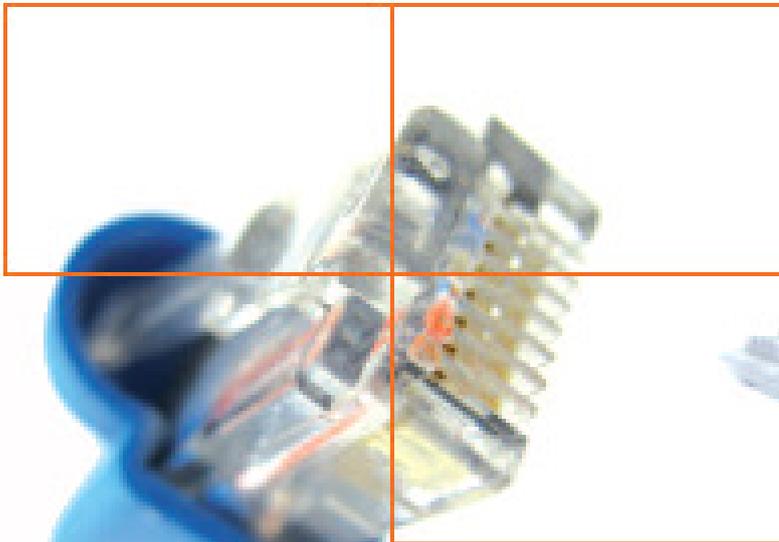




ICT markets in East Africa and the Indian Ocean Challenges and prospects



1000020 11 1 100002501 11 1000100000
200000001 11 1010
110011 1201 11 100001 1 1000001 100001002001 11 1001 11 00221000022 11 11 1010 11 0110000100010
11 1111001 1100
0010001 1000001000 100 11 1 101010 100101 11 1 101 11 10201 1102100000001 111 110110
01010101 11 111 11 11011 1000001 11 11 101 1 1000020 11 1 100002501 11 1000100000
200000001 11 1010
00 11 1201 11 100001 1 1000001 100001002001 11 1001 11 00221000022 11 11 1010 11 0 11000010001001 101
001 1100
00 10001 100000100010011 1 1010 10100101 11 1 101 1110201
000000001 111 110110
0101010 11 11 11 11 101 11000001 11 11
20000000 11 101

The Novatech 2008 - ICT Africa Marketplace - in Addis Ababa, Ethiopia, is a component of the Pro€Invest programme which is a common initiative of the European Commission (EC) and institutions from the ACP states (Africa, the Caribbean and the Pacific).

This overview of the ICT sector has been prepared by BK Consultants on behalf of the organizers. The authors accept sole responsibility for the profile which does not necessarily reflect the views of the organizers.

TABLE OF CONTENTS

	Page
1. MARKET OVERVIEW	3
1.1 Large and rapidly growing markets	3
1.2 Rapid development of ICTs in all EAIO Countries	4
1.3 Two key ICT players: Mauritius and Kenya	6
1.4 The infrastructure network: large projects underway	8
2. BUSINESS ENVIRONNEMENT	14
2.1 Strong government support and improved legal frameworks	14
2.2 Liberalization of telecom services: opening the door to competition!	15
2.3 Trade associations promoting international partnerships	17
3. ICT SUB-SECTOR OPPORTUNITIES	18
3.1 Telecom and related services	18
3.2 Booming Internet services	21
3.3 Software and ICT Services	23
3.3 E-services	24
3.4 Great efforts on ICT education	26
4. PROSPECTS	28
5. BIBLIOGRAPHY	29

1. MARKET OVERVIEW

1.1 Large and rapidly growing markets

The EAIO countries globally represented a total population of **259 millions** in 2005, and while the population is relatively young in most countries (more than 40% of the population is generally under the age of 14), the population is also rapidly increasing (from 10 to 20% between 2000 and 2005) in all countries except for Mauritius and Seychelles. Six of these countries have a population exceeding 10 Million inhabitants i.e: Ethiopia (71), Tanzania (38), Sudan (36), Kenya (34), Uganda (29) and Madagascar (19). In contrast, Comoros, Djibouti and Seychelles respectively count for less than 1 Million inhabitants each.

In terms of GDP, the whole region approached **US\$ 100 billion** in 2005, 80% of which is concentrated in the five countries of Sudan, Kenya, Tanzania, Ethiopia and Uganda. The growth of GDP has been irregular from one country to another, depending heavily on the fluctuations of a few basic commodities but globally the total GDP of the region increased by 56.8% between 2000 and 2005.

