CHAPTER 13

Multinational Operators in African Mobile Markets

Ewan Sutherland[1]

1. Introduction

The early months of 2006 saw spectacular evidence of the vibrancy of the market for mobile telephony in Africa. The Democratic Republic of Congo (DR Congo), Morocco and Nigeria were in discussions with operators about licensing 3G mobile telecoms. Mauritania launched the assignment of a third mobile licence, while Egypt received eleven applications for its third mobile licence. MTN purchased Investcom for USD 5,500 million. If there had been any doubt it was now clear that mobile telephony had truly taken off in Africa.

The success of cellular voice telephony, primarily the global standard for mobile (GSM), has been made possible by the opening of markets to new operators, relegating to history the monopoly provision of fixed networks. In comparison with the sluggish growth and high monthly rentals of fixed telecommunications, mobile operators have attracted large numbers of customers with packages of handsets, calls and text messages that are considered to be affordable by a significant part of the population. To do so they have built substantial networks making significant investments. Competition has been sufficient to push operators to expand even if not always to reduce their prices.

Across the continent there are now many national regulatory authorities (NRAs) that can provide quasi-independent support for markets, though there are still comparatively few national competition authorities (NCAs). The effectiveness of NRAs in implementing pro-competitive policies and in delivering benefits to current and potential customers is unclear and requires detailed analysis. They often have limited independence and some governments continue to shelter incumbent operators from competition, in particular by continuing their monopoly over international traffic (Shehadi 2002). A test case has been Somalia, where there is strong market growth, low prices, interconnection and competition – all in the absence of a regulator or even an effective government.

There are a significant number of market failings and abuses to occupy NRAs, though some of the work can be reduced through sharing within regional and global networks of regulators. There is a need for considerable support to improve the skills amongst the staff of NRAs and also for consumer protection, in both governmental agencies and associations. These are essential for the accurate analysis of developments on mobile markets. Many of the present skills are in technical aspects of regulation, rather than the application of pro-competitive policies.

A typical problem is the high switching cost for customers in the absence of mobile number portability (MNP). The exorbitant international mobile roaming charges also present a challenge that must ultimately be solved. And a further regulatory problem is the high level of mobile termination rates (MTRs), both a complex issue and one in which the operators are most sensitive. While these rates are generally far above costs, the effects of their reduction needs to be thoroughly understood. For the future, interconnection arrangements need to be designed to avoid such difficult and contentious issues.

Many complaints have been made about poor quality of service and inadequate levels of customer care provider by operators. Such problems arise from the low levels of competition and the high degree of concentration and can largely be addressed by increasing competition.

There are also general concerns about the affordability of mobile telecoms for large parts of the population. It is unlikely that GSM technology can be made affordable for everyone, while remaining viable for operators. Since long-term subsidies will not be affordable, alternative solutions will have to be sought.

Mobile network operators have criticised regulation as restricting investment and for failing to reflect local circumstances. They also criticise regulators for uncritically copying from developed countries, without consideration of local circumstances (PWC 2005). This has to be judged against their global pattern of politico-regulatory gamesmanship.

Africa can be treated as one unit or it can be divided between Middle East and North Africa (MENA) and Sub-Saharan Africa (SSA). It is also possible to divide the continent into the different colonial traditions with Arabic, Anglophone, Francophone and Lusophone groups. However, for mobile telecoms it appears that the larger operators have extended their footprints across Africa and the Middle East, even as far as Afghanistan. It has allowed the operators to spread their risks and to maximise revenues from customers with limited disposable income.

While a few countries in Africa would be considered to have a low political risk, many are characterised by doubt and instability, war and strife. Nonetheless, mobile operators have entered these markets, constructed networks, generated revenues and acquired each other. Changes in government evidently do not result in the loss of licences or disadvantageous changes in regulation.

New challenges arise as we move into an era of broadband and 3G mobile telecoms. It will be necessary to find the content to attract customers and generate the revenues needed to pay for infrastructure and handsets. This is likely to require an entirely different enabling environment with new regulations, including those governing acceptable content.

In the next sections, the performance of fixed networks is briefly analysed, followed by a detailed analysis of the growth of cellular wireless networks in Africa, examining in particular levels of competition and economic benefits. This is followed by an analysis of the large transnational operators: Vodafone, Investcom, Millicom, Celnet, MTN and Econet. Conclusions are then drawn.

2. The fixed network

The lack of competition in fixed networks, in the absence even of a second network operator (SNO) in very many countries in Africa, has meant modest growth and even decline. There has been no business case for the installation of additional copper local loops, with a preference for the construction of GSM networks and, in a few cases, wireless local loops (WLLs). There is not yet a case for the construction of local loops using optical fibre cables, nor does that seem likely in the medium term.

International telephone services have historically been very expensive. Operators have priced calls far above costs, supposedly in order to cross-subsidise fixed line subscriptions and network construction. In many cases international telephony remains a monopoly (World Bank 2004b). The creation of the SAT-3 undersea cable has been little short of a fiasco, with incumbent operators monopolising the capacity and setting very high rates, which result in extremely low levels of utilisation of its capacity.

Business customers in MENA have complained that their fixed network requirements were not being met in terms of service quality being insufficient for corporate applications; very long lead times; and high prices (World Bank 2002). Unmet demand and poor quality of the demand that is met result in additional inefficiencies. Too often businesses are unable to make optimal use of ICTs.

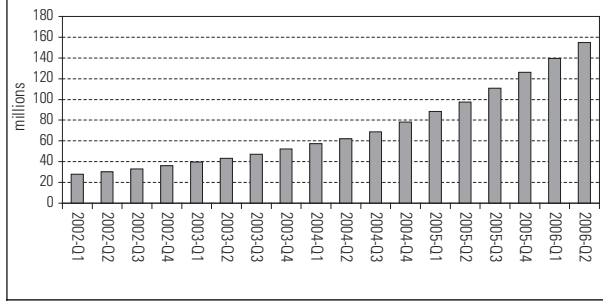
Good telecom services have significant and positive effects on inward flows of foreign direct investment (FDI) and on exports of both manufactured and intermediate goods. Given the poor performance of telecom services, policies that improve their performance should lead to improvements in FDI and exports (Sekkat 2020). The opening of telecom markets to competition can therefore play a catalytic role in easing cross-border constraints on trade (Rossotto et al. 2003).

Both privatisation and competition have led to significant improvements in the performance of fixed network operators. The greatest gains have come from a comprehensive reform program, involving both changes to policies and the support of an independent regulator. The sequence of reforms has been found to be important, with fixed line penetration being lower if competition was introduced after privatisation, rather than at the same time (Fink et al. 2002).

Liberalisation and the opening of markets have promoted the greatest efficiency. Better telecommunications leads to better integration into the world economy which, in turn, leads to strengthening of export performance in manufacturing (Estache and Ana Goicoechea 2005).

The state of fixed network services and markets generally is poor and in extreme cases almost nonexistent. The success of competition in mobile networks has too seldom been followed through by its introduction into fixed networks and, in particular, in the provision of infrastructure and international gateways. The result is that many problems in the rest of the economy are accentuated, when they could be reduced.

Figure 1. Growth of GSM customers in Africa



Source: GSM (2006).

3. Competition and growth in cellular voice telephony

There has been significant growth of mobile telephony in the last few years (see Figure 1). However, there remain large numbers of people and many groups without access to affordable telephony of any sort. With a total population of almost 900 million, there were still almost 760 million Africans without a mobile telephone at the beginning of 2006 or about 84% of the population.

There is also a small number of CDMA licences, mostly WLL, but also some cellular networks (see Table 1). The CDG reports only about six million customers across Europe, the Middle East and Africa, including both WLL and cellular, so that cellular CDMA customers in Africa are very few in number.

