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# African information revolution: a balance sheet

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## Abstract

This paper provides a policy and institutional framework to describe and analyze the diffusion of information technology and the global information revolution (IR) in Sub-Saharan Africa and the major factors that influence this diffusion. We begin by examining regional diffusion and find substantial cross-national diffusion differences across the continent, with considerable variation in regional diffusion of telephone, internet, radio, and television. This pattern undermines technologic and economic explanations as sole determinants of variation in diffusion. Then we conduct an analysis of the IR in Sub-Saharan Africa based on a policy framework. This framework identifies four key policy balances (1. public and private initiatives, 2. monopoly and competition “markets”, 3. domestic and foreign ownership or control, and 4. centralized and de-centralized administrative controls) as important elements to a better understanding of the diffusion of the IR. We find that a necessary condition for an explanation of the diffusion of the IR is a policy and institutional framework that incorporates these four balances.

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## 1. Introduction

Africa, like all other regions of the developing world, stands on the doorstep of a global information revolution (IR) that presents a seeming cornucopia of opportunities. New technologies like the Internet and cellular telephones proliferate rapidly, as do traditional media like radio. In one country after another, the local press serves up lively commentaries and news reports about the latest trends in information and communications technology (ICT).

Yet the speed of these changes, their breadth and their inherent complexities make it difficult to reach unambiguous conclusions about the extent and meaning of the IR for Africa. Is Africa

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where it should be in the IR? Is it ahead or behind where one might realistically expect, given its other conditions? How does Africa compare to other developing regions?

Regrettably, there are very few available studies that provide a coherent overview of these critical ICT changes. Yet Africa's future growth and the well-being of its people will hinge in part on its capacity to make these new resources widely available. This essay provides an analytic framework to help us answer the following key questions:

- What is the global IR?
- How does Africa compare to other regions in the diffusion of ICTs?
- Does the diffusion of the technologies vary by sub-region?
- What are the major factors that explain these patterns of ICT diffusion in Africa?

## **2. What is the information revolution and why is it important for Africa?**

The term “Information Revolution” refers to the bundle of technological, commercial and institutional changes in the information and communications sectors that have rocked the global system since the mid-1980s. Hallmarks of these changes are the tremendous global scope and speed of ICT diffusion. Accelerated technological innovation has brought new capacities to compress and store data available for transfer in new digital forms through various media to diverse users at different times. Whereas print, broadcast, telephony, video, and computing were until recently quite distinct technologies and industries, they are now rapidly converging toward a new form called ‘multimedia’. Thus, the IR has come to mean the transformation of many separate appliances into local and global networks that facilitate health, education, commerce, government, leisure and other activities through cheaper, more powerful information processing and communication.

One reason for the rapid and widespread diffusion of the IR and its enthusiastic embrace by so many Africans, Asians, and South Americans is the failure of the old telecommunication systems to create a reliable, open, and widespread system for transmitting information. Most analysts insufficiently appreciate the failure of the old broken down system and its tremendous inability to meet consumer demand. In Africa during the mid-1990s there were 3.4 million customers waiting an average of 3.5 years for telephone service (ITU, 1998); in Sub-Saharan African the picture is even slower, with nearly 1.2 million customers waiting an average of 5.4 years (ITU, 1998). In other sectors such as broadcasting, it is more difficult to quantitatively measure the senility of the system. Yet, the remarkable popularity throughout Africa of the new non-government broadcasters indicates that popular dissatisfaction for state broadcasting was widespread. Poor ICT services created a mass of disgruntled citizens waiting to be mobilized in favor of new approaches.

Another reason for the spread of ICTs is the rise of economic globalization and accelerating international competition.<sup>1</sup> Fundamental shifts in the basic production processes and institutional structures of the world economy have made information and communication technologies more necessary and more accessible. One of the first questions a potential investor asks of African and other governments around the world is whether the country has a modern and effective

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<sup>1</sup> See Wilson (1998) for further discussion on the information revolution, globalization, and development.

telecommunications system. Telecommunications systems have become a requirement for attracting direct foreign investment. Inexpensive, reliable, and ready access to information and communication is no longer a luxury for the few; it is a necessity for the many.

Other non-economic benefits are possible for Africa. Where grassroots movements can mobilize people the IR can play a critical role by helping to expand popular participation.<sup>2</sup> Because new ICTs are less expensive and more powerful, they bring greater access to information and knowledge, and can bring new participants into the political arena. ICTs are being used to provide information on elections, voter registration and candidates, as was the case in the Senegal election of 2000, for example. [Ott and Smith \(2001\)](#) argue that “the most profound effect of the Internet in these developing countries is to shift the balance of power between states and citizens”. The use of ICTs by community groups is helping them press for changes in government policies. Cheaper and better telecommunications services are also carrying telemedicine, distance education, and electronic commerce around the globe, including Africa ([Wilson, 1998a, b](#)).

ICTs have enormous potential in Africa. Consider the words of Paul Kagame at a 1998 Telecommunication meeting in Kigali, Rwanda:

In today’s world, information and communication have become increasingly important. Knowledge is or should no longer be the domain of a few. Success in promoting democracy, human resource development, socio-economic development, international cooperation, trade and commerce, require access to information and our ability to use it effectively. The ongoing information and communication revolution is leading to accelerated globalization in economic and social activities. This presents tremendous challenges as well as opportunities for industrialized and developing countries alike ([United Nations Economic Commission for Africa, 1998](#)).

For many years, Africa has suffered due to its distance from major world markets, its inability to meet escalating educational needs and costs, and its staggering healthcare demands. The technologies of the IR can help to reduce these costs and improve public service.

The IR *can* positively assist African people to achieve the improvements they so desperately need. As a region Africa has staggering economic and social challenges that ICTs can help meet. But if the IR promises substantial improvements, it also poses substantial risks. If Africans permit the ICT gap between themselves and other regions to grow, or if one state or region successfully harnesses the IR, and other states do not, then the promised benefits of the IR will lead to deeper disadvantages ([Office of International Affairs, 1998](#); [US Department of Commerce, Economics and Statistics Administration, National Telecommunications and Information Administration, 1999](#)).

### *2.1. Current status of ICT diffusion in Africa*

To gain an accurate picture of ICT diffusion in Africa, let us examine the aggregate figures for the leading information and communication industries.

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<sup>2</sup>The role of the IR and grassroots organizations is exemplified in the cases of Chiapas and the anti-land-mine campaign. See [Wilson \(1998\)](#), [Lasaga \(1997\)](#), [Schorr \(1996\)](#) and [Tricks \(1996\)](#) for further discussion.

Table 1  
Per capita ratio of main telephone lines to print to television to radio

	1 Telephone	1 Television
Telephone	1	
Television	2538	1
Radio	14,384	7

Source: ITU (1998).

