¹ considered the growth of wireless communications and their role in increasing ICT use by business and consumers – frequently referred to as “m-commerce”. A number of policy issues were discussed, including the liberalization of telecommunications markets, licensing new mobile operators, creating independent regulatory bodies that would establish a fair and competitive market for mobile services while supporting compatible standards, and facilitating interconnection among mobile services providers.

The discussion concluded that while e-commerce activities involving firms were mainly undertaken using fixed-line networks, individuals would find mobile services increasingly attractive as an entry point for using ICTs, either to order and purchase products and services – the so-called B2C context – or to improve their livelihoods through better communication in their communities and households. It was reported that there were still a number of obstacles to the provision of mobile services that needed to be overcome in developed nations, and in developing ones in particular. Most of those obstacles were related to practical problems in making electronic payments on mobile handsets and networks, and were linked to concerns about the security and privacy of transmitting personal and financial data.

Most importantly, the technical ability of mobile handsets to provide a rich Internet content has yet to match that of a personal computer using fixed-line broad-

band networks access.² This has led mobile providers to explore a different spectrum of services that do not necessarily compete with those offered by a personal computer with a fixed-line Internet connection. Some of those services may not directly result in immediate transactions but would enable or improve the conduct of activities such as intra-firm communication among management and employees, the implementation of sales and marketing programmes, and the provision of after-sales customer services.

In 2006, the UNCTAD *Information Economy Report* observed that mobile communications were growing at a remarkable rate in developing countries, and that mobile telephony continued to be the only ICT sector where developing countries were quickly catching up or even in some ways overtaking developed countries.

Mobile connectivity sidesteps some important obstacles to other types of connectivity, but most notably to the deployment of fixed-line infrastructure, which can be hampered by, among other things, cost and the remoteness of certain areas. In Africa, mobile phones have proved so successful that in many cases they have replaced fixed lines.

This chapter starts by looking at the origins and economic nature of mobile telephony. It describes several examples from developing countries where mobile telephony was used to enhance entrepreneurial and market efficiencies and therefore improve value creation and, ultimately, the economic welfare of their communities. The chapter then examines the development of mobile telephony markets in several sub-Saharan African countries and in doing so considers the main indicators for mobile telephony penetration rates, subscribers and the trend in mobile prices. It concludes by describing policies that Governments may consider in order to enhance the positive development implications of improved mobile telephony network coverage and a growing subscriber base.

B. Mobile telephony: stylized facts

1. Origins and effects

Mobile telephony was invented by AT&T in 1947. Initially known as “radiophones”, the technology developed from exchange-based radio links systems to cellular networks during the 1980s.³ Cellular networks were developed to allow users to move from one cell – and its geographical coverage limit – to another cell without a break in the call, as a result of which true mobile telephony was made possible. The first-generation commercial mobile networks were the analogue Nordic Mobile Telephone system and the Nippon Telegraph and Telephone system, which were introduced in 1979 and became fully operational in the early 1980s.

These “1G” networks were replaced by digital “2G” networks which allowed greater call capacity. 2G digital networks and handsets also reduced power consumption and thus enabled their miniaturization and portability. The invention of the modern mobile handset is often attributed to Martin Cooper of Motorola.⁴ Today, we are witnessing the deployment of 3G networks and handsets that are intended to enable the reception and transmission of broadband data that, in turn, enable mobile Internet connectivity and the development of content-intensive services.

Mobile telephone technology has enabled relatively low network build-out costs and these have resulted in the rapid growth of mobile telephony to the point where it is growing significantly faster than fixed telephony, both globally and in developing countries.

Table 6.1 contains data for 2001 and 2005 that confirm those observations. Table 6.2 provides a comparison by continent of mobile teledensity, described as the number of subscribers per 100 inhabitants, for the years 2002 and 2006.

The year 2001 may be seen as an interesting baseline year as already in 2002 mobile subscribers overtook fixed-line subscribers worldwide (ITU, 2003). In 2005, the worldwide number of mobile phone subscribers passed the two billion mark, with Asia accounting for more than 40 per cent of them. Private research estimates that by the end of 2006 the number of global mobile phone subscribers was approximately 2.6 billion.⁵

In developed countries growth in the mobile phone industry will come from the increased offer and use of innovative services, from SMS and affordable roaming to Internet access and music downloads. For example, it is expected that more than one third of all Europeans will have Internet-enabled phones by 2010 (Kelley and McCarthy, 2006), while a recent survey indicates that 29 per cent of Internet users in France, Germany, Italy, Spain and the United Kingdom regularly access the web from their mobile phones, compared with only 19 per cent in the United States.⁶

Mobile connectivity is very much responsible for the current surge in ICT utilization and, as such, introduces science, technology and knowledge (STK) inputs into value-creation processes in such sectors as industry, services, health and cultural and government services. The actual implementation and effect of mobile technologies within a specific process or value chain will differ. Businesses may see measurable pro-

Table 6.1

Growth in the number of mobile telephone subscribers worldwide, 2001-2005

	Mobile subscriptions	Mobile subscriptions	Absolute change	% change	Source of growth
	2001	2005	2001 – 2005	2001 – 2005	2001 – 2005
Developing countries	388 674 941	1 167 050 600	778 375 659	200.26	65.28
Africa	26 091 686	134 296 038	108 204 352	414.71	9.07
Asia and Oceania	278 511 819	793 375 236	514 863 416	184.86	43.18
Latin America and the Caribbean	84 071 436	239 379 326	155 307 890	184.73	13.03
Transition economies	22 325 131	185 068 576	162 743 445	728.97	13.65
Developed countries	553 610 317	804 830 507	251 220 190	45.38	21.07
World total	964 612 390	2 156 951 688	1 192 339 293	123.61	100.00

Source: UNCTAD summary based on the ITU World Telecommunication/ICT Indicators database.

Table 6.2
Mobile subscribers per 100 population worldwide in 2002 and 2006

	Subscribers per 100 pop.		% change
	2002	2006	2002 – 2006
Developing economies	11	29	179
Africa	4	21	356
Asia	11	28	162
Latin America and the Caribbean	19	53	183
Transition economies *	12	69	479
Developed economies	64	91	42
World	19	41	116

Source: UNCTAD summary based on the ITU World Telecommunication/ICT Indicators database.

* South-East Europe and CIS

ductivity improvements and managerial efficiencies. Governments may move closer to established goals of universal access, and communities may improve their welfare through better self-organization and improved empowerment, the latter being achieved by diversifying and improving the quality of their sources of information.

2. Accessibility of mobile telephony

Schemes that make mobile telephony more accessible and affordable have contributed to the growth of mobile services in developing countries. From a business model perspective and technology perspective, the advantages of mobile telephones are twofold. The first is that they enable prepayment and thus do away with the need to establish post-paid accounts and the financial infrastructure that enables such accounts, thus avoiding problems with non-payment. This advantage is doubly important in regions where large populations would not necessarily qualify as creditworthy because of their relative poverty. The second advantage is that the technology enables a fairly rapid development of the supporting wireless network and thus overcomes the drawback of inadequate fixed-line infrastructures. As a result, near-zero waiting times for new mobile subscriptions are common – at least once the network is in place – and represent a dramatic improvement in the wait and cues for fixed-line accounts. In many countries prepaid services are used to provide mobile public payphones, which improve connectivity and accessibility in rural areas.

For example, in 2004 almost 88 per cent of mobile subscribers in Africa used prepaid services that were tailored to low-income markets (ITU, 2006). However, prepaid fees are higher than post-paid ones, and this underscores the fact that low-income users need access at low prices. Other important factors that have contributed to the popularity of prepaid services are the ability to control costs, and, when savings and earnings are low, using the handset and network to only receive calls. Of equal importance are the reduced requirements for sign-up, as there is no need to submit often non-existent financial or physical data on, for example, bank accounts or postal addresses. Furthermore, prepaid mobile services do not typically require credit checks and do not propose long-term service contracts, as a result of which they are available to people who do not have steady income streams. Finally, prepaid mobile services reduce the amount and expense of various administrative activities for mobile operators as they do not need to engage in billing and money collection, and do not need to risk-manage their exposure to non-payment. While the absolute numbers of prepaid subscriptions may increase, their relative share in mobile accounts will decrease as a result of the interaction between a maturing mobile market and the developing economy.

While the question of whether fixed-line and mobile services are complementary or competitive substitutes is inconclusive in developed country markets (Madden and Coble-Neal, 2004), in many developing countries mobile telephones are generally a substitute for fixed-line telephony. This is a result of not only the low fixed-line penetration rates but also the substandard

quality of service and long delays for obtaining fixed-line subscriptions. Competition in mobile telephone markets contributes to lower access costs and introduces innovation for the benefit of users. For example, the growth of mobile telephony in Asia is, in part, due to highly competitive markets, and this has led to lower prices for calls and mobile handsets. In fact, enhanced competition positively affects mobile teledensity in developing countries in general (World Bank, 2006).

3. The economic context of mobile telephony

The underlying proposition is that, of all ICTs, mobile telephony has the most immediate potential to stimulate growth in the developing countries, and especially in Africa, in particular in sectors where entrepreneurship and access to market information are important factors used to create value and economic benefit.