The numbers of customers of mobile telephony are never very precisely measured. There tends to be some overstatement by operators because of individuals with multiple SIM cards, particularly international travellers. Customers will often carry SIM cards for more than one network to improve the likelihood of obtaining service in countries with poor quality of service. Some discipline in reporting is being introduced by anti-terrorist measures, requiring detailed registration of prepaid customers. A further factor is the need to report to financial markets, where overstating customer numbers lowers the average revenue per user (ARPU).

One of the largest contributors to the total is South Africa, with almost 40 million. However, these numbers have been questioned because they seem so high as to be close to saturation. The causes of over-reporting of customer numbers would include special offers on SIM cards (e.g., ZAR 2.00 per card), use by illegal immigrants and more generally in the informal sector of the economy.

There is also understatement of customer numbers arising from simple resale of mobile telephony by individuals which is prevalent in many towns and villages. This is best known from the microfinance model pioneered by Grameen in Bangladesh, assisting telephone ladies set themselves up in rural villages (Knight-John et al. 2005). This model has recently been introduced into Rwanda (Grameen Foundation 2006). Additionally some individuals have access to telephony through the use of payphones and telecentres on the GSM networks.

Customers of mobile telephony in Africa are almost entirely prepaid, with no more than 10% and often less than 5% being post-paid subscribers. For example, in Morocco where the total mobile teledensity has reached almost half the population, only 2% of overall teledensity is post-paid mobile, compared with 40% which is prepaid mobile.

The sale of prepaid cards in countless retail outlets results in some additional costs but makes telephony available on a wide scale. Cards are usually available in relatively small incremental units, which suits customers with very limited access to cash. Such purchases also generate revenues for the shopkeepers.

Many countries have markets in more affordable second hand mobile phones. These often overlap with markets for illegally imported handsets, avoiding government duties on electronic goods. In some countries there are also supplies of stolen handsets from the same country and elsewhere, notably from the developed countries.

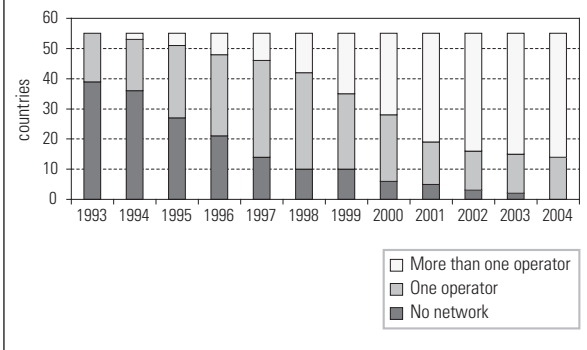
The limits of the expansion of cellular networks are a mixture of the network construction costs, population density and disposable income. The gross national income (GNI) can be used as a proxy for monthly income, allowing for purchasing power parity (PPP). However, it is necessary to consider the GINI index to take account of the distribution of income among individuals or households. A perfectly equal distribution would have a GINI score of 0 while a value of 100 would be perfect inequality. Literacy rates also affect use of services such as SMS. A heavily urbanised population would require lower network construction costs and lower maintenance than a largely rural population. A worst case scenario would be low income, limited urban population and high GINI, pointing to a small addressable population for cellular voice telephony.

Table 1. CDMA cellular networks

Country	Operator	Frequency
Angola	Movicel Telecomunicações	800 MHz
DR Congo	Telecel International	800 MHz
Ghana	Kasapa Telecom	800 MHz
Nigeria	Reliance Telecommunications	1900 MHz
Zambia	Telecel International	800 MHz

Source: CDMA Development Group website.[2]

Figure 2. Mobile networks and competition in Africa



Source: ITU (2004).

Table 2 shows the GINI scores and the human development rankings, together with literacy and urbanisation rates for countries in Africa with low human development.

There has been a gradual acceptance by governments that mobile telephony is a commercially viable model and that competition amongst operators was both possible and would accelerate its adoption by customers (see Figure 2). There was further opening of markets to competition in 2005 and 2006, for example, in Swaziland. The significant pool of unmet demand for telecommunications has been reduced by the availability of mobile telephony.

Table 2. GINI index in low human development countries

Country	GINI	Year	Human Development rank	Urban %	Adult Literacy %	GNI per capita (PPP) per month
Rwanda	28.9	1984	158	18	64	103
Burundi	33.3	1998	171	10	59	55
Yemen	33.4	1998	148	26	49	68
Côte d'Ivoire	36.7	1995	161	45	48	123
Mauritania	37.3	1995	154	62	51	171
Uganda	37.4	1996	147	12	69	121
Tanzania	38.2	1993	160	35	69	56
Mozambique	39.6	1996	170	36	46	98
Guinea	40.3	1994	157	35	-	180
Senegal	41.3	1995	156	50	39	138
Kenya	44.5	1997	146	39	74	94
Madagascar	46.0	1999	149	27	71	70
Guinea-Bissau	47.0	1993	166	34	-	58
Cameroon	47.7	1996	142	51	68	177
Gambia	47.8	1998	151	26	-	158
Burkina Faso	48.2	1998	173	18	13	98
Ethiopia	48.6	2000	169	16	42	63
Malawi	50.3	1997	162	16	64	53
Mali	50.5	1994	172	32	19	79
Niger	50.5	1995	174	22	14	65
Nigeria	50.6	1996	152	47	67	81
Zambia	52.6	1998	163	36	68	74
Zimbabwe	56.8	1995	145	35	90	170
Central African Republic	61.3	1993	168	43	49	92
Sierra Leone	62.9	1989	175	39	30	46

Source: UNDP (2003); World Bank (2004b).

In many instances governments have been tempted or persuaded to manage the introduction of competition, usually in order to protect the commercial interests of the incumbent operator and, sometimes, other operators. In only a few cases has more complete competition been allowed or created and for the remainder, it could take many years.

In DR Congo, despite internal strife and civil war, there has been the entry of foreign operators making significant investments, notably Celtel and Vodacom. With the number of operators rising to three and eventually to six, the result has been rapid growth to an estimated 3.5 million customers by the end of the first quarter of 2006 (see Figure 3). There has already been discussion of the licensing of 3G, in order to increase the spectrum available to operators. The contrasting case is Ethiopia, where the absence of competition had seen very limited growth of the GSM customer base, with a total of less than 0.7 million customers at the end of the first quarter of 2006, not quite 1% teledensity.

A very small number of market players, protected by high politico-regulatory barriers to market entry, can easily result in price shadowing and even in collusion. Analyses of the markets for mobile call origination in France, Ireland and Spain have illustrated this problem, despite operators competing on the market for some years. In the case of France there has been shown to be collusion between the three operators, resulting in heavy fines (Conseil de la Concurrence 2005). To date, there has not been detailed analysis of markets in Africa, nor the regulatory action to remedy the lack of effective competition.

One measure of market concentration is the Herfindahl-Hirschman Index (HHI), showing the extent to which a small number of firms account for a large proportion of output. It is used as one possible indicator of market power or competition amongst firms, by summing the squares of the market shares of all firms in the industry. The higher the HHI for a specific market, the more it is concentrated. An HHI below 1000 means that the market concentration can be considered to be low, between 1,000 and 1,800 moderate and above 1800 as highly concentrated. For example, in Morocco with only two operators the HHI has declined from 5,900 in 2003 to 5,500 at the end of 2006, while in South Africa with three operators it was 4,600. By comparison, the figure in France was 3,750 while Hong Kong SAR managed 2,200.

The ITU reports the following countries as retaining a monopoly on international services: Botswana, Burkina Faso, Cape Verde, Eritrea, Ethiopia, Gambia, Lesotho, Namibia, Tanzania and Zimbabwe. Others do not permit GSM operators their own gateway, or require additional licences and payment of fees. Lifting these restrictions would have the effect of significantly reducing the prices of outbound international calls and also the cost of inbound calls. The present limits on international telecommunications operations no longer serve any valid economic purpose, but constrain the rest of the economy.