## 2.2. Status of traditional ICT: broadcasting and telephones

While the most dramatic advances are the new ICTs, there is also remarkable progress in the more conventional information and communications technologies such as broadcasting and telephone services. The number of main lines in Africa, a benchmark telecommunications performance, rose by an average of about 5% per year in the 1990s. In more than 10 countries the main telephone line growth rate has exceeded 10% annually. In many countries the number of television and radio broadcasters has increased and now include private owners, domestic content, and continental coverage. One stunning example is the explosion of community radio in Mali, which has grown from less than a handful to more than 60 radio stations (Bilodeau, 1999).

Table 1 illustrates the dramatic dominance of radio and television. For example, the ratio of per capita main telephone lines to radios is roughly 14,000 radios for every main telephone line. Even the rare television is more than 2500 times more prevalent than a single main telephone line. Low literacy rates, which range from 50% to below 25%, underscore the importance of radio broadcasting as the primary means of mass communication.

## 2.3. Status of new ICTs: cellular phones, computers and internet

As important as the older ICTs are, new technologies are surging forward and offering new services, particularly cell phone, computer, and Internet markets. For the Sub-Saharan region as a whole, Internet users have grown substantially. Estimates in some markets suggest sustained growth rates of up to 15% per month.<sup>3</sup> Cell phone diffusion has also been spectacular. In Uganda and Tanzania, for example, the liberalization of cell phone markets with the introduction of second mobile operators has meant that ordinary people, such as taxi drivers, are able to use this technology. For the continent as a whole the ITU estimated that per capita cellular telephone penetration nearly tripled from 0.16 to 0.39 per 100 people between 1996 and 1999. Even more spectacular growth rates have been projected for the 1998–2003 period, where places like Cameroon have projected increases of more than 1400% (Pyramid Research, 1999). In 2001 cell phone penetration in Africa exceeded fixed line with 53% of telephone subscriptions (ITU, 2001).

Among the “newest” ICTs, the number of personal computers (PCs) in Africa is estimated to be a little over 3 million in the late 1990s, over half of which are in South Africa, one-sixth in North African countries, one-sixth in Nigeria, and the remaining sixth in the other Sub-Saharan African countries (ITU, 1998). On a PC per capita base (per 100 persons), this is equivalent to 3.8 in South

<sup>3</sup>This is based on interviews with ISPs in Kenya, Rwanda, Ghana, and Senegal over the past 3 years.

Africa, 0.5 in North Africa, 0.5 in Nigeria, and 0.3 in the remaining Sub-Saharan African countries (ITU, 1998). Related to the spread of PCs is the networking of PCs into the global data infrastructure network we know as the Internet. Of the 1 million or so PCs in Sub-Saharan Africa, about 25,000 were permanently connected to the Internet in 2000 (Jensen, 2000). Diffusion of the Internet and the underlying data infrastructure is crucial for Africa's future development. Internet connectivity in Africa as a whole has increased steadily, as the following illustration demonstrates (Fig. 1).

Not only have the number of Internet users grown, but the telecoms' capacities, i.e. bandwidth, have also been increasing steadily. For example, in mid-1996 the African continent only had 20 countries with full web Internet connectivity, and only one, South Africa, had connectivity greater than 1 megabits per second (Mbps). At the end of 1998, 49 countries were connected, of which 9 had connectivity greater than 1 Mbps. In the same period, countries with Internet circuits of 64 bps increased from 1 in 1996 to 59 in 1998 and maximum access costs dropped from of \$240 per month in 1996 to \$100 in 1999.

Other ICT infrastructures are also spreading. Among the leaders are new wireless technologies, such as fixed (non-mobile) cellular telephones and microwave links, which are supplanting more traditional wire-linked technology. Such technologies are attractive because they avoid the high cost associated with fixed lines, and are easy to install. For example, a satellite link Internet service can be ordered, installed, and operational in a 90-day period using a very small aperture terminal (VSAT). At the same time, high-speed wireless modems can be used to provide connectivity to support Local and Wide Area Networks. In this way, the cost of telecommunication services in Africa can be cut in half at the same time that bandwidths are doubled. Not only is installation more cost effective, but once built, networks configured for data transmission, which carry voice traffic, are much more efficient than voice configured networks.

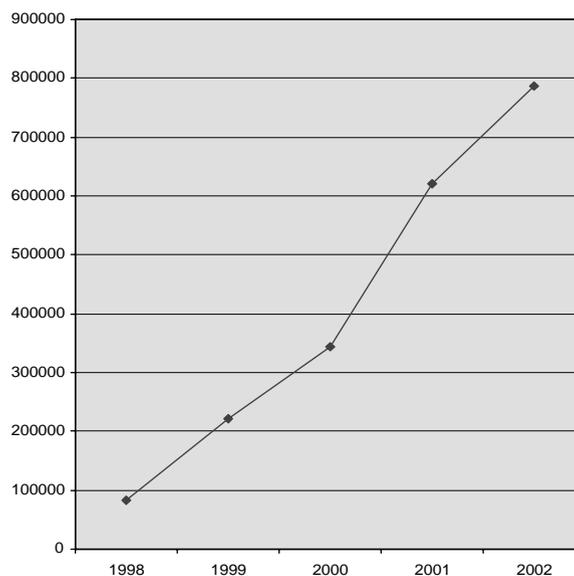


Fig. 1. Sub-Saharan Africa estimated internet subscriptions 1998–2002. Source: Jensen (2002).

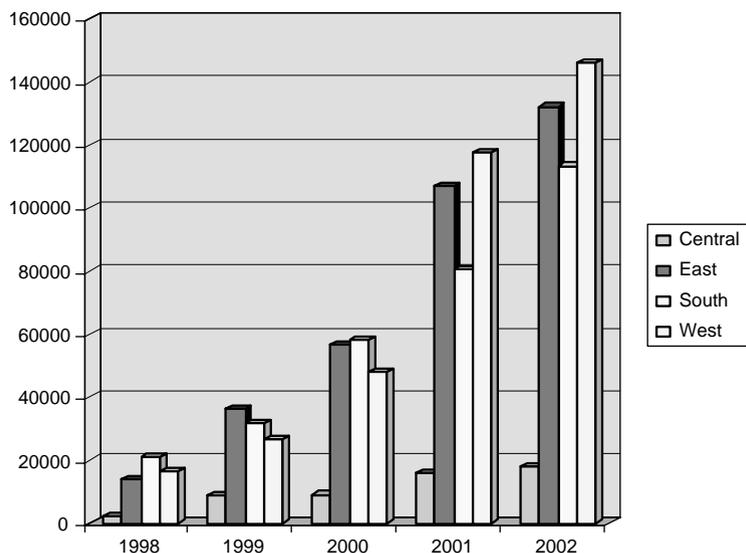


Fig. 2. Internet dial up account 1998–2002, by Region. Source: Jensen (2002).

#### 2.4. Sub-regional diffusion: Africa South, West and East

Let us look at the regional distribution of these powerful new tools across Africa. Not surprisingly, Southern Africa is the region with the densest networks of traditional and modern technologies, reflecting its preponderant economic weight on the continent, especially for the powerhouse South Africa. Since South Africa's GDP is almost equal to all the other Sub-Saharan countries combined, and since South Africa has more ICT infrastructure than the rest of Sub-Saharan Africa—20 times more main telephone lines, 10 times more PCs, and twice as many home satellite antennas—we exclude South Africa as part of Sub-Saharan Africa to avoid the huge distortions that would otherwise appear in our analysis.