The GDP per capita remains very low with two striking exceptions: Seychelles and Mauritius exceeding US\$ 5000 per capita. A second group including Djibouti, Comoros, Sudan and Kenya ranges between US\$500 and US\$ 1000, while the GDP per capita in the rest of the region is lower than US\$ 320. One might note that there are considerable differences between the rural and urban areas within each of the countries.

Various economists estimate that the relatively high GDP growth rates observed in 2005 and 2006 (up by 5%) will continue through the years of 2007 and 2008 in many of the East African countries. This would mainly be due to the high demand for various basic commodities and the development of emerging manufacturing industries and services.

EAIO countries	Population 2005 (in Million)	Share of total (in %)	Population increase 2000 to 2005 (in %)	GDP 2005 (Current Million US\$)	Share of total (in %)	GDP increase 2000 to 2005 (in %)	GDP per capital 2005 (current US\$)
Burundi	7,50	2.9	16.4	<i>799.8</i>	<i>0.8</i>	<i>12.8</i>	<i>106</i>
Comoros	0,60	0.2	11.1	387.0	0.4	91.7	645
Djibouti	0,80	0.3	11.0	708.8	0.7	28.6	894
Eritrea	4,40	1.7	23.8	969.9	1.0	53.1	220
Ethiopia	71,30	27.5	10.8	11174.3	11.5	42.4	157
Kenya	34,30	13.2	11.6	18730.4	19.2	47.4	547
Madagascar	18,60	7.2	14.9	5040.0	5.2	30.0	271
Mauritius	1,20	0.5	4.8	6289.6	6.4	40.7	5059
Rwanda	9,00	3.5	12.6	2153.5	2.2	18.9	238
Seychelles	0,10	0.0	4.1	693.6	0.7	12.8	8209
Somalia	8,20	3.2	17.3	<i>2200.0</i>	2.3	N.A.	267
Sudan	36,20	14.0	10.1	27542.2	28.2	122.7	760
Tanzania	38,30	14.8	10.3	12111.0	12.4	33.4	316
Uganda	28,80	11.1	18.5	8724.5	8.9	47.2	303
Total EAIO	259,40	100.0	12.4	97524.6	100.0	56.8	376

Estimates are in italics

Source: World Bank WDI, 2005

1.2 Rapid development of ICTs in all EAIO Countries

The “digital divide” between developed and developing countries has been highlighted for years by political leaders and international organizations, and several initiatives have been launched in order to bridge the gap.

Information and Communication Technologies (ICTs) cover a wide range of hardware/software products, ranging from personal computers (PCs) to communication facilities such as broadband fibre optics and wireless transmissions (mobile phones, WI-FI, GPS). In the case of the EAIO countries there are still considerable differences in the level of ICT usage but positive trends can be recognized in various areas and sectors. The appearance of more affordable solutions for low income countries has thus stimulated the development of ICT services in Africa covering not only the professional activities but also the large public in general.

In 2007, the ITU published the results of a remarkable benchmarking exercise called “**the ICT Opportunity Index**”¹, based on a comparative analysis of 10 indicators (see table below), with the objective of assessing to what extent the digital divide had worsened or improved between different country groups. The results show that the gap is generally widening between developed and developing countries. However, a number of low income countries have been achieving take-offs or rapid developments:

- The composite ICT Opportunity Index, which reflects the capacity of countries to meet the high requirements of well developed sectors (e.g. tourism and ICT services), indicates that Mauritius and Seychelles are ranked substantially higher than advanced African economies such as Egypt and South Africa.
- On the other hand, it is clear that countries with large areas and rural populations such as Sudan, Ethiopia, Kenya, Tanzania and Madagascar are heavily hindered in terms of connectivity and they effectively appear with a low ranking in most indicators per capita.

In conclusion, we might underline that most EAIO countries have considerably improved their global index between 2001 and 2005 and this is without taking into consideration that the level would certainly be much higher if it only focused on capital cities such as Nairobi or Addis Ababa.