The GSM operators have struggled to exclude alternative technologies and business models, not least by proclaiming the success of their own model. They appear to be concerned

with avoiding introduction of any different version of 3G and also of technologies such as CDMA in the 450 MHz band and WIMAX in the 2.5 and 3.5 GHz bands. This presents a serious public policy problem by excluding cheaper alternatives and by reducing the opportunities to develop innovative business models for broadband.

While most countries now have more than one operator and thus nominal competition, the true extent of competition has seldom been measured in terms of falling prices, rising quality and increased geographic coverage. HHI scores show highly or very highly concentrated markets, largely because of the reluctance of governments to issue more licences in the face of resistance from established operators. This lack of competition goes some way towards explaining the high prices and thus profitability of the GSM operators. Competition between technologies will become much more important in driving the movement to new business models.

4. Economic benefits

The lack of infrastructure in developing countries is self-evident, not least in Africa, with serious consequences for economic growth. The problem has been to raise funds and to find ways in which the private sector can raise funds needed to pay for closing the infrastructure deficit. For example, the Asian development banks identified a need for USD 1,000 billion in infrastructure for the period 2005-2010 (ADB et al. 2005).

The African Development Bank (AfDB) has drawn attention to the poor performance of the continent in terms of access to water, to electricity and to telecommunications, both in quantity and in quality. The magnitude of the infrastructure deficit and the financing challenges were considered to require concerted efforts from all funding agencies (AfDB 2006a). Infrastructure development has been put at the heart of the New Partnership for Africa's Development (NEPAD) strategy for poverty reduction through growth and full participation in the global economy – via the Infrastructure Development Programme.

Since many countries lack the economies of scale found in larger markets, infrastructure development can serve as a driver for regional integration and trade competitiveness. It can also be a necessary basis for development of infrastructure in order to allow for economies of scale through pooling of resources and joint facilities, as well as to overcome the limitations of small and fragmented markets. One such regional project has been the East Africa Submarine Cable System (EASSy) which is to improve international and regional communications.[3]

The AfDB lent 36% of its funds on infrastructure projects in the period 1967 to 2004 (AfDB 2006b). However, only 3% of the USD 12.5 billion of infrastructure funding went to telecom projects (see Figure 4).

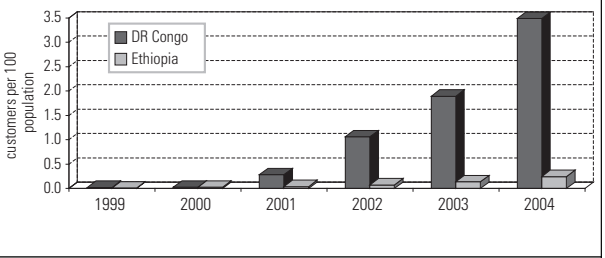
In 2005 the World Bank lent 1% of both its USD 3.9 billion for Sub-Saharan Africa and USD 1.3 billion for MENA for "information and communications" (see Table 3). Although small in size, the investments in Celtel, Investcom and MTN have proved highly profitable.

The Vodafone Group funded research on the effects of mobile telephony in Africa in an effort to demonstrate the economic benefits of the adoption of GSM technologies (Vodafone 2005). This followed a research tradition in which investment in fixed telecom has been shown to be strongly linked to economic growth. Unsurprisingly, Waverman et al. (2005) confirmed this for mobile telephony. This work continues at the London Business School in a programme funded by the Leverhulme Trust.[4]

In Africa, the research shows the effects where cellular wireless network costs are significantly lower and more easily scaleable than with traditional fixed networks. Moreover, prepaid cards have made mobile telephony more accessible than subscription-based fixed telephony, always provided it continues to be supported by high MTRs.

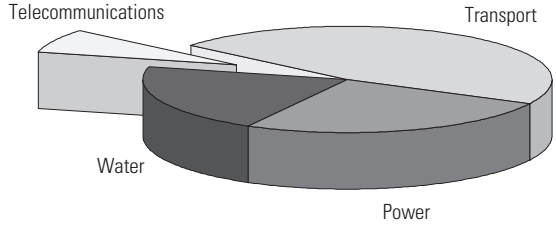
However, there has been no research, even for developed countries, that separates out the economic value of mobility in telecommunications. In developed countries the incremental

Figure 3. Mobile teledensities in DR Congo and Ethiopia



Source: ITU (2006).

Figure 4. AfDB infrastructure lending 1967 to 2004



effect of mobile phones, on top of widespread access to fixed telephony, is very hard to quantify. Much of it will be conspicuous consumption, not contributing to economic growth. Research is needed on the relative economic merits of full and partial mobility, especially when compared to nomadic and fixed telecom. Equally, as the emphasis in telecom moves towards fixed and mobile broadband access, there is a need to assess the economic value of the uses of these technologies.

The infrastructure deficit remains very evident in Africa. Even with the considerable progress that has been made with cellular wireless telephony, it has been against advances in other parts of the world, leaving Africa with a continuing, if evolving, deficit. In turn, that infrastructure deficit gives rise to significant economic disadvantages. The progress achieved has been made by the private sector, which obliges governments to put more emphasis on the macro-economic and politico-regulatory environments that will enable further investment and sustainable operations.

5. Vodafone Group plc

The largest global mobile operator in financial terms is the Vodafone Group plc – although China Mobile is larger in customer numbers it has significantly smaller revenues. Faced with slowing growth in mature markets, the need to cut costs and to boost growth in emerging markets, Vodafone restructured its business into three divisions: Europe, emerging markets and new business (Vodafone 2006). Vodafone had been under increasing pressure to match competitors in steps toward integrating fixed and mobile service offerings. Arun Sarin, its CEO, said:

> By creating three new business units ... we are reflecting the different approaches that will be required to succeed, both in terms of our existing operations and in capturing new revenue streams for the future.

In emerging markets, Vodafone is present in several African countries, both directly and through Vodacom, a 50/50 joint venture with Telkom South Africa. South of the equator Vodacom is the brand used, elsewhere it is Vodafone. The financial results for Vodacom have shown impressive growth (see Figure 5).

The cumulative capital expenditure by Vodacom, up to and including 2005, had been almost ZAR 25 billion.[5] Of this over 80% had been spent in South Africa, with the remainder being ZAR 1,359 million in Tanzania, ZAR 1,759 million in DR Congo, ZAR 696 million in Mozambique and ZAR 210 million in Lesotho.

In 2005, Vodacom had a total of 15.5 million customers spread across its operations in Africa, some of which are a decade old: South Africa (1994), Lesotho (1996), Tanzania (1999), DR Congo (2001), Mozambique (2003).

Vodacom had over twelve million customers in South Africa, with a market share of just over one half. These split between about eleven million prepaid customers with an ARPU of ZAR 78 and almost two million post-paid customers with an ARPU of ZAR 624. Saturation of the market would seem to be very close, so that customers will have to be persuaded to use new services if revenue growth is to be maintained, requiring substantial investment in new networks.

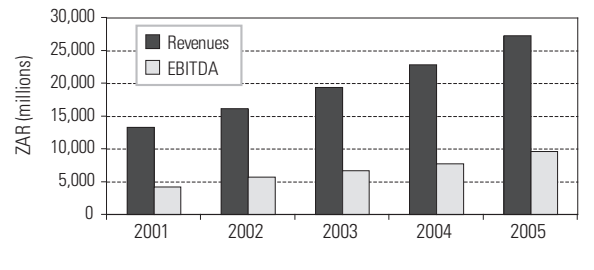
Vodacom launched a 3G service in South Africa at the end of 2004 using universal mobile telephone system (UMTS), later upgraded to 3.5G with high speed download protocol access (HSDPA) in early 2006. It announced its intention to launch the same services in Dar es Salaam, though it is unclear if or when it will extend that service to other parts of Tanzania. Presumably this is intended to be paid for from international roaming revenues from visitors from South Africa and elsewhere, rather than a large local market. For the present, there is very limited evidence of use of 3G and only a small contribution to Vodacom revenues. Nor are there signs of the emergence of local suppliers of mobile value-added services (VAS). Separately, Vodacom has also experimented with a DVB-H mobile television service.