The following figures report the regional diffusion of the modern ICTs—Internet, mobile phones, television, and telecoms. The surprising *preliminary* result is that there is very little consistency across the regions. For the Internet, we find that East and South first led from 1998 to 2000, and then the West led from 2001 onward. For cell phone and television West Africa leads. As far as investment, the South and the East lead. This suggests that the more deeply rooted structural variables, such as kind and type of economic conditions which remain constant across regions, cannot fully account for *consistent* regional variation of the new ICTs (Fig. 2).<sup>4</sup>

Thus, we find significant differences across African regions. Differences across African countries in the same region can sometimes be dramatic as well: on a per capita basis Botswana

<sup>4</sup>The Central Region includes Burundi, Central African Republic, D. R. Congo, Rwanda, Uganda. The East Region includes: Djibouti, Eritrea, Ethiopia, Kenya, Madagascar, Mauritius, Seychelles, Somalia, Sudan, Tanzania. The South Region includes: Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, Swaziland, Zambia, Zimbabwe. The West Region includes: Benin, Burkina Faso, Cameroon, Cape Verde, Congo, Cote d'Ivoire, Equatorial Guinea, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, Togo.

has seven times the number of Internet hosts as Zimbabwe. In this essay, we simply point out these sub-regional differences. There are multiple reasons for these differences, including sectoral and income differences, political stability as well as price and regulatory regimes (Figs. 3–6).

### 2.5. Africa's status in global context

As robust as the continent's growth has been, how does it compare with other regions? Is there a digital divide or digital equality? The numbers show that while Africa is clearly accelerating her own entry into the information age, she does so from a very low base (Freepong & Atubra, 2001).

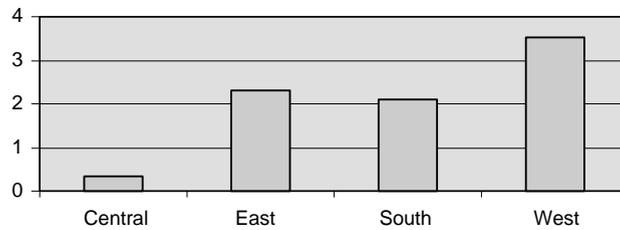


Fig. 3. Mobile telephones per 100 persons. *Source: ITU (1998).*

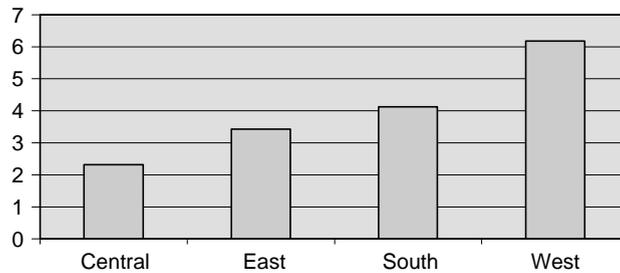


Fig. 4. Television sets per 100 people. *Source: ITU (1998).*

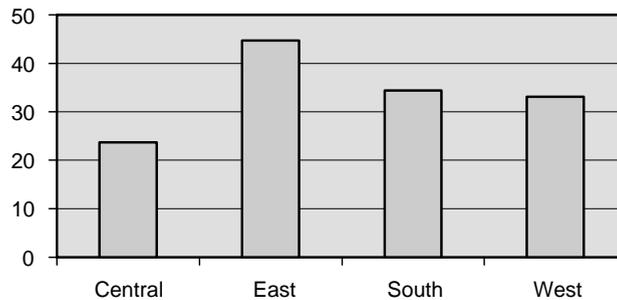


Fig. 5. Telecom investment as a % of telecommunications revenue. *Source: ITU (1998).*

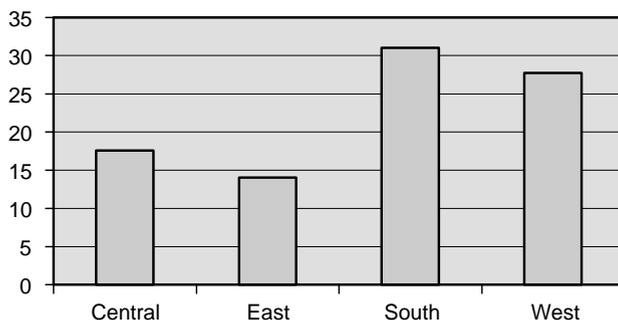


Fig. 6. Telecom investment millions US\$. *Source: ITU (1998).*

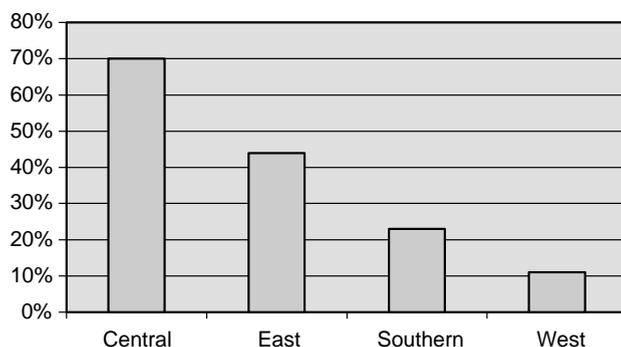


Fig. 7. Percentage growth in the number of people waiting for main telephone line 1990–1996. *Source: ITU (1998).*

Alarming, other developing regions are moving ahead even faster (Petrazzini & Guerrero, 2000; Gutierrez & Berg, 2000).

Indeed, in some important respects, Africa is falling farther behind. For example, with 12% of the world's population (ITU, 1999), Sub-Saharan Africa had only 2% of global telephone lines in the early 1990s (Wilson, 1996). By 1997, the situation deteriorated, as the Sub-Saharan African share declined to only eight-tenths of 1% (ITU, 1998).

Perhaps most indicative of the poor telephone infrastructure in Africa relative to other areas is that of the \$95 billion invested in the telecommunications sector worldwide between 1994 and 1998, only \$1.7 billion was made in Africa (ITU, 1998). The low investment level is perplexing because African telephone companies are far from unprofitable, and as illustrated in Fig. 7, the demand for services is quite high. In fact African telephone companies are among the most profitable telephones companies in the world. While their average revenue per main telephone line declined from \$1225 in 1995 to \$1175 in 1996 (ITU, 1998), when compared to the \$735 average revenue per main telephone line of the world as a whole, the profitability of the African telephone sector is clear. In some states the 1997 per line revenue ranged as high as \$3600 in Angola and constituted as much as 5% of GDP in Gambia (ITU, 1998). Reflecting this tendency, in states where private investment is encouraged, foreign telephone and communication companies have reacted quickly and positively (for a detailed description see the case of Uganda further below).