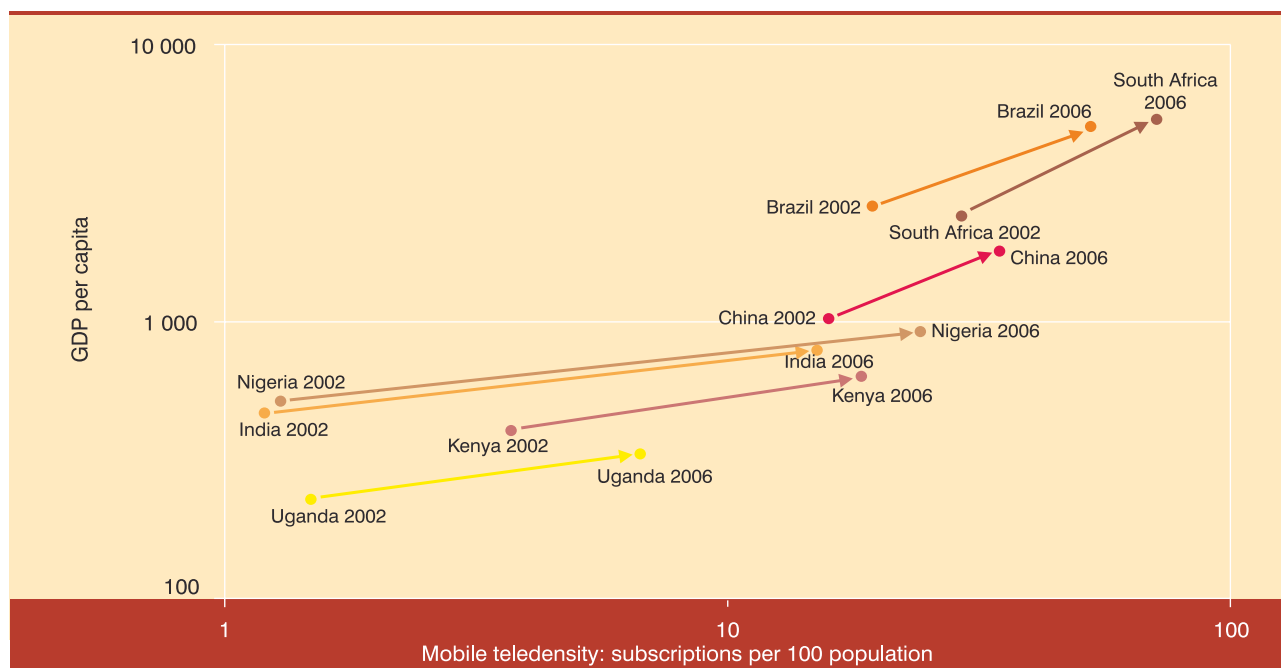
Mobile telephony has real economic consequences, particularly for micro-entrepreneurs. The relevance of mobile phones for small businesses in developing countries was noted in UNCTAD's *Information Economy Report 2005*, which suggested that the importance accorded to those economic benefits is reflected in the larger share of income that developing country users

spend on telecommunications as compared with users in developed countries. Like any other ICT investment, mobile telephony can lead to economic growth in several ways. Investment in network infrastructure and related services creates direct and indirect employment opportunities. The use of mobile telephony in the conduct of business reduces the costs and increases the speed of transactions. Those effects will be more pronounced for economic activities that have a greater need for information or where added information enables increasing returns to scale.

There is a broad consensus in current literature that the introduction and the growth of mobile telephony have important economic effects for developing countries, however much estimates may vary and methodologies differ. Hausman (2002) suggests that mobile telecommunications services create very large gains in consumer welfare. Aochamub, Motinga and Stork (2002) consider that there is an important bidirectional relationship between growth in the telecommunication sector and economic development. Thompson and Garbasz (2007) found that countries with less developed ICT use, and therefore emerging mobile services markets, may experience stronger feedback of growth in mobile ICT use into general economic growth. Keck and Djiofack-Zebaze (2006) analysed the relationship between mobile use and

Chart 6.1

Mobile teledensity and GDP per capita



Source: UNCTAD summary based on the ITU World Telecommunication/ICT Indicators database and UNCTAD Globstat database.

growth in African member countries of the WTO, and suggest that increasing access to mobile networks by 1 per cent may translate into a 0.5 per cent increase in real GDP per capita. Chart 6.1 presents a comparison between the growth of mobile teledensity and GDP per capita in several developing countries.

While overall mobile price trends are downward, Africa still suffers from higher prices compared with the world average. Enhanced competitiveness, as measured by the number of operators, may work to adjust prices towards global prices and thus improve penetration rates. Regulation aimed at securing affordable rates and improvements in quality of service should also reduce regulatory uncertainty for mobile operators and promote investment. The fact that mobile markets have eclipsed the fixed-line sector in developing countries may be better explained by new investment and the increasingly competitive nature of mobile telephony markets. Overall economic growth and development may be playing a role in the adoption of mobile telephony. However, most of the recent literature explores how technology affects growth and development, and not the other way around.

The general UNCTAD policy recommendation that ICT adoption be part of an integrated e-strategy and overall national development strategy is equally tabled in current literature. Unless policymakers accept and implement that recommendation, it is unlikely that investments in mobile services will bring economic and social development to Africa and, in particular, to its rural areas. Transport and financial services, education and health are among the many necessary and complementary elements for successful development policies with important ICT and e-strategy components.

4. Use of mobiles

In developing countries the potential impact of mobile telephones is quantitatively different from that in the developed world. For the developing world mobiles have become an essential entry point into the information society. Mobile telephony is the critical tool that creates business opportunities, enables efficient sharing of information and intelligence, and empowers households and communities to stay connected. That said, it is still mainly the booming urban communities that are best served by mobile providers in developing countries.

Mobile telephones can also be used to facilitate or even generate business since they provide an opportunity to

check current market prices for agricultural and other commodities relevant to rural economies, and currency rates, as well as to confirm payments, enquire about weather patterns, and more generally keep in touch with customers and stay informed about transport logistics.⁷ For example, in Uganda, improved market and price information using short message services (SMS) on mobile telephones has diminished the role of middlemen and has resulted in an increase in farmers' and fishermen's income as their bargaining power.⁸ A selection of the various modes of use of mobile telephones is presented in more detail in box 6.1.

Both Sinha (2005) and Meso, Musa and Mbarika (2005) explain that lower absolute penetration rates of mobile subscriptions in developing countries must not be taken literally, and consequently their impact on society should not be underestimated. In developed countries the operational model for mobile telephony is one of individual ownership of one or more subscriptions. However, in developing countries, because of their portability and ability to function using prepaid subscriptions, mobiles can be shared in terms of access and payment, with the positive side effect of reinforcing community linkages.

The Grameen Phone company is perhaps the best-known example of community use models. Owned by the micro-credit pioneer Grameen Bank and the Norwegian telecom Telenor, Grameen Phone set out in 1997 to bring telephones to rural Bangladesh. Today, it is the largest mobile telephone provider in the country. The Village Phone Program offers access to telecommunication services in remote, rural areas to people who normally cannot afford to own a telephone, while providing more than 200,000 women Village Phone operators in rural areas with an income-earning opportunity.

In the United Republic of Tanzania, the mobile operator Vodacom has a similar initiative, called Simu Ya Watu (People's Phone). Its aim is to create public call stations using the mobile network to provide public fixed telephones. The service is aimed specifically at rural and densely populated, but under serviced, areas of the country. The business model requires the involvement of local entrepreneurs who purchase a single or multiple call line unit, and is said to be designed for shops, restaurants and other business establishments with fixed premises that would like to offer public call services to their customers. The benefits for customers would be lower and more flexible call charges and the ability to make phone calls without owning a mobile telephone.⁹

Box 6.1

Examples of mobile telephone use in a development context

Every day a new example of innovative and productive mobile telephony use in developing countries surfaces in the media. What is interesting about many of them is their focus on the economic realities of everyday life. What follows is a diverse selection of various activities that is by no means exhaustive but only illustrative of the possibilities that ICTs create for economic development. Their common linkage is how mobile technology affects better information and financial flows that reduce market inefficiencies and improve the earnings of users and their communities.

Mobiles improve earnings of fishermen in Kerala, India*

An abundant catch of fish for Kerala fishermen usually meant that local beach market prices would be low. Fishermen then faced the dilemma of accepting a smaller return on their time and effort, or investing additional labour and fuel – and taking the relevant risks – to seek opportunities in a more distant market where the local catch might not have been so good and therefore the prices were possibly higher.

According to Jensen (2007), on average 5 to 8 per cent of the total catch ended up being thrown away. At the same time, owing to information inefficiencies, some fish markets were undersupplied and prices of fish varied substantially along the Kerala coastline. Since mobile telephones were introduced in Kerala in 1997, anecdotes have surfaced about how fishermen used them for price discovery and inventory management: how much fish to catch and to which of the beach markets to take the catch. However, Jensen's research adds a formal microeconomics analysis to existing anecdotal evidence.

Having access to information about catch volumes and beach market prices at various locations resulted in fishermen taking on the additional risk of venturing beyond their home markets, the final result being a reduction in catch wastage and in price volatility. Thanks to improved market efficiency, fishermen's profits rose by an average of 8 per cent while fish prices fell by 4 per cent thus benefiting consumers. Improved earnings more than compensated for the cost of the mobile telephone handsets and subscriptions. The enhanced flow of information helped local markets work more efficiently and, consequently, improved welfare.

Mobile telephones for weather and market information for farmers in Rajasthan, India**

The timing of the annual onset of the often unpredictable monsoon rains is crucial for the farming communities of Rajasthan as it dictates when they should sow their crops and when to take their produce to market. The accuracy of the forecast is critical for the Indian economy, and the timing and intensity of the monsoon can have significant effects on Indian GDP. While farmers in the past relied on faith and ceremony to perceive the nature of oncoming monsoons, mobile technology is today taking the lead in the form of a pilot scheme launched in June 2006 by Reuters India. A local-language text message service offering weather and market price information will be offered to 200 farmers in the state of Maharashtra. Following the trial, a full roll-out will be offered, targeting farmer landowners with three acres or more and an average annual income of \$2,000.

According to Professor Venkata Reddy, Associate Professor of Marketing at the University of Agricultural Sciences in Bangalore, market inefficiencies due to a lack of information result in a waste – totalling up to \$12 billion – of India's fruit and vegetable production. Farmers are not aware of market conditions and prices in neighbouring markets and therefore do not venture to invest to diversify their distribution network. In order to be successful, the Reuters service will need to overcome the relatively poor coverage of mobile networks and the dearth of handsets in rural areas: less than 2 per cent of the 100 million mobile phones in India are owned by people living in rural areas.

Local agricultural content in Uganda***

In Uganda the CELAC (Collecting and Exchanging Local Agricultural Content) project is helping farmers organize their production and distribution using information provided through mobile telephone technology. Under this scheme, farmers regularly receive and send vital information from their network and other networks affiliated to them. For example, WOUNET (Women of Uganda Network) assists by translating information into local languages for farmers based in northern Uganda. In the past farmers in rural Uganda relied heavily on agricultural extension workers for knowledge support regarding their livestock or crops. Unfortunately, the experience was often not timely and frequently lacking. Community radios that would have helped to bridge the vacuum also suffered from coverage problems and did not provide possibilities for feeding back information into the network.