Table 3. World Bank activity in Africa in 2005

Country	Company	Loans (USD million)	Equity (USD million)	Institution
Cameroon	Orange	9.4	13.8	IFC
DR Congo	Celtel	16.3	-	IFC
Ghana	Investcom	40.0	-	IFC
Morocco	Medi Telecom	76.6	-	IFC
Nigeria	MTN	35.0	-	IFC
Sierra Leone	Celtel	1.2	-	IFC
Zambia	Celtel	2.3	1.3	IFC
Sub-Saharan Africa	Celtel	10.0	11.8	IFC

Source: IFC (n.d.); and IFC and Investcom Holding (2005).

Figure 5. Financial results for Vodacom



Vodacom has generated significant growth outside South Africa (see Figure 6). The performance in DR Congo is especially impressive, given the continuing political problems and the level of competition. Associated with this are quite high operating costs, for example, in providing security for employees. There are also problems of securing base stations, in particular the generators and fuel supplies. It is not yet clear how profitable these operations will prove to be.

There has been an inevitable decline in the ARPU, as more but poorer customers are added. However, there is less variation between the countries than might have been expected (see Figure 7). Taking GNI per capita per month as a proxy for income, the ARPU are respectively 2.5% in South Africa, 4.6% in Lesotho, 7.2% in Mozambique, 19.5% in Tanzania and 23.3% in DR Congo.

Vodafone owns nearly 40% of Safaricom, one of two GSM operators in Kenya, the other being KenCell.[6] The remaining 60% of Safaricom is held by the fixed incumbent operator Telekom Kenya which has been due for privatisation for some years. In January 2006 the Government of Kenya, in its National ICT Strategy, proposed to sell 24% to a strategic investor and to float 34% on the Nairobi Stock Exchange (Ministry of Information and Communications 2006). Safaricom obtained an international gateway licence in early 2006.

Vodafone Group presently owns 50.1% of Vodafone Egypt.[7] Previously, it held 67%, with 10% owned by Alkan Group, 5% owned by Banque du Caire and the remainder by a number of companies and individuals in Egypt, including Orascom. Vodafone sold 16.9% to Telecom Egypt, the state-owned incumbent operator in 2005. Telecom Egypt subsequently bid for the third GSM licence in partnership with Telecom Italia. If that succeeds it will, presumably, sell its shares in Vodafone Egypt back to the Vodafone Group, otherwise it will continue to profit from the investment in Vodafone. This appears to be a highly unusual every-way bet on mobile telecoms with Telecom Egypt being supported by the government.

Vodafone Egypt showed significant growth in 2005, with an increase of 71% to almost six million customers and revenues rising by one third to EGP 1.4 billion.[8] Capital expenditure for the year was about EGP 1.6 billion.

For Vodafone and Vodacom there remains potential for expansion via acquisitions and new licences. However, the Vodafone Group faces considerable competition from other large groups that have driven prices up to levels that it would not be able to justify to its shareholders. The withdrawals from Sweden and Japan and potentially from the US and Fiji suggest that the future geographic configuration of Vodafone is far from clear, thus an exit from Africa is not unimaginable. Tension between Vodacom and Vodafone raises the question of why Vodafone is in Africa at all, given that the growth it is achieving is not making significant contributions to its overall profits, which depend more on the success of 3G in Europe.

6. Investcom

Investcom LLC was a private company led by Najib Mikati, former prime minister of Lebanon. It operated under the Areeba brand in several African markets (Benin, Ghana, Guinea-Bissau, Liberia and Sudan) and also in Cyprus, Syria and Yemen. In 2005 it was awarded further licences in Guinea and in Afghanistan. In May 2006 Investcom was acquired by MTN of South Africa (Investcom 2006).

Investcom began operations in Lebanon in 1982 through the creation of Inteltec, a telecommunications engineering services company. In 1991 it established the first privately owned and operated GSM network in the MENA region, from which it built by acquisition and licensing across MENA.

The Investcom footprint at the end of 2005 covered ten countries and a population of 147 million. Mostly these had teledensities of only a few percent, reflected in the total of just under five million customers for Investcom and high growth potential. At the end of 2005, almost 88% of its customers were prepaid, because of the primarily cash economies in which it operated, the low levels of disposable income of the individuals and their inexperience in managing credit. The subscription customers were mostly in Syria (see Figure 8).

Figure 6. Vodacom revenues by country

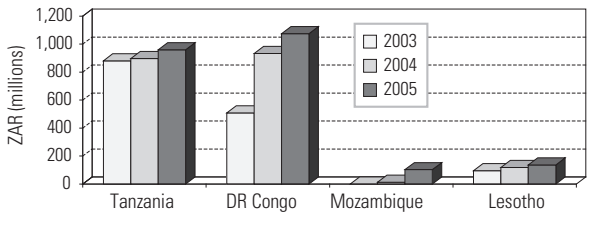
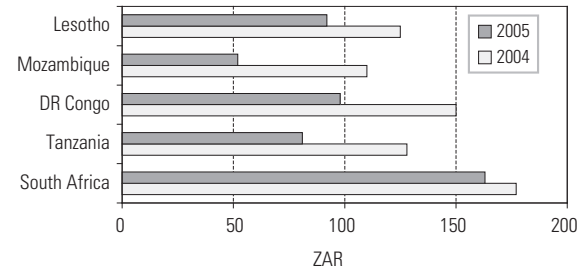


Figure 7. ARPU in Vodacom operations



In July 2005, Areeba became the second operator in Sudan. Despite the considerable problems of civil war, it managed to acquire over one quarter of a million customers in the first five months of its operations there. These appear to be mainly in Khartoum, a city of around six million.

Given the types of economies in which Investcom operated, a substantial difference between the post-paid and prepaid ARPU would be expected (see Figure 9). Both would decline over time as the customer base was widened to include more but poorer customers. Additional IP-based services might sustain post-paid ARPUs, but there is little evidence of this to date.

The rapid expansion of the customer base combined with increased usage resulted in gross operating revenues growing by 43% in 2005, from USD 633 to USD 903 million (see Figure 10). The core markets for Investcom were in Syria and Ghana.

In October 2005 Investcom floated almost one quarter of its shares on the London Stock Exchange and the Dubai International Financial Exchange, valuing the firm at USD 3.3 billion. In early May 2006, MTN purchased Investcom for USD 5.5 billion with a mixture of cash and shares, representing a very substantial increase in value since the previous October. Indeed, this valuation at almost USD 1,000 per customer appears to be a serious over-estimation of its net worth. It hints at a return to the irrational exuberance of the dot-com bubble and the pattern of excessive payments in acquisitions of mobile operators seen in Europe in the late 1990s.

It could be that MTN values the large number of potential future customers, or in other words, that it is betting on growth. This was the same basis as the wave of European acquisitions in the 1990s that pushed financial analysts to strict reliance on ARPU and away from promises of future revenues based on population covered. MTN was able to pay for the purchase in part with shares, but also by selling bonds on the Johannesburg Stock Exchange, valued at ZAR 7 billion (USD 3.85 billion), indicating that the financial markets remain confident about its prospects.

An accurate valuation of Investcom is not easily achieved. Clearly, the financial markets put a high value on the company, implying confidence that it will achieve strong growth in customer revenues. Given risks of further market entry and technological change, the financial markets may be being overly optimistic. For the present, organic growth will continue to deliver new customers, but mostly with a very modest ARPU.