Thus, despite dramatic improvements, the overall performance of African telecommunication sectors is dismal in comparison to the rest of the world. The benefits of ICT progress are very real for people who gain greater access, but taken as a whole Africa may be eclipsed by the pace of the revolution in other regions. As others move ahead more swiftly, Africa is getting left further and further behind. For example, on the World Wide Web Africa had made startling progress, with annual Internet host growth rates of 85% between 1994 and 1997. Yet, a recent study reported that Africa has fallen in the last several years from 0.25% of the total web sites in the world to 0.22%.

### 3. Explaining outcomes: policy leads

What explains different levels of diffusion? Why do different African countries and regions have such different ICT profiles? Given the potential importance and consequences of the IR for Africa, these questions of why some countries do well and others lag behind are of tremendous importance. In part, these big ICT differences reflect differences in levels of economic performance and economic structure both within Africa and globally (Fig. 8).

In general the level and quality of ICT performance is closely linked to the structure and performance of the national economy (Daly, 1999). We would expect richer countries to have better developed ICT sectors, and poorer countries to have less well-developed ICT sectors. At the same time, we do find some interesting variations. A number of African countries at roughly the same level of economic development (as seen in GDP per capita) have very different levels of telecommunication or Internet penetration, and broadcast liberalization. The attached illustration shows that the relationship between Internet penetration/per capita and GDP/per capita is positive, but not iron clad. If economic performance does not strictly determine ICT performance in Africa, neither does technology. New technology can be bought off the shelf by anyone. In many ways, getting the communications and information technology is the easy part.

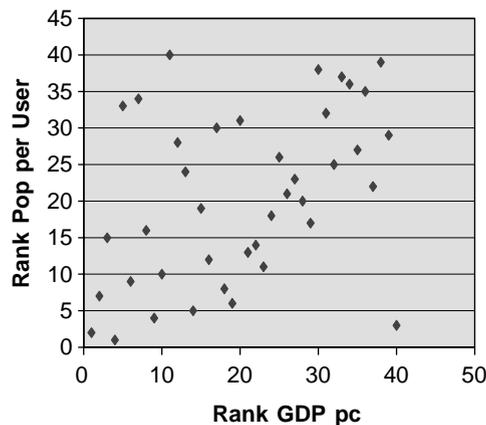


Fig. 8. Rank order of GDP pc and rank order of people per internet user in 40 African states. Sources: Internet Users Jensen, 1999 and GDP/pc World Bank 1999.

If neither technology nor the economy are the sole determinants of variations in diffusion, then what else shapes African ICT performance? The answer is politics and public policy. Especially important are policies that support a positive ICT *enabling environment*. Such policies create incentives for producers and consumers of information goods and services. Even very poor and resource scarce countries are finding it possible to create enabling environments that promote the dissemination of efficient ICT. Rwanda, for example, despite its recent social chaos, has been able to construct one of the most modern telecommunications infrastructures in Africa,<sup>5</sup> according to the [World Bank \(1998\)](#).

Insisting on the importance of public policy, and explaining the apparent contradiction between high profits and relatively low investor participation in African telecommunications, former Ghanaian Minister of Communication Ekwow Spio-Garbrah argued at an African telecom conference that many telecommunication projects in Africa do not attract investors because the policy and political environments are risky, unreliable, and “fraught with political and administrative costs” (Cukier, 1998). Spio-Garbrah urged African policy makers to turn their attention to policies that bring<sup>6</sup> “privatization, liberalization, and transparent regulatory regimes [necessary] to attract foreign investment” (Cukier, 1998).

After several years of resistance, the view that policy reform is critically important is now more widely shared among senior African officials. More officials are now echoing Spio-Garbrah’s call for increased privatization, liberalization, and transparency. The importance of an enabling public policy in creating a positive environment for ICT dissemination was commented on by a number of African Ministers, African Telecom Managers, and non-African observers at *The 1999 All Africa Telecommunications, Informatics, and Broadcasting Conference*. Whatever the ideological and institutional appeals of tight government controls, the *ancien regime* can no longer deliver what people want. The state-monopoly model is simply no longer able to generate the financing necessary to modernize the needed telecommunications infrastructure. In the absence of policy changes the four main problems with the old telecommunications are:

1. inadequate financing,
2. insufficient supply,
3. sub-standard distribution with very long waiting lists, and
4. very poor quality of service.

This earlier recognition of policy’s importance has been repeated more often since then, witness the central role of policy with the 2002 “Tel.com Africa” conference held in South Africa in October 2002.

The clear rhetorical conclusion of many African officials is that without positive government policies that license and encourage private sector participation and competition, the necessary technological base will not be developed, and Africa’s IR will be stunted. Decision makers increasingly recognize that technological diffusion is very largely dependent on government guidelines, incentives and disincentives, and the responses they provoke in millions of African

<sup>5</sup>In addition to having an advanced network, Rwandatel was also debt free, according to a 1999 discussion with Mr. Sam Nkusi who was then Director General of Rwandatel.

<sup>6</sup>This also points to the importance of policy and institutions and the four balances.

customers and suppliers. A positive enabling environment toward the Internet, E-commerce, and broadcasting means adjusting some very basic ICT laws and regulations to make them more consistent with the direction of global technological innovation and commercial practices in other regions, while protecting national interests. African leaders need to take this step to begin catching up with other regions and to achieve the long-term potential of the continent.

### 3.1. *Common policy balances*

The ICT policies that countries employ to balance their ICT sectors tend to be remarkably consistent around the world, in developing and developed countries alike (Wilson, 2003). There are four key policy balances that all countries try to maintain in ways that promote their national interests and permit them to capture global benefits of ICT. They are the balances between:

- public and private initiatives,
- monopoly and competition,
- domestic and foreign ownership, and
- centralized and de-centralized administrative controls.

From the end of World War II into the 1980s, most countries followed very similar policies toward their ICT sectors. The order of the day was public over private, domestic over foreign, monopoly over competition, and central control over de-centralized distribution. For a generation or two, whether in Western Europe or West Africa, ICT sectors (especially telecommunications) followed the public, monopolistic, domestic, and centralized pattern. These four balances constituted an international *regime* that received the backing and authority of the leading states and international institutions like the World Bank, the International Telecommunications Union (ITU), as well as regional powers like the EU. With few exceptions, the state-owned national broadcasting and telephone companies dominated the service and typically permitted no local competition. These state monopolies force-fed the public the views of the government (i.e. propaganda). Would-be private broadcasters were defined by the rulers in power as “threats to national security”, and much of the TV content was second hand European, American, or Asian imports, with little locally produced content.

With the coming of the IR in the late 1980s and early 1990s, more and more national governments in Africa felt compelled to adjust these traditional balances. There were internal political pressures from dissatisfied (non)customers and would-be local suppliers, and the backlogs of customers were becoming impossible to ignore. In Nigeria, there were more than 3 million people waiting for telephone service (Business in Africa, 2000). Growing external demands from international financial institutions and development institutions pressed for liberalization. The UN estimates that more than 75% of all loans and grants for Africa were conditional on privatization (UN, 2000), and development assistance such as USAID’s Leland Initiative specifically conditions cost-based tariffs, the precursor to competitive pricing. Today, virtually every government in the world has, to greater or lesser degrees, begun to shift toward more private, more international, more competitive and more distributed and de-centralized management of their ICT industries. Compared to other regions, African governments are not moving at the same pace, nor using the same agencies, nor do they get the same results; however, the

evidence we present shows they are all shifting away from the exclusively public, domestic, monopolistic and centralized patterns of the past.