To remedy that problem, the CELAC project collects and exchanges local agricultural information using diverse technologies, media and networking opportunities. According to the project organizer, the Busoga Rural Open Source and Development Initiative, CELAC aims to benefit in particular women farmers. It uses various information and communication technology (ICT) methods to foster knowledge-sharing in an effort to enhance poverty reduction and food security, especially among women farmers. Regarding mobile technologies, the project uses SMS to send text messages on local agro-related information to the project's database of phone numbers every Monday. This service is designed for farmers, community development workers, agricultural extension workers and any other interested persons. CELAC has its own website that is used to share information on the crop and animal farming practices that have proved successful among Uganda's farmers. CELAC uses open development mediums, in particular free and open-source software for knowledge-sharing and information management and encourages the use of empowering participatory development frameworks methods enabled by ICTs.

Box 6.1 (continued)**Boosting profits using mobile telephones in South Africa******

About a hundred rural African farmers from the Makuleke region in South Africa are experimenting with mobile technologies in order to access information about market conditions in Johannesburg. This reduces the need to travel and move inventory, with frequent and substantial waste and pilferage during the nine-hour “share-taxi” voyage, and with little certainty as to sales and income. Using a virtual trading facility installed on mobile phones provided by the project sponsors, Vodacom, farmers can sell their produce directly from their small farms.

By checking prices in the Johannesburg markets by mobile telephone, farmers can avoid paying excessive commissions to intermediaries. At the same time they are able to negotiate from an improved position, fully aware of market and price conditions, and with a consequent reduction of the information divide between them and larger industrial farmers. With mobile telephone use growing rapidly, the exaggerated information asymmetries caused by rural isolation and poverty will, if not disappear, at least be substantially reduced.

Senegal market information on mobile telephones*****

In May 2005, the Senegalese company Manobi established a commercial trading platform for farmers and fishermen. The platform allows users to access information on the Internet and through Internet-enabled phones as well as by requesting price data and trading using simpler SMS text messages. The SMS version of the platform, Xammarsé, was developed in partnership with Sonatel (principal telecommunications provider of Senegal), the Ministry of Commerce and the National Agricultural Saving Bank.

More than 3,400 producers, middlemen, traders and hotel keepers receive by SMS daily data on the prices of products of interest in selected local markets. About 5 per cent of Xammarsé users typically will make additional SMS requests to receive price updates. Better information allows farmers to improve their negotiating position with middlemen and increase their earnings. To gather data, Manobi employees conduct daily surveys in Dakar’s markets using pocket computers and mobile connections. Mobile technology enables them to store up to 15,000 data entries per day and thereby keeps the Xammarsé database permanently updated.

Mobile telephone services and microfinance in Kenya*****

Microfinance is the provision of financial services to poor people. Micro-credit, micro-savings and micro-insurance are essential support services to enable poor people to trade and take part in the mainstream economy. Realizing the potential of mobile technology for extending financial services beyond urban areas, Vodafone/Safaricom in 2003 initiated a pilot mobile-telephone-based project in Kenya. While the initial objective was to create efficiencies to reduce the cost of loan disbursement and recovery, the technology was found by users to be convenient for person-to-person transfers. Since early 2007 the project has been commercialized and is currently subscribed by more than 175,000 users.

To implement this scheme, Vodafone/Safaricom partnered with the Commercial Bank of Africa, Citibank, DFID-FDCF and the Faulu micro-finance company to design and test M-PESA micro-payment platform. M-PESA allows customers to use their mobile telephones like a bank account and debit card. Customers credit their accounts with their prepaid time vendor and can, in addition to spending their credit on calls and messages, transfer funds to another subscriber, or make small or micro-payments for goods and services without the need for cash.

* http://www.economist.com/finance/displaystory.cfm?story_id=9149142; Jensen (2007); <http://www.ncaer.org/downloads/lectures/popup-pages/PressReleases/popuppages/PressReleases/7thNBER/RJensen.pdf>.

** <http://business.timesonline.co.uk/tol/business/markets/india/article691684.ece>; <http://www.nextbillion.net/blogs/2006/08/01/in-india-weathermen-are-the-new-priests>.

*** <http://www.celac.or.ug/>; <http://blogs.bellanet.org/index.php/?archives/198-Farming-on-mobile-phones-in-rural-Uganda.html>; <http://www.comminet.com/experiences/pds2006/experiences-3873.html>.

**** <http://digital-lifestyles.info/2005/07/05/african-farmers-boost-profits-with-mobile-phones/>; <http://www.nextbillion.net/newsroom/regional/subsaharanafrika>.

***** http://www.ictparliament.org/CDTunisi/ict_compendium/paes/senegal/SEN05.pdf; http://www.manobi.net/news.php?M=5&SM=2&idnews=2006_01_02_manobi&lang=en; <http://www.manobi.net/>.

***** <http://www.financialdeepening.org/default.asp?id=694&ver=1>; http://www.vodafone.com/start/responsibility/our_social___economic/socio-economic_impact/micro-finance.html; <http://www.iht.com/articles/2007/07/08/business/micro09.php>; <http://www.nextbillion.net/newsroom/2007/07/09/in-poorer-nations-cellphones-help-open-up-microfinancing>.

Besides voice and SMS communication, beeping – ringing a number according to a pre-agreed code (e.g. one beep or ring would mean “I have arrived”) and hanging up before the call is connected – is often used when incomes do not permit the luxury of completed calls.¹⁰ As beeping is not charged it allows a certain redistribution of wealth to lower-income users as they free-ride the established mobile infrastructure. It is the least costly form digital communication and will be found anywhere where consumers are highly price-sensitive. However, its content is not as meagre as it initially seems. Each time a call is beeped and missed the mobile handset logs the calling number (i.e. identity) and the time of the communication.

Building on discussions of various modes of use and ownership models, Donner (2005) points out that much of the current research tends to relate more to urban users. Empirically, this makes sense, given that the urban milieu has been the cradle of mobile growth and information would be easier to obtain. However, by focusing on urban users in the developing world, researchers may underestimate the true development impact of mobile use. Such discussion may lead to questioning the utility of mobile telephony for the rural environments by arguing that most rural communication is local. Other issues raised are that public mobile and shared mobile telephones can be unreliable and frustrating for users. Also, non-voice services may be a red herring for rural populations, given lower literacy levels, and policy should refocus on voice-based communication rather than SMS and Internet-based e-mail. Because many economically disadvantaged users may not be mobile – for example, subsistence farmers – the quality of mobility in mobile telephony may be less relevant than usually assumed.

The examples in box 6.1 provide evidence that dispels to a certain extent such short-sighted notions and advances our understanding about just how interdependent, and therefore interconnected, rural communities may be. They also remind us of the role and value of information for productive efficiency even in the oldest and most iconic of all economic ventures, namely fishing. Fishermen, farmers, SMEs and large-scale businesses all require information for decision-making. In order to provide products and services to customers, knowledge-based systems based on appropriate technologies can be used even in the most turbulent environments and sectors. The ability of farmers and fishermen alike to forecast changes in weather and in other natural occurrences and prepare timely responses will determine their success. This ability is tied solely to their capacity to retrieve

useful information, and therefore the enabling role of ICTs and mobile telephony in particular should not be underestimated. Indeed, mobile technologies today provide the building blocks for enhancing the productive capacity of all economic sectors in developing countries.

5. Mobile telephony and GATS

Commitments in telecommunications services were first made during the Uruguay Round (1986–1994). In extended negotiations during 1994–1997, members of the General Agreement on Trade in Services (GATS) successfully negotiated on basic telecommunications services. Since then, new commitments have been made either by new members, upon accession, or in a unilateral fashion by an existing member. These commitments are still guided by the WTO Reference Paper on Regulatory Principles for Basic Telecommunications that was produced by the WTO Negotiating Group on Basic Telecommunications and contains definitions and principles for national regulatory frameworks for basic telecommunications service.¹¹ The Reference Paper is a negotiated text containing a summary of regulatory principles and definitions which a number of WTO member countries have incorporated into their GATS commitments for telecommunications.

The broader significance of the Reference Paper is that many countries regard it as a model for regulatory frameworks for telecommunications services that could also be regarded as a best-practice example for other service sectors. More specifically, the Reference Paper establishes a common set of regulatory principles relevant for opening telecommunication markets to competition. These include eliminating restrictions on interconnection, establishing and maintaining the independence of regulatory authorities, and public availability of licensing criteria. It has been suggested (Satola, 1997; International Chamber of Commerce, 2005) that Reference Paper implementation would be an important element for attracting investment in the telecommunications sector of developing countries, and thus Governments establishing national telecommunication legal and regulatory framework should use it as their lead reference.

C. Country analysis

1. Mobile telephony in Africa

The growth in the number of mobile subscriptions in Africa has indeed been swift as table 6.1 indicates. According to ITU statistics, between 2000 and 2006 the number of mobile subscriptions increased more than 12 times, from 15,633,872 to 189,497,105 and in 2006 represented approximately 62 per cent of total mobile and fixed-telephone subscriptions. By 2006, all African countries had active mobile services operators, compared with only one out of five in 1993. In spite of such progress, the number of telephones per 100 inhabitants is still low, since approximately 80 per cent of the African population lives in rural areas to which mobile networks and services do not extend. Consequently, the extension of mobile services into rural Africa may be an important component for continued growth and acceleration of ICT use. However, the rapid growth of mobile telephony in Africa emerges from initially very low penetration rates.

Even if mobile penetration in African urban conglomerations may be near the averages found in other developing countries, improving rural penetration is a more daunting task because of inherent difficulties caused by the lack of distribution channels, education and poverty (Anderson, 2006). Still, when we consider teledensity intensification in Africa, it is easily the fastest growing region in the world to the extent that between 2000 and 2005 the expansion of new mobile subscriptions equalled the number of fixed lines that were built in the past 100 years (ICT4D, 2005). On the demand side, commonly cited contributory factors are the decrease in relative prices of handsets, calls and connection charges and the use of more affordable second-hand handsets and equipment, inexpensive handsets specifically designed for low-income countries and the lower level of ICT skills required in order to operate a handset, compared with using the Internet. On the supply side a quicker return on investment, easier resolution of geographical obstacles and the simplicity of the prepayment model are often noted (Engvall and Hesselmark, 2005; Waverman, Meschi and Fuss, 2005).