7. MTN

MTN is registered in South Africa and listed on the Johannesburg Stock Exchange. It has substantial operations there and in Nigeria, respectively 10.2 and 8.4 million customers at the end of 2005, with a further 4.6 million customers in other African countries.[9] Nigeria has proved problematic for MTN where it has fought and, at the time of writing, lost legal battles with Celtel for control of Vmobile, a mobile operator.

Financially, MTN has grown significantly (see Figure 11). However, revenues have not kept pace with customer numbers, given the lower incomes of new customers and some having several SIM cards.

The ARPU has, as would be expected, declined as the customer base has widened in each country (see Figure 12). It has converged towards USD 20 or ZAR 120, with South Africa being a little higher because of the much larger proportion of subscription customers.

Figure 8. Investcom customers

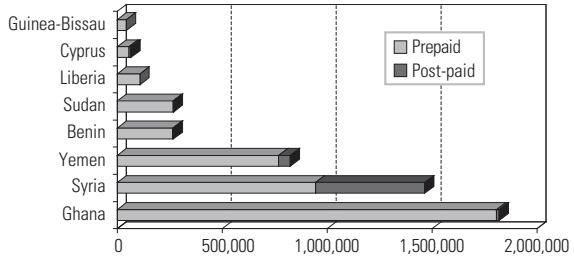


Figure 9. Investcom ARPU in 2005

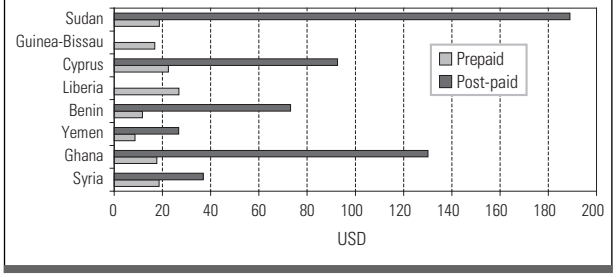
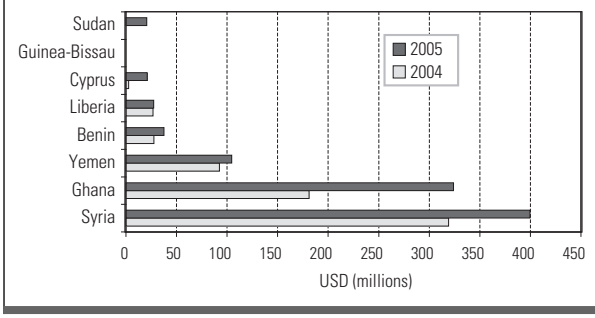


Figure 10. Investcom revenues



In addition to organic growth in its established markets, MTN acquired Investcom, giving it a substantial footprint across Africa: Cameroon, Congo (Brazzaville), Côte d'Ivoire, Ghana, Guinea-Bissau, Nigeria, Mauritius, Rwanda, South Africa, Sudan, Swaziland, Togo and Uganda. Additionally, MTN acquired a 49% stake in Irancell, for USD 350 million, a potentially lucrative market but where the politics are very delicate and security a major concern.

In South Africa, MTN launched a 3G (UMTS) service in mid-2005 and like Vodacom it is also migrating to offer HSDPA. However, this is aimed only at a niche market for post-paid subscribers and not yet the mass market. In some respects it is a substitute for fixed broadband, given the very high prices in South Africa.

Prior to the acquisition of Investcom, over 80% of the shares were held by nominees. Part of the acquisition having been paid in shares, the Mikati family now has a 10% stake in MTN.

An assessment of MTN depends on the one hand on the valuation of its acquisition of Investcom and on the other on its ability to evolve to new business models. On both counts there are serious doubts, but nothing more. MTN appears to be funding expansion from its two cash cows in Nigeria and South Africa, which cannot be sustained indefinitely.

8. Millicom

Founded in 1968 in Luxembourg, Millicom maintained a comparatively low profile, while building up its portfolio of mobile network operations in developing countries (see Table 4). It entered markets early, in partnership with local interests, which it has often later bought out. Millicom was ranked by *Business Week* as number 93 in its InfoTech 100 in 2006, reflecting its strong growth, much of it under the Tigo brand for prepaid mobile telephony.[10]

Millicom has shown strong growth in recent years, having reached ten million customers, primarily prepaid, in early 2006 (see Figure 13). Its operations are all in countries with low or very low teledensities, where GSM operators have been able to take advantage of unmet demand. Many of its African operations are in countries that have conflicts or have recently emerged as post-conflict, with a few having intermediate or semi-conflict status.

The growth in number of customers is reflected in the growing revenues and earnings before interest, depreciation, taxes and amortisation or EBIDTA (see Figure 14). Capital expenditure in 2005 was USD 88 million per quarter and USD 95 million in the first quarter of 2006. Of the revenues in 2005, USD 204 million were from Africa, about 20% of the total, hav-

Figure 11. MTN revenues and earnings

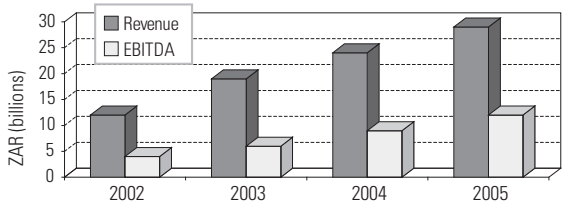


Figure 12. MTN ARPU by country (USD)

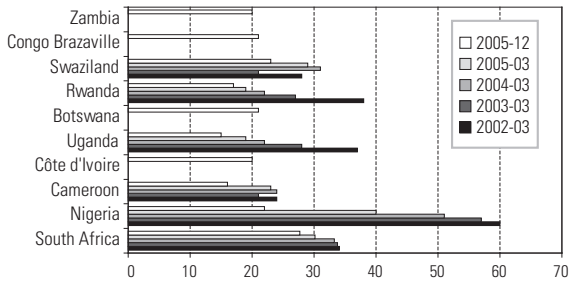


Figure 13. Growth of the Millicom customer base

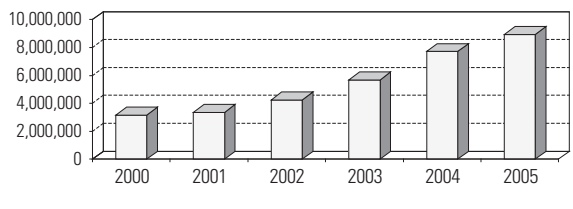
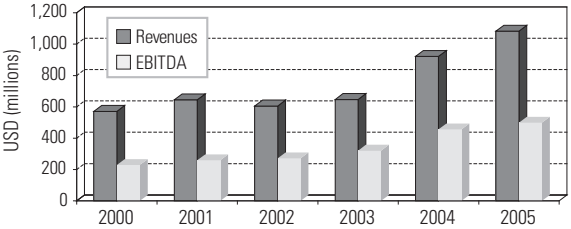


Figure 14. Growth of Millicom revenues



ing grown 36% since 2004, while the EBIDTA in Africa was USD 88 million.

Millicom is listed on NASDAQ, with the Swedish investment firm Kinnevik AB owning around 35% of the shares. Kinnevik also owns 30% of Tele2, a somewhat disruptive presence on several European fixed and mobile markets.

In January 2006 Millicom, with Morgan Stanley, announced a strategic review, after having received a number of unsolicited approaches from other firms. The public bids included Investcom offering USD 5 billion, but with China Mobile winning by paying USD 5.3 billion. This values each Millicom customer at around USD 530, or fifty times ARPU.

The collapse of bids for Millicom caused its shares to tumble. Perhaps, in time, another bidder will appear. However, the underlying business remains solid, with good prospects for continued growth across its very wide portfolio.