¹ ITU: *Measuring the Information Society 2007*

	Indicator used
Info density	
Networks	- Main telephone lines per capita - Mobile cellular subscribers per capita - Int'l Internet bandwidth (kpbs per capita)
Skills	- Adult literacy rates - Gross enrolment rates (primary/secondary/tertiary) (source: UNESCO)
Info use	
Uptake	- Internet users per capita - Proportion of households with a TV - Computers per capita
Intensity	- Total broadband Internet subscribers per capita - Int'l Outgoing telephone traffic (minutes) par capita

EAIO	ICT Opportunity Index		Average growth (%)	EU (15)	ICT Opportunity Index		Average growth (%)
	2001	2005	2001 to 2005		2 001	2 005	2001 to 2005
Mauritius	96,00	150,00	56,25	Sweden	263,41	378,00	43,50
Seychelles	115,00	140,00	21,74	Luxembourg	239,15	366,00	53,04
Sudan	25,00	50,00	100,00	Netherlands	255,51	363,00	42,07
Kenya	30,00	42,00	40,00	Denmark	254,10	361,00	42,07
Djibouti	26,00	41,00	57,69	UK	208,51	346,00	65,94
Somalia	16,00	32,00	100,00	Belgium	228,54	324,00	41,77
Tanzania	20,00	31,00	55,00	Austria	230,08	306,00	33,00
Uganda	19,00	30,00	57,89	Germany	211,33	303,00	43,38
Comoros	10,00	29,00	190,00	Finland	204,69	294,00	43,63
Eritrea	8,00	27,00	237,50	Ireland	165,90	280,00	68,78
Madagascar	19,00	26,00	36,84	France	190,22	278,00	46,15
Burundi	13,00	21,00	61,54	Italy	163,81	256,00	56,28
Rwanda	16,00	20,00	25,00	Spain	161,48	249,00	54,20
Ethiopia	10,00	18,00	80,00	Portugal	147,69	210,00	42,19
				Greece	122,03	162,00	32,75
World average:	100,00	147,56	47,56				
<i>For reference:</i>							
South Africa	80,00	97,00	21,25				
Egypt	52,00	79,00	51,92				

Source: ITU World Telecom/ICT Indicators 2007

1.3 Two key ICT players: Mauritius and Kenya

In the region, two countries deserve special attention due to the large investments they have made in ICTs² and due to their respective roles as regional platforms:

Mauritius

With a relatively small area (2,040 square km) and population (1.2 Million), the country has developed one of the highest telecommunication densities in Africa in terms of telephone and Internet users. Mauritius is already connected to the **SAFE fibre optic** cable system and is participating in the future EASSy submarine cable project.

One estimates that 80% of Mauritian households have a telephone land line and that the number of mobile phone subscribers has reached 713,000. There are 180,000 Internet users and approximately 30% of the population has a personal computer. Moreover, 90 % of the national territory has access to an internet connection.

While the traditional economic sectors (sugar and garments) are facing some uncertainty due to intensified competition, the country has achieved a diversification policy, notably in terms of services, especially tourism and ICT services.

The remarkable growth of the ICT sector in Mauritius is first and foremost a result of the political stability, modern banking services and advanced legal system. But while these elements have contributed to attracting overseas trade partners and investors, the rapid emergence of ICT companies is certainly also due to the availability of high level education and qualified staff, their bilingual capacities (English/French) and close business links with Europe, South Asia and Australia. It is additionally worth noting that ICT companies have developed rapidly in various sectors such as software development, WEB design, data management, call centres, etc.

The EBENE Cybercity Development project has been designed to transform Mauritius into a diversified, high tech, high income services and knowledge based economy following the example of Singapore. When fully completed in 2007, the Cyber City is expected to employ some 20,000 people including 5,000-7,000 computer professionals.

While labour costs are likely to increase, Mauritius can play a role of regional platform, subcontracting various ICT activities to neighbouring low income countries such as Madagascar, Comoros or Tanzania. Additional trade relations with South Africa, Middle East, South Asia, ASEAN and Australia³ would also be a natural consequence of the current progress and development.

² According to ITU's World Telecom/ICT Indicators 2007, the telecommunication investments in each country amounted to US\$ 28.7 per capita in 2005 while it was inferior to US\$ 6 in other EAIO countries

³ For more details on Mauritius ICT sector, see: International Finance Corporation; Country Report: Mauritius 2004

Kenya

With a much larger area (582,650 square km) and population (34 million), Kenya does not display similar density indicators as Mauritius but its main business centres (Nairobi and Mombasa) concentrate a major part of ICT activities and play important roles as logistic hubs (air and maritime transport) in the East African region. In fact, a large number of international service companies have established their regional offices in Kenya, benefiting from easy physical and data communications with neighbouring countries, as well as from modern banking services.