The prices of mobile services will remain relatively high for local incomes in developing countries, as certain cost components (e.g. network hardware) will be sourced at global prices, and this will have a negative effect on access and affordability. In response,

solutions such as mobile phone sharing or new services such as mobile payphones¹² are being introduced to increase access. However, the most important impact on increased access and affordability will come with greater investment in the mobile sector. Box 6.2 describes an interesting example of investment and entrepreneurial activity in the African mobile sector.

To examine the development of mobile markets in Africa several datasets will be considered. Mobile penetration rates, the number of mobile subscribers and the trend in mobile prices will be examined in four countries of the sub-Saharan region, namely Kenya, Nigeria, South Africa and Uganda. Those countries were selected because they provide four examples of possible approaches to mobile market development and policy, and the outcomes point to varied mobile telephony adoption indicators and growth rates, thus illustrating the general discussion of underlying trends and relationships with country reviews in some detail. The supportive data, if not indicated otherwise, are based on indicators for mobile telephony from the ITU World Telecommunication ICT Indicators database.

2. Nigeria

Overview of the telecommunications sector

As recently as 2001, Nigeria was one of Africa's most underserved telecommunications markets. Today it is one of the fastest-growing mobile markets in the world, with a 125 per cent average annual rate of growth in the number of subscribers for mobile and fixed lines. In the past three years, there was a dramatic decrease in waiting lists for telephone lines and a reduction in local, national and international telephone tariffs, which are currently the lowest in Africa. Furthermore, mobile operators have started targeting residential and business customers, changing the landscape of the telecom market and contributing to the development of Nigerian economy.

Before the liberalization of the Nigerian telecommunications sector, telephone lines were scarce and expensive, and waiting times were long. In 1992, the Nigerian Communications Commission (NCC) was established to improve consumer service, begin with the deregulation of the telecommunications industry and introduce greater competition in the sector. In 1999, the federal Government decided to pursue a more aggressive mobile telephony development policy, as a result of which, if one is to judge by the number of mobile

Box 6.2

Investment in African mobile telephony: the case of Celtel*

Celtel was founded by a Sudanese-born British Telecom engineer, Mohamed Ibrahim, in 1998 and is today owned by Mobile Telecommunications Company (MTC), a Kuwait-based telecom firm operating in 21 countries and providing telephony services to over 20 million subscribers.** Early on, Celtel correctly assumed that people felt the need to communicate with each other equally in Africa as anywhere else, but that Africans felt frustrated because of underdeveloped fixed-line telephony. Mobile telephony was able to satisfy this pent-up demand, and Celtel moved to invest in the first mobile networks in Uganda and Zambia in the late 1990s.

Realizing that roaming interconnectivity was crucial for many African subscribers whose family, social and business communities transgress political borders, MTC/Celtel launched in 2006 its «One Network» borderless network for East Africa. One Network enabled its subscribers in Kenya, Uganda and the United Republic of Tanzania to use their subscriptions in any of those countries to make calls at local rates without roaming surcharges, as well as to receive incoming calls free of charge and recharge their prepaid accounts with any of the local top-up cards. In June 2007 One Network was being extended to six more African countries, the plan being to ultimately provide a seamless network in all 15 African countries of operation.

MTC and Celtel, before and after the acquisition, are examples of successful private sector investment and operation in the mobile telephony sector in developing countries. Celtel has to date invested more than \$750 million in Africa and has influenced the continuously improving perception of Africa as a continent of investment opportunities. According to its founder Mohamed Ibrahim, as recently as 1998 nobody was keen to invest in sub-Saharan Africa apart from South Africa. The negative image of this region, which is conveyed by the daily difficulties facing its impoverished people, led to a greatly exaggerated perception of investment risk.

* See <http://www.celtel.com/en/our-company/leadership/mo-ibrahim/index.html> ; <http://www.celtel.com/en/our-company/index.html> and http://www.moibrahimfoundation.org/downloads/news/TheEconomist_240507.pdf.

** MTC is a public company listed on the Kuwait Stock Exchange with market capitalization exceeding \$25 billion. Through its Celtel acquisition, MTC now operates in 15 countries in Africa: Burkina Faso, Chad, Congo, the Democratic Republic of the Congo, Gabon, Kenya, Madagascar, Malawi, Niger, Nigeria, Sierra Leone, Sudan, Uganda, the United Republic of Tanzania and Zambia.

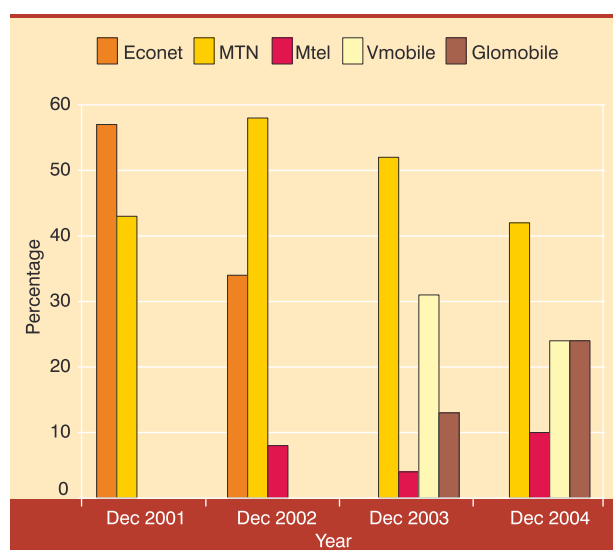
operators and licence issues, Nigeria may now have the most liberalized telecoms market in Africa.¹³

The first mobile licences were issued in 2001 to Econet Wireless Nigeria and MTN Nigeria Communication. A year later a third company – Mtel – entered the market, followed by V-mobile and Glo Mobile in 2003. All operators were fully established by 2003, after two years of testing and market research. As chart 6.2 indicates, in 2002 MTN took the lead in the mobile sector and was soon followed by Econet.

While the mobile sector experienced unprecedented growth, the fixed-line market serviced by the monopoly provider Nigerian Telecommunications Ltd (NITEL) remained stagnant, owing to lack of infrastructure investment as well as administrative and bureaucratic inefficiency. After prolonged difficulties and delays in the privatization process, which had started in 1999, NITEL was finally sold to Transcorp in 2006, together with its mobile subsidiary, Mtel.¹⁴ Late in 2002, the NCC granted Globacom a license for a second national operator in order to improve competitiveness by providing an alternative network to the, at the time,

Chart 6.2

Mobile telephone market share from 2001 to 2004



Source: NCC (2005).

government-owned NITEL. Globacom paid the \$200 million required for the license, which gave it the right to operate a national carrier service, digital and mobile services, long-distance connections and fixed wireless access services. NITEL remains the dominant fixed-telephone operator with 556,590 connected lines (76.8 per cent of the total).

Between 2001 and 2004, Nigerian Communications Commission has issued 523 new telecoms licenses of various types, including many that commission companies to invest in developing parts of the physical network, interconnections and exchanges. However, not all of these licences have become fully operational and many types of licenses are held by a single company.

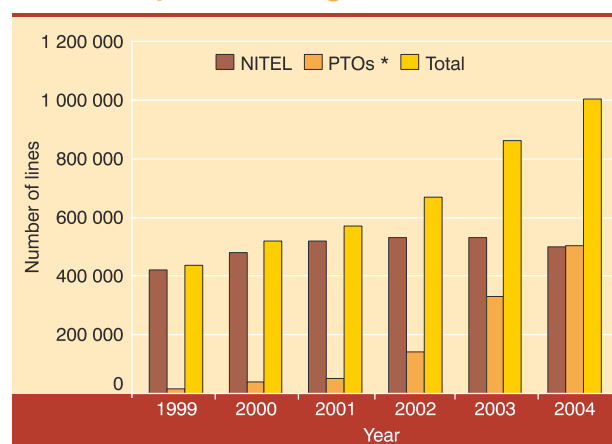
Today in Nigeria there are approximately 30 fixed and mobile service companies, including four GSM operators, as well as at least 80 Internet Service Providers (ISPs) and VSAT companies. Table 6.3 shows the growth in the number of operators in Nigerian telecommunications sub-sectors.

Mobile market development

The introduction of several operators in the mobile industry has fostered development and enhanced operators' competitiveness, which has had a positive effect on the entire telecom sector. The main outcome has been a major increase in the number of mobile subscribers. Towards the end of 2004, there were 10.2 million active mobile telephone subscriptions compared with 3.1 million in 2003, representing an increase of 291 per cent over the previous year. The increase of fixed-telephone lines connected during the same period was less spectacular, growing by 17.8 per

Chart 6.3

Fixed and mobile telephone lines and subscriptions in Nigeria, 2001-2004

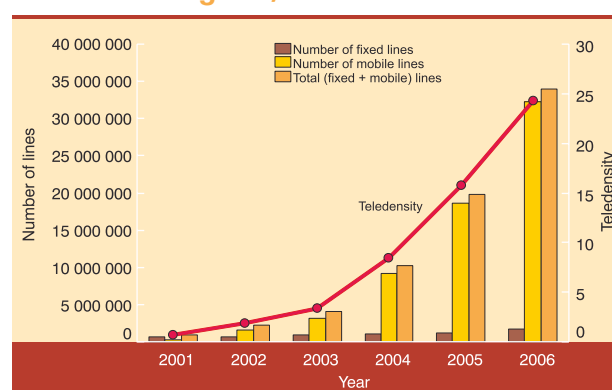


Source: NCC (2005); ITU World Telecommunication/ICT Indicators database.

* PTOs = public telecommunications operators.

Chart 6.4

Teledensity and subscriber growth in Nigeria, 2001-2004



Source: NCC (2005); ITU World Telecommunication/ICT Indicators database.