9. Celtel

In January 2004, what had been MSI Cellular Investments Holdings, based in Hoofdorf in the Netherlands, was renamed Celtel International BV. MSI Cellular Investments was founded in 1998 by Mohamed Ibrahim, who had previously founded and run Metapath Software Inc. (MSI), and before that was a technical director at Cellnet in the UK.

Celtel built up a vast geographic footprint across Africa, but with significant gaps in the populous states of Egypt and South Africa (see Figure 15). Its presence in Nigeria, a very large and rapidly expanding market, has been subject to complex and protracted litigation with MTN of South Africa over the ownership of Vmobile. For now, this seems to have been settled in favour of Celtel, which hold 65% of the shares. Further expansion has continued, for example, in 2005 when Celtel acquired Madacom, a GSM operator in Madagascar with some 200,000 customers.[11] In Zambia, Celtel also operates an m-commerce service, known as Celpay.

Table 4. Millicom operations

Africa	Asia	Latin America
Chad	Cambodia	Bolivia
DR Congo	Iran	El Salvador
Ghana	Laos	Guatemala
Liberia	Pakistan	Honduras
Mauritius	Sri Lanka	Paraguay
Senegal	Viet Nam	
Sierra Leone		
Tanzania		

In early 2006 Celtel acquired sole ownership of Mobitel, a GSM operator in Sudan, covering some of the areas controlled by the Khartoum government, notably the capital, but neither Darfur nor the south. Celtel, which already owned 39%, purchased the remaining 61% of Mobitel stock from the incumbent state-owned operator, Sudatel. However, the price of USD 1.3 billion put the value of Mobitel at USD 2.1 billion or USD 100 per customer – a remarkably high value.

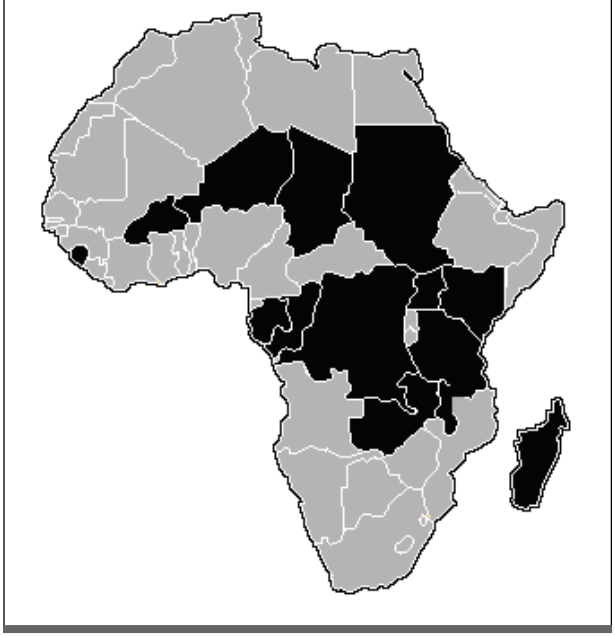
There may be some premium justified by buying out the government, a form of one-off licence fee. Investment in Sudan would appear to have a high political risk, though this is reduced while Mobitel remains in areas controlled by the present government, especially around the capital. Because the chairman, Mohamed Ibrahim, is of Sudanese origin, the commitment to the country is very strong.

In March 2005, MTC agreed to acquire Celtel for USD 3.4 billion, beating MTN, and making what it claimed was the largest single FDI ever made in Africa.[12] MTC was then a provider of mobile telecommunications in six Middle Eastern countries, to which Celtel added 13 Sub-Saharan African countries. MTC is listed on the Kuwait Stock Exchange and had a total of 7,000 employees and over 14 million customers.

With only five million customers, the acquisition valued the customers at USD 670 each, a comparatively high value when the ARPU is USD 21 per annum and declining. However, revenues show strong growth, as has the EBIDTA (see Figure 16).

In 1983, MTC was the first mobile operator in Kuwait and in the Middle East. Initially, this was ETACS cellular service,

Figure 15. Map of Celtel licences



replaced in 1994 with a GSM service and more recently supplemented by a UMTS (3G) service. MTC expanded abroad in 2003 by acquiring a controlling interest in Fastlink, a GSM operator in Jordan, and GSM licences in Bahrain and Iraq. In 2004, it reached a management agreement with MTC Touch in Lebanon. In its home market, the government of Kuwait introduced competition in 2000 and reduced its holding in MTC from 49% to 25% in 2001.

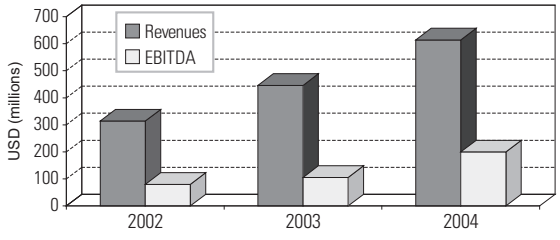
Celtel's acquisition of MTC was a very substantial expansion into quite different areas, which are linguistically and culturally more diverse and significantly poorer. Backed by MTC, Celtel is a now a financially powerful presence in Africa with a substantial footprint. It has the capacity to spread its political risk, to share what it learns from its different operations in order to improve its performance and to develop new business models.

10. Orascom

The Orascom Group is privately controlled, comprising:

- Orascom Construction Industries;
- Orascom Hotels and Development;
- Orascom Technology Solutions; and
- Orascom Telecom Holding SAE.

Figure 16. Revenues and EBIDTA for Celtel



Orascom Telecom Holding (OTH) owns interests in GSM operators in Algeria, Egypt, Tunisia, Zimbabwe and Pakistan and Bangladesh, with some 30 million GSM customers (see Figure 17). It has gradually increased its holdings, for example, taking it to 50% of Tunisiana and 88% of Djezzy (Algeria). At the same time, OTH sold its stakes in Oasis (DR Congo) and Libertis (Congo Brazzaville). It has expressed an interest in acquiring the third licence in Saudi Arabia and will doubtless pursue other opportunities as they arise. Orascom Telecom has also acquired, in partnership with Telecom Egypt, a fixed network operator licence in Algeria.

Revenue from its GSM operations were USD 1,799 million in 2004, rising to USD 2,793 million in 2005, generating EBIDTA of USD 979 million and USD 1,332 million respectively. The capital investment over the last two years by OTH subsidiaries has been substantial (see Table 5).

Orascom purchased the Italian operator Wind in 2005, a company with 14 million customers and EUR 4.7 billion in revenue (in 2004) (Wind 2005). This was seen as a surprising move by Italians and was not entirely welcomed, despite the high price it paid.

Predicting the future path of privately controlled groups is notoriously difficult, since they are less obliged to signal their intentions. Clearly, Orascom Telecom will expand in MENA as opportunities present themselves, though probably not in Sub-Saharan Africa. It seems unconstrained by financial resources in expanding. It will also continue to invest in its present portfolio of networks.

11. Econet Wireless

Econet Wireless is smaller than the other groups and has had a more troubled existence, with many legal battles with investors and putative partners.[13] Operations in Zimbabwe are severely constrained by shortages of foreign currency, essential for the purchase of equipment and also for the settlement of international traffic. The gross revenues of Econet were only USD 60 million in 2004 (see Figure 18).

Figure 17. Orascom Telecom customer base at 2005

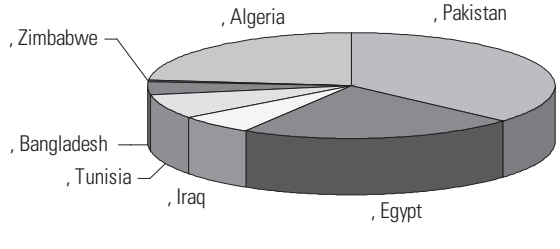
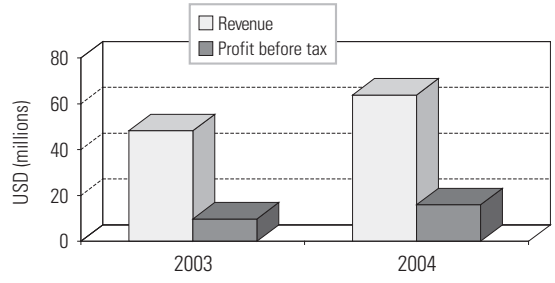


Figure 18. Econet financials



In 2005, Econet had five million customers in Botswana, Kenya, Lesotho, Morocco, Nigeria, Rwanda, South Africa and Zimbabwe, to which it added a licence for Burundi in early 2006.