The tele-density for telephone land lines is 4% in urban areas as opposed to only 0.16% in rural areas. Mobile phones are increasing rapidly with an overall tele-density of 14.4% (5,8 million subscribers in 2006). The number of web users was estimated at 1,65 million in 2006 (a density of 3.1%), the majority of them using the 1,050 Internet Cafés available in the country. There are numerous web providers (an estimated 72 ISPs), the main companies being: Africa Online, UUNET, Access Kenya, Swift Global, Wannachi, Inter Connect and Flashcom.

The VOIP (Voice Over Internet Protocol) is an emerging market in Kenya. The services have remained 80% cheaper than fixed phone calls and while the demand from companies is increasing, several VOIP cafes are equally emerging in the capital.

The latest initiative from the Communication Commission of Kenya (CCK) is to attribute unified licences, allowing Service Providers to offer fixed-mobile, VSAT and internet solutions to their customers.

Considering the availability of a well-educated workforce that is fluent in English and the forthcoming connection to the EASSy high speed cable, Kenya's government has set ambitious goals for 2010. Nairobi has in this framework been set to become the African capital of outsourcing, with the creation of 1 million jobs in ICT services. Business links are additionally expected to develop with dynamic markets in Europe, the Middle East and Asia⁴.

⁴ For more details on Kenya ICT sector: see: International Finance Corporation, *Country Report: Kenya 2004*:
http://www.csk-online.org/html/ict_report.php
See also portal of the Computer Society of Kenya (CSK): http://www.csk-online.org/html/ict_report.php

1.4 The infrastructure network: large projects underway

Eastern African and the Indian Ocean is not yet served by a submarine fibre optical cable - with the exception of Mauritius that is as mentioned connected to the SAFE undersea cable. All countries in the region primarily rely on satellites for their international connectivity, and this solution is first of all expensive for its capacity and second of all the bandwidth for voice and Internet traffic is limited. Landlocked countries such as Ethiopia and Uganda are therefore building fibres to neighbouring coastal countries in order to reach a share of the future East African submarine fibre optic cable (EASSy).

VSAT (Very Small Aperture Terminal) satellite ground stations represent an interesting alternative to costly physical infrastructure implementations. In this framework, the new satellite RASCOM (Regional African Organisation of Satellite Communication), which covers the African continent, offers a real opportunity to increase the networks capacity. The RASCOM satellite has been built by Thales Aliena Space and is supposed to be **launched at the end of 2007** by Arianespace.

In addition, a large number of ICT projects at the regional or national level are being implemented or launched in the EAIO region, particularly in the framework of the *NEPAD ICT Projects and initiatives* (See: www.nepad.org). They can be classified into 2 main categories:

- **ICT Infrastructure Facilitation Projects:**
 - Telecommunications Equipment Manufacturing in Africa;
 - ICT Policy and Regulatory Framework Harmonization at Regional Level;
 - Strengthening of African Telecommunications and ICT Institutions;
 - Programme to Enhance Africa's Participation in the Global ICT Policy and Decision Making;
 - The ICT Human Resource Capacity Development Initiative for Africa;

- **ICT Infrastructure Exploitation and Utilisation Projects:**
 - The African SCAN-ICT and e-Readiness Initiative;
 - The African Regional Telemedicine Initiative;
 - The Electronic Governance & Government Initiative for Africa;
 - The African Electronic Commerce and Trade Initiative;
 - The African Regional Tele-education Initiative;
 - The Africa Content Development Promotion Initiative.

Examples of regional projects (supported by NEPAD or other initiatives):

- **The NEPAD ICT Broadband Infrastructure Network for Eastern and Southern Africa** is a NEPAD initiative to interconnect all the countries of East and Southern Africa to one another to one another and to the rest of world. The infrastructure will consist of submarine and terrestrial long haul fibre optic cables. The NEPAD regulatory framework for the infrastructure consists of a Special Purpose Vehicles (SPV) – to build, own, operate and maintain the networks; and the Inter-Governmental Assembly (IGA) – to oversee the policy and regulatory framework. The NEPAD e-Africa Commission is the

Secretariat of the IGA, and is the implementing agency of the protocol. The East Africa project when combine with similar projects for West aand North Africa will Interconnect the rest of the continent.