Table 6.3

Number of operators and service providers in Nigeria

Service category \ Year	1999	2000	2001	2002	2003	2004
National carriers	1	1	1	2	2	2
Mobile (GSM) telephony	1	1	3	3	4	4
Fixed telephony	9	16	16	17	20 **	24 ***
VSAT networks	N/A	N/A	N/A	N/A	51	52 *
Internet services	18	30	30	35	35	36
Total	29	48	50	57	112	118

Note: * confirmed, ** including 3 fixed wireless access (FWA) operators; *** including 6 fixed wireless access (FWA) operators.

Source: NCC (2005).

cent from 872,500 subscriptions in 2003 to one million in December 2004. As a result, teledensity increased significantly from 1.89 per 100 inhabitants in 2002 to 3.36 in 2003. Chart 6.4 shows the growth in the total number of connected phone lines (fixed and mobile) and teledensity in Nigeria.

The growth of the mobile sector has resulted in a decrease in mobile tariffs and prices, wider coverage, better quality of service and more innovative products, as well as improving employment opportunities. When Nigeria liberalized its market in 1999, telephones were neither available nor accessible to the majority of the population, partly owing to the high tariffs charged by NITEL. In 2001, with the entry of two private mobile operators, MTN and Celtel, in competition with the incumbent Mtel, mobile prices quickly dropped to below the prevailing mobile and fixed-line range, with a consequent fall in fixed-line tariffs by almost 90 per cent before the end of 2004. Charts 6.5 and 6.6 describe these important price trends.

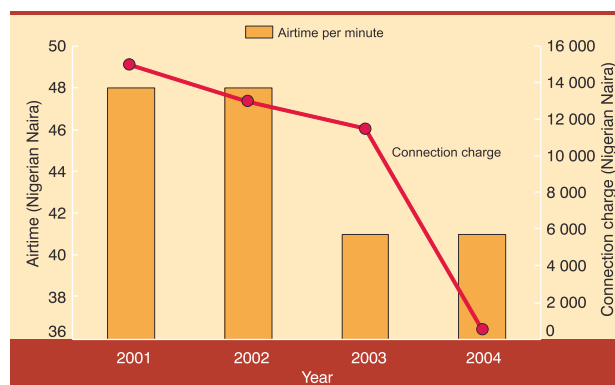
The entry of the fourth mobile operator, Glo Mobile, in 2002 completed the change from a controlled to a competitive telecommunications market in Nigeria. Glo Mobile introduced a “per second billing” option and other innovative packages aimed at reaching low-income segments of the population, thus contributing to further lowering mobile tariffs. From an initial \$0.38 per minute for basic prepaid service, mobile call costs have dropped to between \$0.19 and \$0.26 per minute. However, in 2003 the incumbent operator rebalanced tariffs, with a consequent 50 per cent increase in price for local calls, counterbalanced by a reduction in

international call rates (which dropped from \$0.72 to \$0.33 per minute). Lately, there have been continued price reductions among all operators, matched with ever more complex service packages.

The benefits that subscribers are gaining from lower tariffs and greater choices in Nigeria are the direct outcomes of the liberalization process and the resulting competition among private operators. In particular, reductions have been the result of increased competition triggered by the launch of NITEL’s new tariff structure in May 2004 and by Globacom and Celtel marketing strategies.

Chart 6.6

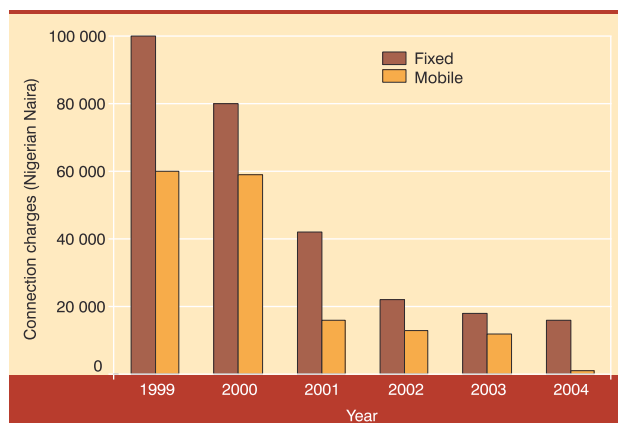
Connection and airtime charges for mobile telephones in Nigeria



Source: NCC (2005).

Chart 6.5

Fixed and mobile telephone connection charges in Nigeria



Source: NCC (2005).

Beyond the immediate providers who are the first echelon of contact with consumers, the development of the mobile sector and the fall in network infrastructure prices are to an important degree enabling the benefits of price reduction to be passed on to consumers. However, the main problems facing the Nigerian telecom sector remain the provision of universal access and the scarcity of investment in mobile telephony for rural areas. This is quite important since 54 per cent of Nigerians live in rural areas. While competition and market liberalization may benefit consumers in urban areas, they have little effect on rural access. Therefore, Government needs to consider adopting a more active policy stance through incentivizing rural investment or, indeed, providing public investment funding for infrastructure development.

3. Kenya

Overview of the telecommunications sector

Between 1995 and 2004 Kenya experienced remarkable growth in the proportion of mobile subscribers among its population, and this has been credited with giving an important boost to activities in the small business sector. According to the Government's 2005 Economic Survey, mobile phones had a positive impact in the development of the small business sector as they created approximately 437,900 new jobs. This is in line with research conducted by Waverman, Meschi and Fuss (2005) suggesting that a developing country which added 10 more mobile phones per 100 population between 1996 and 2003 would have enjoyed per capita GDP growth that was 0.59 per cent higher than otherwise. This increase is mainly determined by the productivity and efficiency gains stemming from the use of mobile phone technology by local entrepreneurs (Eagle, 2005). From an ICT adoption perspective, Kenya is not only one of the fastest-growing mobile markets in the region, but also has one of the largest Internet communities in Africa. It has great potential for further ICT adoption and ICT-based developments, as mobile and fixed-line penetration are only at around 10 per cent and 1 per cent respectively.

When mobile telephones were first introduced in the Kenyan market in 1992, they were so expensive that only the wealthiest of the population could afford them. Considering that 64.8 per cent of the Kenyan population lives in rural areas and only 40 per cent manages to achieve incomes above the poverty line, the wealthy represented a small market. This resulted in a marginal mobile subscriber growth of less than 20,000 for the period from 1993 to 1999.¹⁵ In 1999, with the establishment of the Communications Commission of Kenya (CCK), based on the Kenya Communications Act enacted in 1998, the level of competition in the mobile market increased. The newly privatized Safaricom Limited and a new market entrant, Celtel Kenya (formerly known as KenCell Communications), were licensed by the CCK to provide mobile services. The CCK, as a matter of policy, expects competitive market forces to determine prices. However, mobile operators are required to present their prices to it before they can apply them.¹⁶

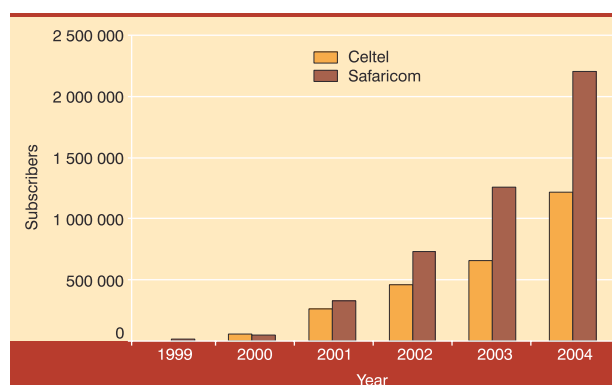
In terms of licence agreements, the two operators have covered the majority of the areas required, adding new districts according to business growth. For example, Celtel significantly exceeded its licence targets from its very first year of activity, while Safaricom remains the

operator with the highest number of subscribers. Chart 6.7 describes and compares the subscriber growth of Celtel and Safaricom.

Mobile teledensity has shown continuously superior growth over the years when compared with fixed-line teledensity, which has actually decreased. As a result, total teledensity (i.e. mobile and fixed) increased from 8.8 lines per 100 population in April 2003 to 14.7 lines per 100 population in May 2005 as a result of the extraordinary increase in the number of mobile subscribers. Despite this growth it is important to note that the great majority of fixed line subscribers – 94 per cent – still live in urban districts, while only 6 per cent of fixed lines reach out to rural areas. The latter also explains the decrease in the absolute number of fixed-line subscribers, this decrease suggesting that mobile telephony is a substitute for fixed-line telephony. Chart 6.8 illustrates the rural-urban divide in terms of mobile access in Kenya.

Chart 6.7

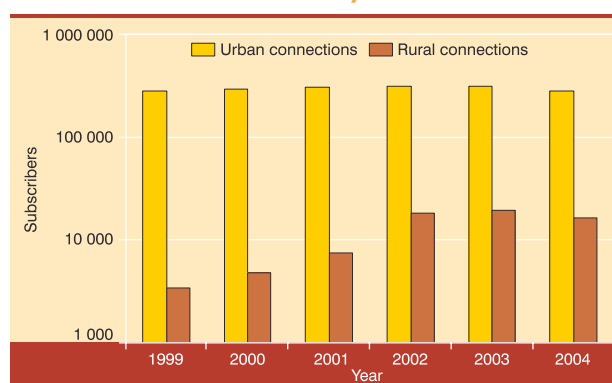
Mobile networks in Kenya



Source: CCK (2005); see <http://www.cck.go.ke/UserFiles/File/telecom.pdf>.

Chart 6.8

Urban and rural fixed connections in Kenya



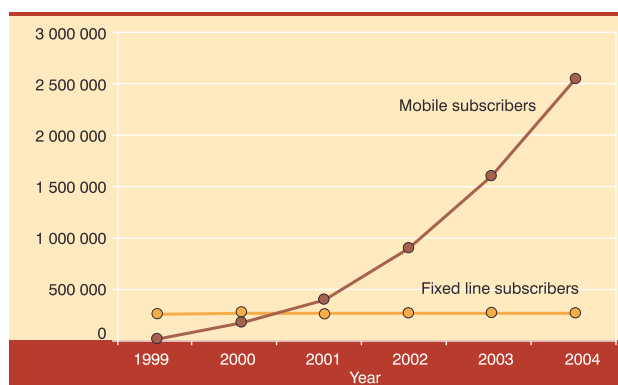
Source: CCK (2005).