### 3.2. Africa's progress toward ICT reforms

#### 3.2.1. Phase I: 1980–1990

The shifting balances described above did not all happen at once, nor did they happen the same way in all countries. Rather, these new balances emerged slowly and fitfully, with occasional reversals and surprises, over the course of more than 20 years, between 1980 and 2000. A variety of reformers in both the public and private sectors led these efforts.

During the 1980s African ICT sectors were organized around the classic balances of the *ancien regime*. While slight variations existed, ICT policy was remarkably stable and for the most part reflected the interests of the state elites in power, who preferred the public, monopolistic, domestic, and centralized system. For some years after political independence the system operated well, with the relevant ICT Ministry making virtually all tariff, investment, pricing and other decisions within a centralized bureaucracy. All communications functions, from post to telephone and telegraph were owned, operated, and regulated by the state. This was the typical old PTT policy model that existed in most of Africa until the 1990s. Table 2 illustrates this configuration of balances that dominate a landscape of the *ancien regime*.

While this system was stable over many years and widely accepted by elites globally, it started to collapse in the late 1970s and 1980s. The prelude to reform began to emerge as early as 1967 when the Ethiopian government bifurcated its Post, Telephone, and Telegraph Office (PTT) monopoly into two separate offices, one responsible for postal functions and the other telecommunications operations. *The bifurcation of traditional PTTs into post and telecommunication, two distinct, separate organizations, is a necessary first step towards decentralizing the old PTTs.* Twelve years later in 1979 the PTTs in Burundi and Lesotho followed suit. Figure 9 below depicts the frequency and timing of PTT bifurcation cumulatively: it reveals that it was not until the early 1980s that many PTTs in Africa took this first step at decentralizing and streamlining.

These initial institutional reforms are an important milestone marking the modern evolution of the ICT sector, as the rising volume of communication traffic and the need for greater efficiencies put a premium on greater specialization. But government still owned and operated both services

Table 2  
Four balances of phase I

	Public or private	Domestic or foreign	Monopoly or competition	Centralized or decentralized
Telecommunications	State run	No foreign actors allowed	Monopoly	Centralized control
Broadcasting	State run	No foreign actors allowed	Monopoly	Centralized control
Information processing	State run	No foreign actors allowed	Monopoly	Centralized control

as monopolies. Since the other three policy balances remained unchanged the actual impact on customers was minimal (Fig. 9).

One important and exceptional instance of institutional bifurcation that reflected policy change occurred in 1981 with the separation of Senegal's international telephone operations from the PTT. TeleSenegal was created to operate the international network, while the PTT, the Office of Post and Telecommunications (OPT), maintained and operated the national telephone network.

The creation of TeleSenegal in 1981 as a parastatal body is important to note because TeleSenegal was granted "autonomy of decision and management" (Gadio, 1995) and was able to access its own funding not subject to the same hazards faced by OPT. OPT funding was not only subject to cross subsidization, but was also subject to the Public Treasures Office, "which would reroute" OPT funds "according to other priorities of its general investment program" (Gadio, 1995, pp. 182–183). However, this reform was short lived. In 1985, the OPT and TeleSenegal were officially disbanded when postal and telecommunications functions were bifurcated.

In place of the disbanded TeleSenegal and the telecommunication portion of OPT, Sonatel was created in 1985 to manage both national and international networks. While officially "freed from direct governmental control and supervision" (Gadio, 1995, p. 186) a number of institutional ties with the Ministry of Communication remained. Thus, some "minimal conditions of liberalization" had been introduced, which became a basis for subsequent reforms (Gadio, 1995, p. 191).

Yet the experience of TeleSenegal's qualified autonomy spilled over into Sonatel. The combination of bifurcation, and the introduction limited autonomy made Sonatel a different kind of institution. Yet, one important element was still missing. Until the monopolies were subjected to some degree of cost-based pricing or competition, it remained unlikely that performance would change substantially. One of two things had to change for this to occur. First, the Telecom would have to *be autonomous and disciplined*. This could come about through rationalization of a government ministry, or through guidance by a regulator. Second, private actors operating under market conditions would have to be allowed to participate and through their competition discipline the parastatal. For these to occur the policy balances would have to change radically.

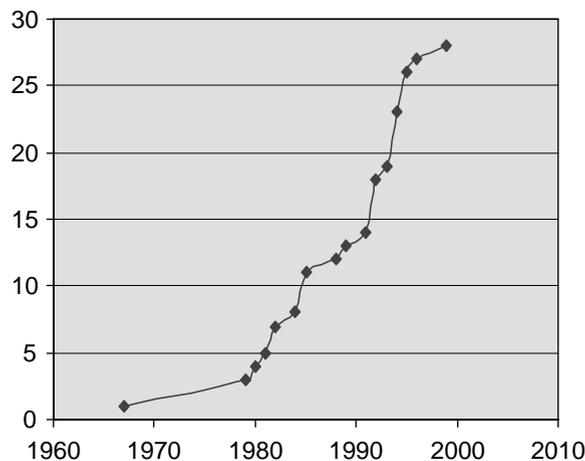


Fig. 9. Total countries with bifurcated PTTs and year of bifurcation. Source: ITU 1998.

Thus, in Senegal as in other African nations, despite some limited reforms policy re-calibrations were so few and so limited through the 1980s that the new ICT sector continued to operate as it always did. Performance declined, demands went unmet, and frustration grew.

### 3.2.2. Phase II: 1990–1995

If some PTT managers were content during the 1980s and early 1990s, most users were not. In many African countries citizens and businesses that wanted and could afford a telephone might have to wait nearly a decade for service.

Change in percentage of average time required for telephone service between 1990 and 1996, a key measure of unmet demand, reveals that the waiting time increased dramatically in more countries than it decreased. In 11 of 27 countries waiting time improved, but in 16 other countries waiting time actually increased, and in 12 of these countries the waiting time doubled between 1990 and 1996 (ITU, 1998). There was little institutional incentive to succeed.

Furthermore, even when a customer eventually got a telephone, the service was often poor; telephone calls were interrupted or did not go through. In this period an average of nearly 80% of African main telephone lines experienced some technical malfunctions (ITU, 1998). In some countries just emerging out of Phase I, such as Kenya in 1997, one often needed to dial a number more than 10 times before a call could be completed between 9:00 a.m. and 3:00 p.m. *The inability of the ancien regime to meet even minimal levels of service provided fertile ground for the formation of a potent political constituency for change.*

At the same time telephone services were deteriorating in most African countries, demand was on the rise. For example, Fig. 10 reveals that between 1990 and 1996 only four countries reported decreases in outgoing international calls, while 33 countries report an increase, of these 13 reported an increase, of more than 50%. At the same time, domestic telephone capacity actually decreased. For example, in East Africa, local telephone traffic dropped about by 15% in Uganda, 15% in Kenya, and in Tanzania by 30%. This was a low point for telecom services in Africa.