Additionally, Econet Wireless Limited has a licence in New Zealand, in combination with Maori interests. This is a technology neutral licence which had originally been expected to be used for GSM, though after long delays it appears that EWL will use it for a 3G network.

The small size and the management troubles of Econet Wireless suggest that its future is uncertain and that it might well become a target for more acquisitive groups, if they can avoid the difficulties encountered by others. It is now too late for Econet to build its operations by acquisition, forcing it to rely on the slower path of organic growth and being assigned further licences. Moreover, there are unavoidable high risks, both political and financial, because of its involvement in Zimbabwe.

12. Conclusions

There has been significant investment in network infrastructure and in expansion of the markets for cellular telephony in Africa, reaching a mobile teledensity of almost 16%. This has largely been by companies based in Africa and the Middle East or those specialising in the region, able to draw on capital from financial markets in developed economies and the Gulf. An obvious exception is Vodafone, a European company with significant strategic investments in Africa.

The political risks of operating in Africa are nominally quite high, but seem not to deter mobile network operators. In practice almost no licences have been revoked and few adverse regulations have been imposed on operators. Since competition is limited, prices can be kept high, boosting profits. Businesses can be sold, often at surprisingly high values, ensuring an easy exit from a market. Operators are able to spread their risks across many countries.

African mobile telecom is now dominated by a small number of large groups. These corporations seem likely to continue in strong positions, given their capacity to generate capital and to make cost effective purchases on the global market for equipment. They have shown solid organic growth within their existing footprints and by their expansion into other countries, obtaining additional licences and acquiring other operators. The prospects for further expansion are good, since many millions of potential customers remain to be served and many countries could issue a third or fourth licence. However, potential customers are mostly very poor and many live in the countryside, often engaged in subsistence agriculture with little cash income.

Some of the recent deals give cause for concern with the possibilities that irrational exuberance or even a bubble economy might be building under GSM operators in emerging markets. The valuation of Mobitel at USD 2.1 billion and of Investcom at USD 5.5 billion appear to exceed, by a considerable measure, their true worth, even discounting the political and market risks. By comparison, the EASSy project will cost only USD 0.25 billion, but has required enormous efforts to raise the funds.

The continued reliance on EBIDTA as the primary comparative indicator is also a concern, when other sectors prefer more accurate and complete measures. Accurate ARPU data, with clear separation of voice, SMS, data and VAS contributions is essential for understanding developments.

It is unclear what would be the consequences of the controlling groups having to write off much or all of these very high valuations. Minimally, it would seem to make raising further capital much more difficult and thus hinder future network growth. However, at present there is no pressure on the operators to adjust these values.

While there has been considerable investment and generation of significant profits it is much less clear that there is real competition. The very high levels of concentration in markets arise from the limited number of market entrants in most countries, resulting from the staged introduction of additional operators. This has been justified by the alleged need to avoid turmoil in markets and to share out limited spectrum, but also to reduce the required investment in base stations.

A small number of players in any market will tend to copy each other's practices, rather than to drive down prices and to drive up quality. Where governments are concerned with the high level of profits or by the low levels of competition, the logical response would be to increase competition, which would deliver significant downstream economic benefits, although operators will actively resist such measures. It would be possible to issue more licences and more diverse licences (e.g., CDMA450 and WiMAX) to new entrants. Additionally, there is a range of simple pro-competitive regulatory measures including the introduction of mobile number portability, the regulat-

Table 5. Capital expenditure of subsidiaries (USD millions)

Country	Brand	2004	2005
Algeria	Djezzy	408	457
Egypt	MobiNil	110	427
Tunisia	Tunisiana	1,121	106
Africa	Telecel	13	1
Bangladesh	Banglalink	14	113
Iraq	Iraqna	89	125
Pakistan	Mobilink	340	615
	Other	18	25
	Total	**1,113**	**1,871**

ed reduction of mobile termination rates and allowing MNOs to operate their own international gateways.

Criticisms voiced by the GSM Association about regulatory regimes appear to be self-serving, seeking advantage for its members and an unjustified lessening of tax and regulatory burdens. Few African countries have engaged in the serious regulation of mobile markets seen in Europe or India. While the GSM Association complains about the taxes on imported equipment, its members seem very reluctant to block the use of illegally imported and stolen handsets. Operators would rather take the call revenues from the use of stolen phones than protect their original owners by blocking handsets listed as stolen in the Central Equipment Identifier Register (CEIR).

The focus of regulation will have to shift from licensing towards a more strongly pro-competitive focus. It will require careful analysis of the levels of competition on the different markets and the steps which can be taken to raise them, in order to deliver goals of lower price and higher quality.

There have been some early moves into mobile payments and m-commerce, complementary services that will generate little network traffic. On the one hand they raise regulatory issues about the application of banking regulations to mobile operators and on the other they might allow the unbanked access to limited financial services. One very obvious risk is the leveraging of market power from cellular telephony into banking.

Today, the business model is very close to monoculture, exclusively prepaid GSM voice and SMS, supported by the high charges for inbound calls. There has been some very limited experimentation in data and value-added services aimed at subscription customers, but nothing that suggests a new prepaid business model for 3G or multi-play. Yet, in a future that is based on value-added services and broadband, this delay in innovation creates the risk of sudden and potentially disruptive change.

Possible business models may well see convergence in handsets offering access to a range of technologies including satellite-based digital broadcasting and terrestrial wireless, though this evolution will not be immediate or direct.

Notes

[1] The author expresses his thanks for comments on earlier drafts of this document to Professor Philip Court of the Graduate School of Telecommunications and Information Technology (GSTIT) in Addis Ababa; to Professor Bill Melody of the Danish Technical University (DTU); to Mike van den Bergh of Gateway Communications; and to Svetoslav Tintchev of the World Bank. All errors are entirely my own.

[2] CDMA Development Group <http://www.cdg.org/worldwide/index.asp?h_area=5>.

[3] <http://www.eassy.org/>.

[4] London Business School Digital Transformations <http://www.london.edu/digitaltransformations.html>.

[5] 1 USD is equivalent to ZAR 6.10.

[6] <http://www.safaricom.co.ke/>

[7] <http://www.vodafone.com.eg/>

[8] 1 USD is equivalent to EGP 5.80.