Mobile market development

Following the licensing of Safaricom Limited and Celtel Kenya, the number of mobile subscribers grew significantly, did as the geographical areas covered by mobile networks. Furthermore, connection tariffs dropped from \$142 in 1999 to \$33 in 2005. Call prices also dropped from \$0.40 per minute in 1999 to \$0.20–0.32 per minute in 2005. Since Kenya still has a single incumbent fixed-line provider, the most recent tender for a second national operator having failed in March 2007, it is not surprising that long-distance and international tariffs have decreased by only 25–40 per cent, while local call prices have risen by 20 per cent. Therefore, it is no surprise that already in 2001, three years after the introduction of competition, the number of mobile telephony subscriptions had started overtaking the number of fixed telephony subscriptions, and towards the end of 2005 the number of mobile subscribers was ten times larger than the number of fixed-telephone lines. Chart 6.9 maps this development during the last seven years.

Chart 6.9

Comparison of growth of fixed and mobile networks in Kenya



Source: CCK (2005).

In June 2004, Telekom Kenya's monopoly was unbundled and three new kinds of licences (i.e., Network Facilities Providers, Applications service Providers and Content Service Providers) were introduced by the government, somewhat opening up the market. Currently, the licensing of a third mobile operator and the liberalization of VoIP telephony are under review. The third licence was originally awarded in 2003 but revoked shortly afterwards by the Ministry of Information and Communication, because of issues related to shareholding requirements concerning local investor holdings. The licence has been reinstated in early 2007 and Econet Wireless is now planning to deploy its network early in 2008.¹⁷

As a result of the strong growth of the mobile sector, fixed line traffic and revenue levels have decreased in 2004 and 2005 with local call charges falling by 15.6 per cent, compared to 31 per cent for long-distance calls and about 33 per cent for international calls. Prices for fixed-to-mobile calls fell by 7.4 per cent over the same period. While changes in mobile prices in recent years have been characterized as insignificant, a 28% reduction of international mobile call charges by Safaricom Ltd has eased prices for consumers calling abroad. Overall, Kenya has experienced an increase in teledensity to 18.5 mobile subscribers per 100 population in 2006, compared to 7.8 in 2004 and 13.5 in 2005.¹⁸

4. South Africa

Overview of the telecommunications sector

The mobile sector in South Africa has played a significant role in boosting overall telecommunications access. Mobile telephony is increasingly more affordable and accessible thanks to continuous innovation in tariff structures and the introduction of prepaid services.

Today, 43 per cent of the South African population has access to mobile services. In 1993, two GSM public land mobile network licences were issued to Mobile Telephone Networks Ltd (MTN) and Vodacom Ltd, which then started providing mobile telephony on a national level. The actual provision of mobile services was introduced in mid-1994 and by the end of the 1990s the number of subscribers had grown to over two million.

The liberalization of the telecommunications sector took almost a decade. In 1996, the new Telecommunications Act allowed further mobile network competition and a year later Telekom, the incumbent fixed-line operator, was partially privatized. However, because of an exclusivity agreement that was established for fixed-line services for Telekom in order to increase its attractiveness for investors, no real progress was made in improving competitiveness before its expiry in May 2002. Moreover, the fact that only two licences were issued for mobile telephony leads on to wonder whether if an additional one or two licences could have more significantly improved affordability, given the potential of the South African market and its overall higher level of development.

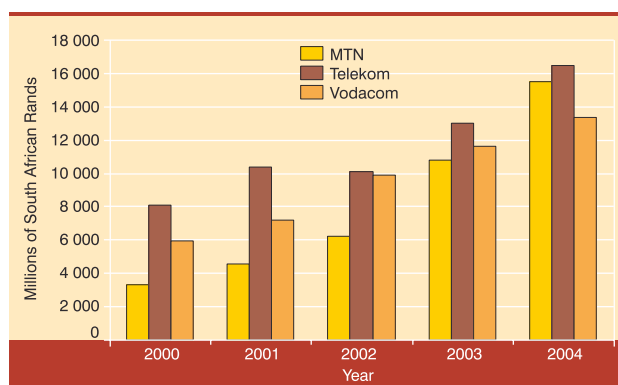
The Telecommunications Act of 1996 also established

the South African Telecommunications Regulatory Authority (SATRA), which became responsible for regulating the telecommunications market in the public interest. It was succeeded by the Independent Communications Authority of South Africa (ICASA) in July 2000 pursuant to the provisions of the Independent Communications Authority of South Africa Act No. 13 of 2000, which merged the functions of SATRA with those of the Independent Broadcasting Authority. The two bodies were merged in expectation of the convergence of telecom and broadcast technologies.¹⁹

In 1997, the introduction of a prepaid option for mobile calls boosted the number of subscribers to 1.9 million, or 4 per cent of the population, a figure that exceeded initial expectations. Given such positive results, in November 1998 licence clauses for the third and fourth mobile providers were released. The market continued to grow steadily and by the end of 1999 there were roughly 3.2 million subscribers, or 7 per cent of the population. Following the numerous regulatory challenges in 2000, the South African mobile industry continued to grow as new products and services, such as the “happy hour tariff”, were introduced (Vodacom, 2005).

Chart 6.10

South African telecommunications providers' earnings growth*



Source: Telekom, Vodacom and MTN annual reports quoted in South Africa Foundation (2005).

* Earnings before interest, tax, depreciation and amortization.

Mobile market development

In 1993 two mobile operators, Vodacom and MTN, were licensed to operate mobile telephony services, and they operated as a duopoly until 2001. In November 2001, a third mobile licence was granted to Cell C, allowing full competition in the market (Gillwald and Kane, 2003).

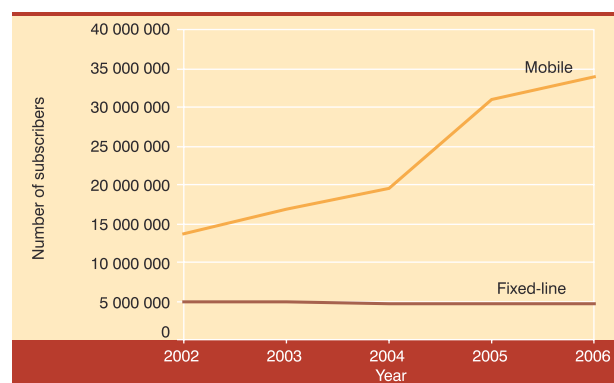
By 2001, the South African mobile market had over 30 per cent of the total telephony market in terms of total revenue and more than three times the number of subscribers than the fixed network, its growth having thus exceeded all expectations.

At the present time there are four mobile operators in South Africa, with Virgin Mobile having acquired a licence in 2006. Vodacom and MTN together have a market share of 85 per cent. On the other hand, Cell C, which started in 2001, and the most recent operator, Virgin Mobile, which started operations in 2006, have a combined market share of 15 per cent, a fact that suggests that they are having difficulties in attracting both new and existing subscribers. One possible reason is that operators may find it challenging to compete in terms of price since mobile tariffs need to be filed with and approved by ICASA.

While the regulatory wisdom is that this may protect the operators during the duopoly period from below-cost pricing as a result of price wars and consequently financial and service delivery problems, it is questionable whether such a practice is ultimately positive from a consumer welfare perspective. As a result, the costs of telecommunications in South Africa are usually more than they could be when there is more liberal price-based competition. Specifically, mobile call tariffs are still high compared with fixed-line rates, and the fast growth of mobile telephony can be attributed solely to service quality and the convenience of prepaid mobile services. Furthermore, all four mobile network operators depend on the sole national operator Telekom for interconnection and are consequently constrained by its pricing structure (South Africa Foundation, 2005).

Chart 6.11

Fixed and mobile telephone subscriber growth in South Africa

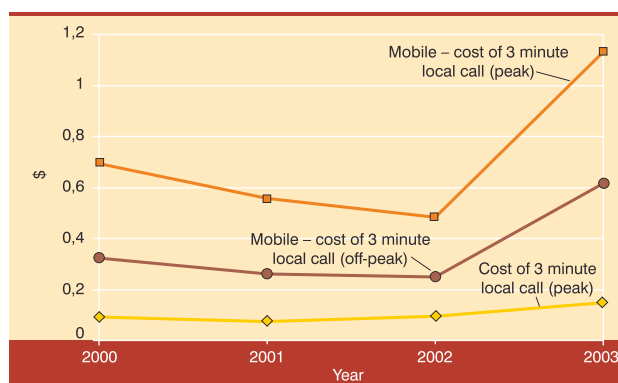


Source: ITU World Telecommunication/ICT Indicators database.

While there has been a continuous decline in total fixed teledensity, it has been compensated for by continued growth in the number of mobile subscribers. As already noted, the latter has been possible thanks to the rapid diffusion of prepaid services and a general increase in competitiveness with the additional licences. According to market research conducted by Bmi-TechKnowledge (2005), 75 per cent of mobile subscribers use prepaid services and more than 90 per cent of new connections are prepaid. Furthermore, Cell C estimates that 98 per cent of its subscribers are prepaid users (Gillwald and Kane, 2003).

Chart 6.12

Comparison of cost of fixed and mobile networks in South Africa, 2001–2006



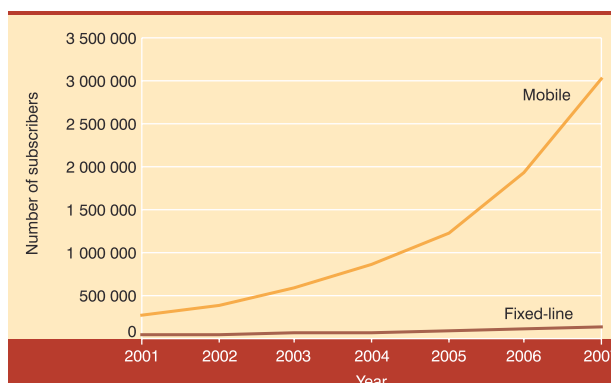
Source: 2002 Telkom Annual Report, in Gillwald and Kane (2003); ITU World Telecommunication/ICT Indicators database.