In this 5-year period, more and more political demands were being placed on the old system. Governments were making a bad situation worse by spending more money providing poor service to a shrinking percentage of the population. Local telephone costs were increasing and services were decreasing. Demand remained high, but government simply could not do the job. Yet

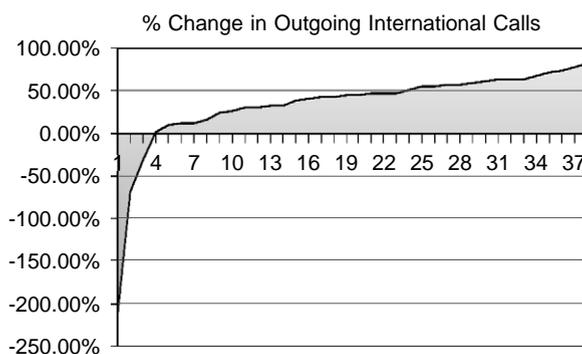


Fig. 10. Percentage change in outgoing international calls in 37 Sub-Saharan countries, 1990–1996. Source: ITU (1998).

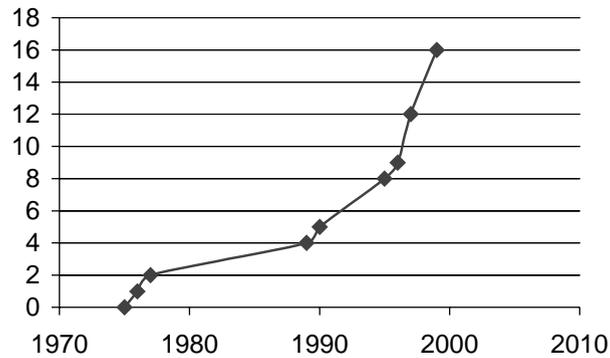


Fig. 11. Cumulative telephone operator privatization. Source: ITU (1998).

government officials insisted on maintaining their monopoly. The private sector was frozen out of business opportunities while being penalized by poor service. This situation was ripe for a breakthrough. A break in the *ancien regime* occurred when new communications technologies entered the market. By the early to mid-1990s the introduction into Africa and elsewhere of the Internet, mobile phones, and other value added services started to demonstrate that small, private enterprises could provide reliable, convenient, and cheap telecommunications in sharp contrast to the old stodgy monopolies.

With few exceptions private companies in Africa were first allowed to operate in value added markets of cell phones, paging, and data services, and in the installation of telephone handsets, answering machines, facsimile machines, and other terminal equipment (ITU, 1996). More familiar core activities of “plain old telephone service” (POTS), long distance calling and domestic calls, remained in the realm of the Telecom or the PTT. At the same time important pressures were being exerted by international financial institutions and the multilateral World Trade Organization, as well as by the domestic private sector.<sup>7</sup> As a result, some policy changes did occur in the sector. The attached illustration reports the cumulative number of private national operators and the year privatization occurred (Fig. 11).

Thus, by the mid-1990s all the technical, commercial, and political pressures described above pushed hard on the *ancien regime*, both internationally and domestically. *In the first half of the 1990s we see the first serious and sustained re-calibration of the four balances on a broad scale across various ICTs.* Each industry, including broadcasting, telecommunications and information-processing, saw some re-calibration of the critical core balances. While not universal, these changes were also not isolated to a particular geographic region but increasingly appeared across the continent (Table 3).

The broadcasting and print sectors also experienced de-monopolization and de-regulation of the *old* policies. This was manifested in the tremendous increase in the numbers of broadcast stations and print publications, as well as in their diversification. No longer was there a single

<sup>7</sup>By privatized we simply mean that a private actor owned a portion of the Telecom, whether it is 10% or 100%. This does not suggest that the Telecom offered services in a competitive market. In fact, in some cases, like Ghana or South Africa, private actors bought portions of the Telecom, but the Telecom remained and operated as a monopoly.

Table 3  
Four balances of phase II

	Public or private	Domestic or foreign	Monopoly or competition	Centralized or decentralized
Telecommunications	Foreign and domestic private actors become active	Telecoms begin to de-monopolize and bring on foreign partner	Competition in specific sectors emerge	PTT bifurcation
Broadcast	Private radio and TV stations begin to emerge	Restrictions remain	Monopoly remains, but monopoly erosion is beginning via limited competition	non-government broadcasting begins

state-run radio, television station, or newspaper in most African countries. One World Bank paper has described the “explosion of media outlets and the diversity of their outreach” as the “second liberalization” of Africa. A close examination of Ghana illustrates this dynamic: in Ghana broadcasting stations nearly tripled between 1994 and 2000 to 21 radio broadcasting stations and six television stations (three cable and three broadcast) and the number of newspapers nearly doubled from less than 20 to more 38.<sup>8</sup>

In the other ICT sectors we see a similar privatization pattern, with private actors granted permission to move into specified areas set by government; areas where they would be unlikely to disrupt the *status quo*. Gradually, these areas expanded in the mid-1990s, but private actors were always looking over their shoulder at government. Again, an example from the broadcasting sector in Kenya is illustrative of this trend.

Until the mid-1990s broadcast content in most African countries was delivered via state agencies. Herman Igambi, the Managing Director of Kenya Television Network’s (KTN) comments that “before the democracy movement started in Africa, all TV and radio stations were used by the governments in power to propoganda their information” ([One World Broadcasting, 1994](#)). His station, started by the ruling party KANU and the first private television broadcaster in Kenya, is an example of privatization that did not disturb the *status quo*.

Kenya’s neighbor Uganda went further on the re-calibration trajectory. In 1992 it issued licenses for the first non-state television station, and by 1994 there were four broadcasters ([One World Broadcasting, 1994](#)). The head of Ugandan Television attributed pressure from the IMF to privatize as an important element in the decision to liberalize the media sector ([One World Broadcasting, 1994](#)).

In summary, Phase II saw some of the first substantial policy re-calibrations in Africa involving the bifurcation of PTTs and the de-monopolization of specific parts of a single sector, the first step in the broader process of shifting from a centralized to a more de-centralized national control system. By the end of 1995, as [Fig. 9](#) reveals, the majority of African PTTs had been bifurcated

<sup>8</sup> For a detailed analysis of telecom liberalization in Ghana see [Freepong and Atubra \(2001\)](#).

into postal and telephone organizations. But granting permission for greater competition and more international investment was slow.

### 3.2.3. *Phase III: 1995–2000*

In Phase III policy changes accelerated. In all sectors ICT reforms spread across more industries, becoming more deeply rooted. This was also a period of higher economic growth rates, and some African countries achieved their highest levels of economic growth in decades. Uganda, Botswana and Angola were among the 10 fastest growing economies in the world. At the same time that macroeconomic conditions improved, domestic opposition to the implementation of structural adjustment programs began to diminish. The end of the Cold War and political liberalization movements in South Africa, Ghana, and Zambia, and across the continent were beginning to be felt in the conduct of public policy.