[9] <http://www.mtn.co.za>

[10] <http://yahoo.businessweek.com/it100/2006/93.htm>

[11] <http://www.madacom.com/>

[12] <http://www.msi-cellular.com/en/news/press-release26/index.html>

[13] <http://www.econetwireless.com/>

References

African Development Bank (AfDB) (2006a). "Infrastructure Development and Regional Integration: Issues, Opportunities and Challenges," *The 2006 ADB Annual Meetings*. Ouagadougou: ADB. 16 May. http://www.afdb.org/pls/portal/url/ITEM/13439FE6FC56D01FE040C00A0C3D37A6

African Development Bank (AfDB) (2006b). "Infrastructure Development and Regional Integration: Getting the Policy Framework Right," concept note paper for *the 2006 ADB Annual Meetings*. Ouagadougou: ADB. 16 May. http://www.afdb.org/pls/portal/url/ITEM/1345D237DE1F4258E040C00A0C3D0A6C

Asian Development Bank (ADB), Japan Bank for International Cooperation (JBIC), World Bank (2005). *Connecting East Asia: A New Framework for Infrastructure*. Tokyo Launch: ADB, JBIC, The World Bank. March 16. http://siteresources.worldbank.org/INTEASTASIAPACIFIC/Resources/Connecting-East-Asia.pdf

Business Week (2006). "Millicom International Cellular," http://yahoo.businessweek.com/it100/2006/93.htm

Celtel (2005). "Celtel International BV agrees to US$ 3.4 billion offer from MTC Kuwait," 29 March. http://www.msi-cellular.com/en/news/press-release26/index.html

Conseil de la Concurrence (2005). *Décision No 05-D-65 du 30 Novembre 2005 Relative à Des Pratiques Constatées Dans le Secteur de la Téléphonie Mobile*. http://www.conseil-concurrence.fr/pdf/avis/05d65.pdf

Estache, A. & Goicoechea, Ana. (2005). "How Widespread Were Private Investment and Regulatory Reform in Infrastructure Utilities During the 1990s?," *Policy Research Working Paper 3595*. Washington, DC: The World Bank. May. http://wdsbeta.worldbank.org/external/default/WDSContentServer/IW3P/IB/2005/05/15/000090341_20050515142549/Rendered/PDF/wps3595.pdf

Fink, C., Mattoo, A. & Randeep Rathindran (2002). "An Assessment of Telecommunications Reform in Developing Countries," *Policy Research Working Paper 2909*. Washington DC: The World Bank. October. http://www-wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/2002/11/11/000094946_02102904035023/Rendered/PDF/multi0page.pdf

Grameen Foundation USA (2006). "Grameen Foundation and MTN RwandaCell to Launch Mobile Phone Venture," *Press Release Newswire*. Washington DC: Press release. 9 June. http://www.prweb.com/releases/2006/6/prweb396625.htm

GSM Association (2006). GSM Statistics, Q1 2006. http://www.gsmworld.com/news/statistics/pdf/gsma_stats_q1_06.pdf

International Finance Corporation (IFC), Investcom Holding (2005). "IFC Provides $40 Million Loan to Scancom Limited - Investment in Ghana's Mobile Telecom Sector,". 1 June. http://www.investcomholding.com/Documents/010605%20IFC%20Provides%20$40%20Million%20Loan%20to%20Scancom%20Ltd.pdf

International Finance Corporation (IFC) (n.d.). IFC Projects. http://www.ifc.org/ifcext/spiwebsite1.nsf/BySector?openview&restricttocategory=Information

International Telecommunication Union (ITU) (2004). Telecommunications Database.

International Telecommunication Union (ITU) (2006). Telecommunications Database.

Investcom (2006). "Investcom and MTN Combine to Create Leading Telecoms Group in Africa and Middle East." 2 May. http://www.investcomholding.com/Documents/Investcomcombineleadingtelecomsafricamiddleeast.pdf

Knight-John, M., Ainudeen, A. & Abu Saeed Khan (2005). "An Investigation of the Replicability of a Microfinance Approach to Extending Telecommunications Access To Marginal Customers." WDR Working Paper 0506, World Dialogue on Regulation. http://www.regulateonline.org/content/view/591/70/

Ministry of Information & Communications (2006). *National Information & Communications Technology (ICT) Policy*. MIC, Nairobi. January. http://www.information.go.ke/policy/ICT%20Policy.doc

Price Waterhouse Coopers (PWC) (2005). *Regulation and the Digital Divide; How Best-Practice Mobile Regulation Can Drive Investment and Penetration in Emerging Markets*. London: GSM Association. http://www.gsmworld.com/documents/public_policy/regulation/regulation_and_digital_divide_v3.pdf

Rossotto, C. M., Sekkat, K. & Aristomene Varoudakis (2003). *Opening up Telecommunications to Competition and MENA Integration in the World Economy*. Washington DC. July. http://lnweb18.worldbank.org/mna/mena.nsf/Attachments/WP+33/$File/WP33.pdf

Sekkat, Khalid (2002). *Trade, FDI and "Backbone" Services in the MENA Region*. Washington DC: The World Bank. June. http://siteresources.worldbank.org/INTMNAREGTOPTRADE/Resources/Sekkat.pdf

Shehadi, Kamal (2002). *Challenges to Telecommunications Regulation in the MENA Region*. Presentation to the OECD Global Conference on Telecommunications Policy for the Digital Economy. Dubai, United Arab Emirates (UAE). 21-23 January. http://www.oecd.org/dataoecd/51/50/1810112.pdf

United Nations Development Programme (UNDP) (2003). "Human Development Indicators," *Human Development Report 2003*. New York: UNDP. http://hdr.undp.org/reports/global/2003/indicator/indic_126_1_1.html

Vodafone (2005). "Africa, The Impact of Mobile Phones," *The Vodafone Policy Paper Series Number 3*. Vodafone. March. http://www.vodafone.com/assets/files/en/GPP%20SIM%20paper.pdf

Vodafone (2006). "New Organisational Structure at Vodafone," *Press Release*. Newbury: Vodafone plc. 6 April. http://www.vodafone.com/assets/files/en/vod1245gmprl.pdf

Waverman, L., Meschi, M. & Melvyn Fuss (2005). "The Impact of telecoms on economic growth in developing countries," *Telecommunications Policy Research Conference*. Washington DC. ID: 405. http://web.si.umich.edu/tprc/papers/2005/450/L%20Waverman%20Telecoms%20Growth%20in%20Dev.%20Countries.pdf

Wind (2005). Sawiris: "Strong Commitment in Wind and in Italy" The First True Mediterranean Telco Is Born Planned Investments in Excess Of 4 Billion Euros. *Press Conference*. Rome. 12 September. http://www.wind.it/eng/media/comunicati/comunicati3041.php

World Bank (2002). *Telecom Infrastructure Development for Corporate Data in the MENA Region*. Washington DC: The World Bank. 9 September. http://lnweb18.worldbank.org/mna/mena.nsf/Attachments/Analysis/$File/Telecom-k4d-paper+-+09-09-02.pdf

World Bank (2004a). "GNI per Capita 2005, Atlas Method and PPP," Washington DC: The World Bank. http://siteresources.worldbank.org/DATASTATISTICS/Resources/GNIPC.pdf

World Bank (2004b). *Competition in International Voice Communications*. Washington DC: The World Bank. Report No 27671. January. http://lnweb18.worldbank.org/ict/resources.nsf/a693f575e01ba5f385256b500062af05/369a6c0624b1cbf985256e47005a20c4/$FILE/InternalDocumentNo1027671.pdf

Annex

Country	Celtel	Econet	Millicom	MTN	Orascom	Vodafone
Algeria					X	
Angola						
Benin						
Botswana				X		
Burkina Faso	X					
Burundi						
Cameroon				X		
Cape Verde						
Central African Rep.						
Chad	X		X			
Comoros						
Congo (Brazzaville)	X			X		
Congo (DRC)	X		X			X
Cote d'Ivoire				X		
Djibouti						
Egypt					X	X
Equatorial Guinea						
Eritrea						
Ethiopia						
Gabon	X					
Gambia						
Ghana			X			
Guinea						
Guinea-Bissau						
Kenya	X					X
Lesotho						X

Country	Celtel	Econet	Millicom	MTN	Orascom	Vodafone
Liberia						
Libya						
Madagascar	X					
Malawi	X					
Mali						
Mauritania						
Mauritius			X			
Morocco						
Mozambique						
Namibia						
Niger	X					
Nigeria				X		
Rwanda				X		
Sao Tome & Principe						
Senegal			X			
Seychelles						
Sierra Leone	X		X			
Somalia						
South Africa				X		X
Sudan	X					
Swaziland				X		
Tanzania	X		X			X
Togo						
Tunisia					X	
Uganda	X			X		
Zambia	X			X		
Zimbabwe						