Although universal access has increased noticeably, there are still important differences in access and services between rural and urban households. The introduction of prepaid service has helped lessen those differences, since the number of prepaid subscribers on both national networks is now greater than the number of contract subscribers. Moreover, new strategies have been adopted in order to increase accessibility. For example, Vodacom has established phone shops in refurbished shipping containers located in poorer communities. They not only offer prepaid calls that cost less than a third of the commercial rate, but also generate job opportunities for the local community (Panos Report, 2004).

High mobile call prices are reflected in high levels of use of public access phones, even among those living in areas that have mobile phone network coverage (Gillwald, Esselaar, Burton and Staveou, 2004) and underscore questions raised about the value of the “mobility” in mobile telephony for low-income regions or populations (Donner, 2005). As illustrated in chart 6.12, fixed-line connections are still more affordable.

Chart 6.13

Fixed and mobile telephone subscriber growth in Uganda



Source: ITU World Telecommunication/ICT Indicators database.

At the moment, the South African telecommunications market is undergoing radical changes, since Telkom has been floated on the Johannesburg Stock Exchange and a second national operator, Neotel, is expected to become fully operational in mid-2007. While some argue that this will result in the entry of another fixed-line operator and in the consequent creation of a duopoly, which could to a certain extent improve the openness and competitiveness of the South African telecommunications market, others cite the fact that Neotel plans initially to use mobile technology for the last-mile infrastructure since ICASA was unable to remove Telkom’s control of the local exchange from its last mile connections and make the last-mile infrastructure commercially available to Neotel. This has led to suggestions that it is in fact yet another mobile operator instead of a much-needed competitor.

5. Uganda

Overview of the telecommunications sector

According to the ITU (2002) Uganda can be considered a model for other developing countries that aim to develop and seek development impact from their mobile telephony sector. Although more than 82 per cent of the population lives on \$1 a day or less and telephony may seem to be a luxury, in the past 10 years the number of mobile telephone subscriptions has grown significantly (Gamurorwa, 2004), as the indicated in chart 6.13.

In 1995 the Ugandan Government issued a second network licence to Clovergem Celtel Ltd to foster competition and thus open the market to multiple mobile operators. In 1997 the Government decided

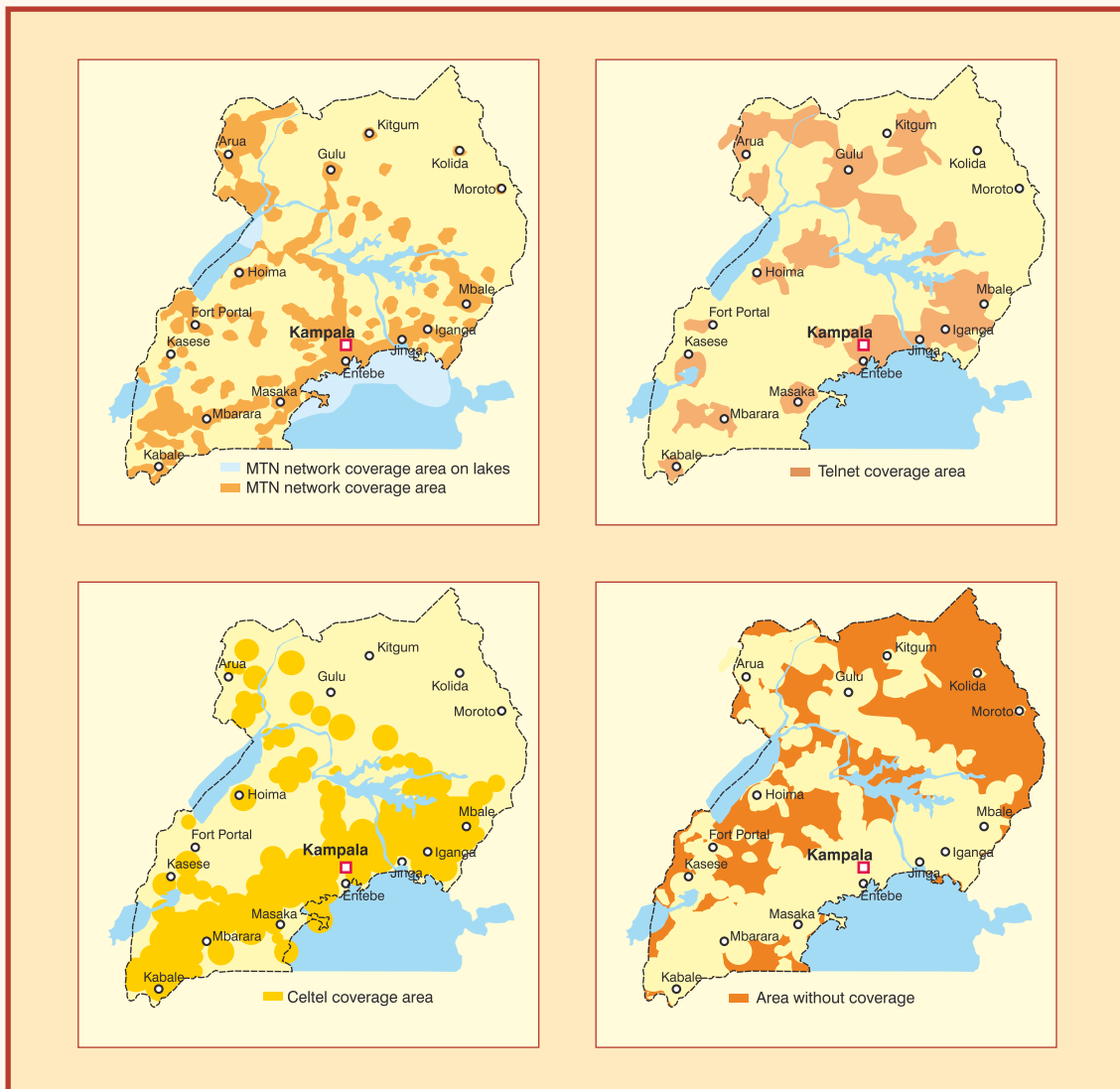
to liberalize the telecommunications sector and therefore created an independent regulatory agency, Uganda Communications Commission (UCC). 1998 is considered to have been a turning point in the Uganda mobile industry since it is the year in which the second network licence was sold to South African mobile operator Mobile Telephone Networks (MTN). During the first year of operation, MTN had 36,500 subscribers (i.e. two thirds of the number of main lines served by the incumbent operator) and by 1999 the number of MTN subscribers surpassed the total number of main lines. In only six years the mobile subscriptions rose

from 17,098 in 1992 to 98,900 in 1998.²⁰ In 2000, the Ugandan fixed line operator UTL was privatized, with the sale of 51 per cent to a consortium made up of Telecel (South Africa), Orascom (Egypt) and Detecon (Germany, a division of Deutsche Telecom) (Shirley, 2001; UCC, 2005).

Recent research (Williams, 2005) suggests that there may be a positive link between mobile penetration and FDI. Uganda can be considered a practical example of this supposition. The rapid growth in the mobile market was triggered by a “Big Push Strategy” introduced by

Box 6.3

Rural coverage of mobile networks in Uganda



Source: Celnet, MTN and Telnet.

the Government in 1998, and to be implemented during the period 2000–2005 in order to foster investment and build ICT infrastructure.²¹ It should be noted that Uganda does not impose any limitations on foreign investors' ownership stake (Gamurorwa, 2004).²²

In the past six years the mobile market has grown significantly: in November 2004 there were nearly 1,040,127 mobile subscribers compared with about 71,056 fixed-line customers. According to UCC, this may be because the past performance of fixed-line telephone networks was associated with great inefficiency and poor customer service. Furthermore, the introduction of prepaid plans and the development of innovative products, such as packages tailored to the low-income population, have had a positive impact on the spread of mobile telephony. Overall, the UCC estimates that there has been significant progress in terms of the freedom to make calls, and improved connectivity and mobility. Mobiles telephones are an extremely important means of communication in Uganda, since fixed-telephone lines are still lacking in most people's homes. In particular, mobiles have been very beneficial to local business, even in rural areas. Box 6.1 in part B.4 of this chapter gives an example of the use of mobile technology in improving knowledge and efficiency in rural and agricultural activities in Uganda.

Mobile market development

With new market entrants and licences issued for the Ugandan mobile market, mobile prices and connection charges dropped considerably (Shirley, 2001). Competition among the two mobile service providers, in addition to the privatized incumbent, has led to increasingly affordable prices and better quality of service. While national GDP has had an average growth rate of 5 per cent since 2000, the mobile telephony sector has experienced a growth of about 25 per cent per year since 1998, when MTN started to operate in the country. Despite the rapid growth in mobile telephony, the majority of the population still does not have access to basic telephony as the infrastructures are still inadequate and tariffs are still too high, per capita income being rather low (\$200 in 2004) and over 39 per cent of the population living below the poverty line. Even if there has been a downward trend in prices, mobile penetration remains low (3 per cent), a fact which indicates that affordability is still a key issue. Box 6.3 provides a graphic representation of, and a commentary on, rural coverage by the main providers.

In 2001, local fixed telephony tariffs increased slightly, since MTN used GSM to offer fixed-telephony services. On the other hand, international tariffs have on the whole been reduced. In December 2003, international fixed and mobile tariff rates in Uganda were almost half of those in Kenya, as chart 6.18 illustrates.

D. Cross-country comparison

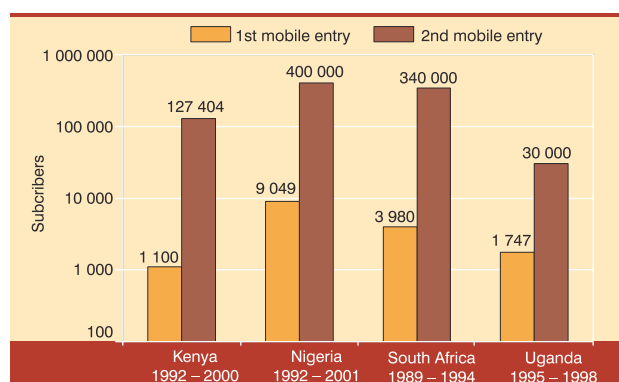
The rapid spread of mobile telephony in low income countries, namely Uganda, Nigeria and Kenya, has led to a much higher percentage growth in the number of mobile subscribers than in wealthier countries such as South Africa, where average income per capita is four to five times higher. Between 2002 and 2004, the percentage of mobile subscribers grew by 494.25 per cent in Nigeria, 172.93 per cent in Uganda, 107.37 per cent in Kenya and 42.73 per cent in South Africa.