Phase III continued the process of policy de-centralization. Support for the old model weakened. There were significant increases in countries' competitive market orientation in the ICT marketplace. And, where only a few years earlier government had owned virtually all the ICT sector, now a new amalgamation of foreign, domestic, public, and private ownership emerged, as is occurring in Uganda and Ghana.<sup>9</sup>

A key difference between Phases II and III was the increase in the volume and pace of change. Change in Phase II occurred in isolation, with limited bifurcation of the PTT, a private actor here and there, and the occasional addition of a new radio station. Changes in Phase III occurred more frequently, and were no longer limited to specific economic niches or new technologies. The ICT sector in this phase thus became more dynamic, a sector where changes in various markets occurred at the same time. The new technologies of cellular telephones, Internet, and satellite linkages spread even faster and gained a significant place in the ICT sector. And where telecoms were reformed, positive sectoral growth followed.

Uganda is an example of shifting multiple balances. In the shift from the old PPT model and its associated balances of Phase I, the Ugandan sector de-centralized, de-monopolized, privatized, and permitted domestic and foreign ownership. Beginning in 1994, Uganda began to solicit pre-qualifying bidders for its Second National Operator (SNO). The bidders represented a diverse mixture of public and private, large and small, and domestic and foreign actors. Among the five who submitted bids were Portugal Telecom, the South African Mobile Telephone Network, Telekom Malaysia, and Telkom South Africa, and others that formed consortia with both international and domestic partners.<sup>10</sup> Thus, new patterns of ownership emerged to complement the changes underway in de-centralization, de-monopolization, and the dismantling of parastatals.

<sup>9</sup> But only slight increase in PVN and selective expansion in foreign investment, mostly in cellular and other value added segments.

<sup>10</sup> The Uganda Communications Consortium, Pune, consisted of Mobile Systems International UK (25%); Vodafone (30%); Telenor (10%); Cypriot telecoms investment group Teledev (10%); Commonwealth Development Corporation, an international development finance institution (10%); and pay phone operator Starlight Communications Uganda (5%). The other was NewTel Consortium, consisting of IPS, an economic development fund (30%); Nexus, a subsidiary of France Telecom (30%); ATI, a Canadian systems designer (10%); and other unnamed Ugandan and foreign investors (30%).

Across the continent the same pattern emerged. For example, in Ghana the policy balance shifted sharply in the relatively short period between 1994 and 1997. In 1995 the PTT bifurcated and in that same year competition was permitted in the cellular market. In 1996, a foreign company, Malaysia Telekom, purchased 30% of Ghana Telekom, and in 1997 a telecommunications regulator was established. At the same time, similar developments were occurring in the broadcasting sector. Radio I, the first non-government owner, was founded in 1994. By the end of 1995 there were three private stations, and in 1998 there were half a dozen (ILG, 1999). Concurrent with the growth of private radio station was the accelerated diffusion of TV sets, which increased dramatically, from 265,000 in 1993 to 800,000 in 1996 (ITU, 1998).

In 1996 radio stations utilizing direct-to-home satellite, cable systems, or local relays that could broadcast to the entire continent came online. One example was World Radio Network (WRN). WRN began broadcasting in May 1996, and currently programs a wide selection of news and information programs (NPR, BBC, and RTV) to the whole continent.

By 1998 private cable and satellite television companies were also in business. Continental companies like South Africa-based M-Nets' *MultiChoice*, as well as *Canal+Horizon* were now available in most other African countries. Like their counterparts in the rest of the world, they provided a wide selection of programming, ranging from CNN to TV1, and a number of sports and movie stations. By 1998 Ghana had three "pay TV" firms, *Crystal Radiovision Network* in Kumasi, *Cable Gold* in Sakumono, and *MultiChoice*, which ranked fourth on the continent with about 10,000 subscribers (GWW, 1999). Thus, in countries like Ghana the range of media sources increased and included both indigenous and international content. The investors were mostly local nationals, although firms like M-Net did do cross border media investment. Worldspace corporation is another entrant to the all-Africa broadcast market, utilizing satellite based broadcasting.

### 3.3. New regulatory institutions

Institutional changes also accelerated in Phase III. Building on the reforms of Phase II, Phase III saw the emergence of African telecommunications regulators. While regulators first emerged in countries like Angola as early as 1985 and Cape Verde in 1992, it was not until 1995 that the pace picked up (Fig. 12). By then Nigeria, Tanzania, and Zambia had established regulators, and in the next 4 years, the number nearly tripled to a total of 18 across the continent. In 1999, the Southern African regulators met in Botswana to discuss their common concerns and compare solutions and created a new regional body. The new telecommunication regulatory agencies are of critical importance to sustained reform and improved service. They protect new market entrants from unfair predatory behavior by established incumbents, both in the telecommunications sector and in other ICT sectors as well.

While the new regulators are welcome to competitors and customers, they are generally opposed by the incumbents, who do whatever they can to circumvent regulators. Furthermore, they also suffered growing pains. Most African countries had virtually no experience with effective independent regulatory agencies. Instead, all regulation was done by in-house ministry officials. Most lack adequate training and money. They frequently lack the autonomy necessary for effective enforcement that facilitates privatization and competition (Hernandez, 1998). Too often, regulatory agents are cast in the role of a newcomer with sets and scripts from the *ancien*

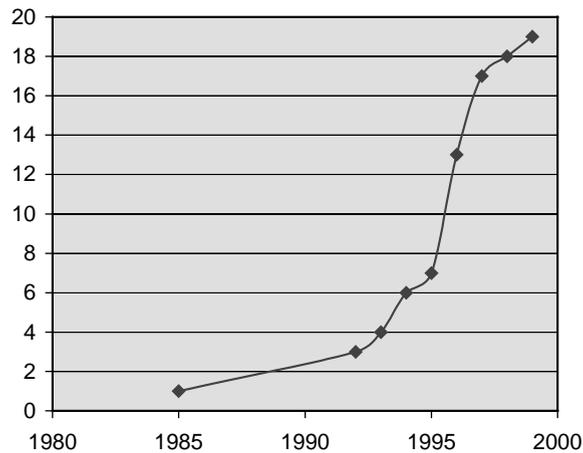


Fig. 12. Cumulative number of African telecommunications regulatory body by year established. Sources: ITU (1998).

*regime*. The persistence of old behavior patterns is reflected in a statement by the Kenyan Permanent Secretary for Communications and Transportation in April 1999. On the eve of the inauguration of the new regulator, the Kenya Communication Commission (KCC), the Permanent Secretary commented that competitive market-based pricing would not make sense once the “facts” were known. However, he was unwilling to discuss or specify these facts. Thus, while in Phase III many African countries established formal regulatory agents for the ICT sectors, in most cases the Regulators were understaffed and lacked the expertise necessary to run an effective regulatory agency. They remained embedded in the *ancien regime*. Unfortunately, the result was that the old under-performing companies were able to continue to use all their political leverage, financial resources and foreign contacts to stifle risk-taking entrepreneurs.