The cost of mobile telephone calls has changed in recent years and in particular from 2002 onwards. Although Nigeria and Uganda show the same trend, as tariffs for both peak and off-peak calls have decreased since 2002, for Nigeria the fall has been more dramatic. In South Africa both tariffs have increased, while Kenya shows a decrease in costs for off-peak calls and a much more significant increase in the cost of peak ones.

Rates for the adoption of mobile telephones and mobile teledensity differ vastly from country to country. Chart 6.14 describes the effect of the entry of a second mobile operator in the market on the number of subscribers. Table 6.4 provides data on the changes in mobile teledensity during the period 2002 – 2006. While South Africa has a teledensity of more than 10 telephone lines per 100 inhabitants, Nigeria and Kenya have a density of between 5 and 10, and Uganda less than 5. Moreover, divergences within the same country are equally as large, a fact which suggests that current policies are effective in promoting ICT access in urban areas, while there is still a policy gap as regards rural areas. For example, Nigeria has a national teledensity of approximately 5.2, with some urban areas having a density of as 25, while in most of the rural ones teledensities are as low as 0.1. The overall telephone coverage is less than 45 per cent of Nigeria's total surface area. In South Africa the situation is rather different. While national teledensity is quite high at 46, rural areas have values of 5. On the whole, mobile penetration in rural areas of the countries under examined is still low.

Chart 6.14

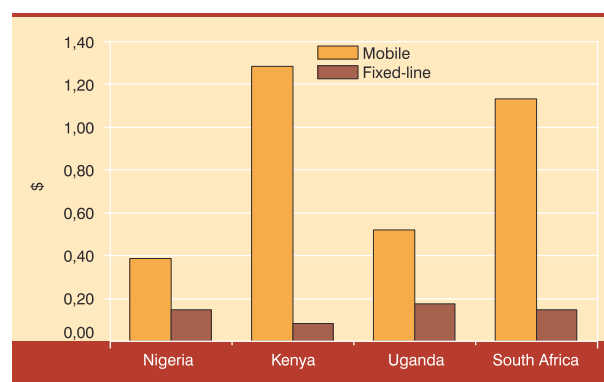
Growth in number of mobile subscribers



Source: ITU World Telecommunication/ICT Indicators database.

Chart 6.15

Call costs in 2003: mobile versus fixed lines*



Note: * Three minutes, local, peak-time, in \$.

Source: ITU World Telecommunication/ICT Indicators database.

Table 6.4

Change in mobile teledensity, 2002-2006

	2002	2003	2004	2005	2006
Kenya	3.8	5.0	7.8	13.5	18.5
Nigeria	1.3	2.6	7.2	14.1	24.1
South Africa	29.4	35.9	41.3	65.4	71.4
Uganda	1.5	2.9	4.2	5.3	6.7
Africa	4.5	6.1	9.0	14.8	20.5

Source: ITU World Telecommunication/ICT Indicators database.

While some research suggests that high costs (Panos Report, 2004) are the main factor in low mobile telephone penetration in rural areas, supply-side issues, namely a simple lack of commercial incentive to provide geographical extension and coverage, may also be valid, as well as issues related to appropriate modes of use relevant to rural populations, highlighted in part B.4. Whatever the case, connecting rural areas continues to be a major issue because, at current teledensity and penetration rates, approximately 70 to 80 per cent of the African population still lacks basic telecommunications infrastructure. This reinforces their economic marginalization and sustains the unattractiveness of rural development as far as market-based, private-investment-led solutions are concerned. Moreover, this may be a manifestation of market failure which needs to be addressed through government intervention by means of policies that improve incentives for investment, and ultimately by investing public funds to develop a supply capacity.

On the other hand, pro-competitive policies, including market liberalization, competition and the establishment of independent regulators, have improved significantly telecommunications services in urban areas.

E. Conclusions

This chapter has described how mobile telephones contribute to digital empowerment. Firstly, mobile telephony enables increasing digital inclusiveness through a platform that is growing in sophistication. Short message services have introduced simple wireless text and data transfers. Mobile handsets are growing in sophistication and functionality, such as digital photography and multimedia messaging, and increasingly provide useful functions previously available only with more costly personal digital assistants or specialized mobile appliances. Secondly,

mobile handsets provide a starting point for digital literacy.²³ For many individuals and communities, once the initial hurdle of ICT acceptance has been overcome, the adoption of higher-level technologies may be less daunting.

It has been demonstrated that a major driving force behind the rapid growth of mobile telephony use in Africa has been the improved supply of services, which has been achieved by issuing licences to a larger number of entrant providers. In the countries examined in this chapter there are different degrees of market competition. Moreover, the difference in growth, adoption and competitiveness levels can be examined by looking at the dynamics regarding the entry of the first mobile operators and subsequent ones, the resulting developments in pricing, and comparing these data with the growth of mobile subscriptions. Even countries with low per capita income have achieved a higher level of growth in the number of mobile subscribers than wealthier countries thanks to the implementation of policies supporting mobile services development and competition in mobile markets. In contrast, South Africa's telecom market, where competition policy was implemented more slowly, has not shown a dramatic decrease in mobile prices expressed in prices of handsets, connectivity charges and call tariffs.

A number of issues raised in chapter 6, dealing with web services of the UNCTAD *Information Economy Report 2006* equally apply to mobile telephony. The issues of interconnection and the network effects of increasing outreach and access to mobile telephony necessarily entail a market environment increasingly marked by cooperation within, and competition among,

networks and, in the case of the present chapter, mobile telecommunications firms. This implies that the successful mobile providers and, more importantly, the growing mobile networks will be those that have the capacity to generate and sustain trust among business partners and consumers.

Regulatory authorities have a crucial role to play in this regard and Governments of developing countries should support the establishment and development of regulatory environments that provide mobile firms, investors and consumers with the confidence and trust that will facilitate ICT-enabled development and its positive implications for overall economic development. The regulatory environment is not static. Rather it is a set of parallel processes that aim to balance the interests of users and consumers, investors, firms and their employees. While consumer welfare is the bottom-line parameter, Governments can achieve their policy ambitions only by giving adequate attention to all processes, as the public interest embraces the totality of the regulatory and economic outcome.

Although privatization of State monopoly operators, market liberalization, competition and the establishment of independent regulators have significantly improved telecommunications services in urban areas, the accessibility of mobile services in rural areas is still low. From a technology perspective, mobile telephones are a workable solution for the development of the information society in rural districts since they can reach wider areas at lower costs. However, economic incentives seem to be still insufficient, and there appears to be no clear consensus as to which policies, if any, can improve this situation.

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Notes

1. That report was the thematic predecessor of the current *Information Economy Report*.
2. This is mostly related to the physical limitations of small screens, keyboards and scrolling devices, as well as the important differences in how such hardware is designed for various handsets.
3. See Historical Timeline at About Bell Labs/Bell Labs History at <http://www.alcatel-lucent.com>.
4. See interview with Martin Cooper at <http://news.bbc.co.uk/1/hi/uk/2963619.stm>; for more information on early standards development see <http://news.bbc.co.uk/1/hi/uk/2963619.stm> and http://www.rfidc.com/docs/introductiontomobility_standards.htm.
5. See <http://www.pcworld.com/article/id,127820/article.html>.
6. See <http://www.comscore.com/press/release.asp?press=1041> or <http://www.emarketer.com/Article.aspx?id=1004233>.
7. See Waverman, Meschi and Fuss (2005) and Sinha (2005).
8. See <http://news.bbc.co.uk/2/hi/africa/3321167.stm> or http://www.interaction.org/ict/success_text_Kenya.html.
9. See <http://www.vodacom.co.tz/docs/docredir.asp?docid=3281> and <http://news.bbc.co.uk/2/hi/business/4145435.stm>.
10. See <http://www.taipetimes.com/News/biz/archives/2007/02/25/2003350026> , http://research.nokia.com/people/jan_chipchase/JanChipchase_SharedPhoneUse_vFinal_External.pdf , or <http://www.panos.org.uk/newsfeatures/featureprintable.asp?id=1206> .
11. For the full text of the Reference Paper see http://www.wto.org/english/tratop_e/serv_e/telecom_e/tel23_e.htm.
12. A mobile payphone is a privately owned handset and subscription that has a definite physical location, for example attached to a general store or a Internet/phone café, which non-subscribers can use for a fee. In this sense, it is not truly mobile; rather, it uses mobile connectivity to establish a payphone service where fixed line infrastructure is lacking or of poor quality.
13. For more details on the pre-1992 period see Onwumechili (2005).
14. Transnational Corporation of Nigeria PLC (Transcorp) is a domestic corporate conglomerate that has investments in oil, electric power, tourism and communication companies. See <http://www.transcorp-nigeria.com/>.
15. See http://www.cck.go.ke/market_information-telecommunications/.
16. See http://www.cck.go.ke/telecommunications-tariff_regulation/.
17. See <http://www.cellular-news.com/story/25056.php> .
18. See CCK (2005); additional data are UNCTAD calculations based on ITU World Telecommunication ICT Indicators database.

19. See <http://www.icasa.org.za/Content.aspx?Page=17>.
20. See Econ One Rsearch (2002, p. 23).
21. See <http://www.mtti.go.ug/docs/MTCS%20for%20the%20private%20sector.pdf>.
22. See <https://www.chogm2007.ug/index.php?option=content&task=view&id=76>.
23. It should be noted that basic digital literacy in the sense of being able to use basic mobile telephone functions does not mean and should not be confused with computer literacy and the truly significant ICT human capacity building needed develop an information society. This is an ambition that outstrips the purpose and potential of mobile telephony. However, it is for many people a first step.