The successful establishment of effective regulatory agencies requires new and scarce resources in the telecommunications sector. Establishing a regulator that can design and implement pro-market rules, punish non-compliance, monitor behavior, set price structures, and accomplish this with some degree of autonomy requires very different roles for all the relevant players, including the regulator, private sector entrepreneurs, the relevant ministries, and the government as a whole. This is a qualitatively different type of de-centralization than the bifurcations of Phase II. These new ways of acting must be learned over time. They must be widely accepted within both government and private sector. These changes do not occur automatically. They emerge out of the heat of political and bureaucratic battles. The country’s highest echelon officials must weigh in to protect regulation from the inevitable pressures from the *ancien regime’s* stakeholders if the regulator is to succeed.

As noted earlier one primary manifestation of Phase III is the acceleration of the privatization trend and the entrenchment of competition in the telecommunications sector.<sup>11</sup> Fig. 13 reports

<sup>11</sup> Privatization and the introduction of competition require the de-centralization of the *ancien regime*, and in the case of Africa, also required the introduction of foreign actors. With few exceptions domestic actors simply did not have the financial resources necessary to change the *ancien regime*. Thus, the changes in Phase II were important foundations for Phase III.

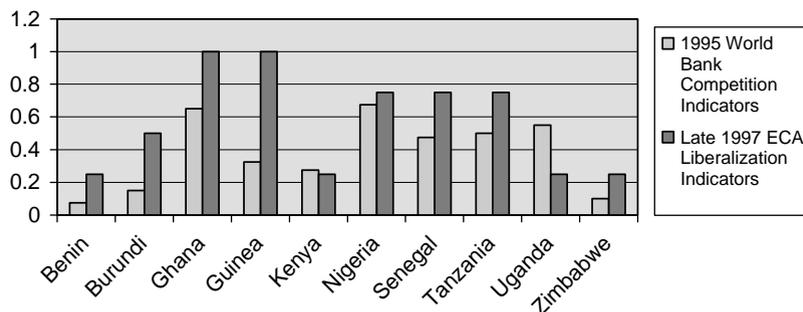


Fig. 13. Select telecommunication liberalization and competitiveness indicators 1995 and 1997.

two indices that reflect these trends between 1995 and 1997.<sup>12</sup> It reveals parts of the dramatic changes we have described above.

In summary, Phase III, from 1995 to 2000, was by far the most dynamic 5-year period in decades, marked by several new trends and a number of new technologies, such as the Internet, cell phones, cable and satellite broadcast, and other wireless technologies. The diffusion of one technology requires a permissive policy and institutional framework that can also facilitate the diffusion of others. Phase III showed that reforming a restrictive policy environment in one sector, whether it be cell phone, Internet, or local telephone service, has an effect on others. Thus, a policy reform that may be intended for one technology can be applied to other technologies and used by entrepreneurs as a lever for reform.

These policy shifts are mutually reinforcing. Increasing competition reduces state ownership and control. Less state control encourages possible entry by foreign investors, provides more competition, drives prices down and service quality up, and increases diffusion. The rationale is straightforward: without competition, de-monopolization, foreign actor participation, and private ownership there is simply not enough financing, technical expertise, human resources, and interested consumer base to support diffusion.

Take the case of Mozambique where the fast diffusion of the Internet and the re-calibration of policy balances coincided with each other (Metzger, 1998). Other examples include Ghana and Mali where the government has relinquished its monopoly, private actors have been allowed to participate significantly, domestic and foreign actors have amalgamated, the sector organization has been de-centralized, and the Internet has flourished.

#### 4. Conclusion

We have defined the information revolution as an institutional and policy revolution, not just a technical one. In order to move from rhetorical promise to real performance African governments and others must insist on accelerated policy reform and substantially increased institutional

<sup>12</sup>To facilitate comparison, the 1995 World Bank competition indicators and the 1997 UNECA liberalization indicators have been standardized on the y-axis.

capacity. To deliver the technologies and put them in the hands of the people requires the kinds of changes in the policy balances we described above—shifts from public to private participation, foreign and not simply domestic investment, competition in place of monopolies, and increased de-centralization. The countries that reform the fastest and get the best technologies to their populations quickly and cheaply will advance more rapidly; the non-reformers will fall behind.

Ultimately, the goal of any policy program in Africa or elsewhere—through whatever means possible, is to put ICT resources into the hands of their people to use them to meet their own social, economic, and political needs as they define them. Sometimes the ICT delivery channels in Africa are public bodies like municipal kiosks. At other times the delivery channels are private suppliers. Under other circumstances, NGOs deliver the services.

Africans are expanding their engagement with the Information Revolution at a substantial rate. We found in all sub-regions, and in Africa as a whole, substantial increases in ICT consumption. We also found considerable cross-national diffusion differences across the continent, sometimes in patterns we did not anticipate. There was not a single hierarchy for all technologies. Instead, there was considerable variation across technologies, with East and Southern Africa leading in per capita Internet accounts, while West Africa led in cell phones and television sets. Regrettably, there is virtually no available comparable evidence that lets us compare and contrast the intra-national differences in ICT consumption in Africa. There is scattered evidence that the same demographic features that drive ICT use in developed countries where at the start those most likely to have Internet access were male, educated, wealthy, and urban apply in Africa as well.

The precise patterns of African reform are best revealed, we argued, in a comparative institutional and policy analysis of the recent evolution of ICT sectors. We identified three periods of reform, and found that in all cases the transition from the old policies of domestic, state-controlled centralized monopolies toward more market-driven, de-centralized sectors with foreign participation, happened in fits and starts, with advances and retreats along almost every dimension. Engagement with the global information revolution has not been a smooth and unidirectional process. It was not until the mid-to-late 1990s that the piecemeal adaptation of most governments became more cumulative and consistent. There is also evidence that the countries farthest along the transition path had better performance in terms of new telephone connections, reduced waiting lists, more extensive Internet connections and other indicators.

Africans are moving ahead on their own terms, participating in the global information revolution and capturing some of its benefits. Still, the revolution poses a dilemma for Africa. Africa has the most to gain, yet also has much to lose.<sup>13</sup> Precisely, because the revolution is as much a policy and institutional revolution as a technological revolution, Africa remains at a distinct disadvantage precisely because like all poor regions its institutions are notoriously weak. The legacy of poverty, colonialism and political misrule, weak institutions, half-hearted leadership and conservative policies does not auger well for rapid change. There will continue to be advances, and some countries in Africa will certainly do better than others. But across the continent the institutional and leadership commitments to advancing ICT are still modest, and that lackluster performance will only accentuate the gap between the ICT haves and have-nots globally. The

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<sup>13</sup> See [Rodriguez and Wilson \(1999\)](#) for a worldwide analysis for the gap between countries.

extent of improvement in any given country will hinge on the capacity of African leaders to create pro-reform coalitions and constituencies that can overcome institutional resistance and sustain the forward momentum of the revolution.

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