NEPAD policy on the infrastructure has the following requirements:

- The application of open, non-discriminatory and affordable access to these networks
- Acceptance that cross-border terrestrial and submarine cable segments of these networks can be developed, owned, and maintained by Special Purpose Vehicles (SPVs).
- Broadband Infrastructure viewed as “public good”
- Application of the principle of public private partnerships (PPP) to these networks.
- Protocol should be signed by countries of the region to underpin their collaboration in developing the network.

NEPAD ICT Broadband Infrastructure Network



- **The East African Submarine Cable System (EASSy)** is an initiative of the East African telecommunication operators to construct and operate a submarine fibre optic cable along the east coast of Africa to connect eight coastal countries as well as island nations to each other and to the rest of the world. The submarine cable for fibre optics broadband communication is being developed with a high speed fibre optic network (320 or 640 Gygabytes/second).

A preliminary study launched in January 2003 estimated the budget at US\$ 200 Million. The full financing scheme by the World Bank and ADB has not yet been finalized but the project is planned to be completed by October 2008.

The length of the cable from South Africa to Sudan is 9,900 km and it should connect coastal and landlocked countries with cheaper communications than satellite connections. So far the Consortium regroups 15 countries and 30 telecommunication companies.

EASSy Network



Source: ITU

EAIO Countries	Landing points
Sudan	▪ Port Sudan
Djibouti	▪ Djibouti
Somalia	▪ Mogadishu
Kenya	▪ Mombasa
Tanzania	▪ Dar es Salam/Zanzibar
Madagascar	▪ Toliary
South African Region	
Mozambique	▪ Maputo
South Africa	▪ Mtunzini
Additional connections	
Comoros	▪ Moroni
Seychelles	▪ Victoria

- SEACOM** is a privately financed, operated & owned submarine cable system which will also connect the coastal countries of East Africa. The project is expected to cost \$300 million and will provide initial capacity of 640 GBps to Europe and 640 GBps to India . Tyco Telecommunication – USA – will perform the Marine survey for the project. Construction is expected to start as soon as regulatory issues with South Africa have been clarified. South Africa now requires that all undersea cables landing in South Africa be majority owned by South Africans. The project is scheduled to be complete in quarter 1 of 2009.

SEACOM Submarine Cable



- **The Communication Telecommunication Project (COMTEL)** was initiated by COMESA in order to improve telecom infrastructure and connectivity. The project includes telecom operators from 21 countries and foresees the implementation of a regional interconnection infrastructure and access to intercontinental bandwidth.
- **Wireless broadband communications:** High speed connection to Internet using the wireless technology WIMAX is considered to offer good prospects for Africa, especially in rural areas and landlocked countries where the 'last mile connection' is problematic via cable transmission.
- **The East African Digital Transmission Project (EADTP)** aiming to build and upgrade cross-border telecommunication (fibre optic) between Tanzania, Kenya and Uganda should ensure a robust, meshed broadband network linking the countries in the region.

Examples of national projects:

- **Kenya:** The Egyptian Company QuickTel has taken over 70% of the GTI branch of TELKOM Kenya producing telecom equipment. Quicktel will invest US\$ 24 million in order to modernize the manufacturing units with a view to producing, under its own brand name, fixed and mobile phones, as well as CDMA terminals and GSM devices. Instead of importing such equipment from Asia, Kenya aims at becoming an exporter of these products throughout the region.
- **Madagascar:** TELMA has signed a contract with Eutelsat in order to install 200 VSAT terminals all around the Malagasy territory; this will expand the offer of services for Internet access, VOIP, videoconferences, VPN etc..
- **Mauritius:** The Government is constructing a CyberCity Island, The EBENE Cybercity Development, regrouping the majors sectors within the ICT business and offering several services and opportunities. The EBENE project has been designed to transform Mauritius into a diversified, high tech, high income services and knowledge based economy following the example of Singapore. When fully completed in 2007, the Cyber City is expected to employ some 20,000 people including 5,000-7,000 computer professionals.
- **Rwanda:** The South African MTN operator plans to invest US\$ 17 Million in its network until 2011 in order to raise mobile teledensity to 20% (against 3.2% in 2005). It has been estimated that during the year of 2007 the number of subscribers for mobile phones will grow from 300,000 to 700,000.
- **Somalia:** Dalkom Somalia, a large ISP provider, is not only considering mainly focusing on VOIP services, but is planning to expand its international gateway services into regional operators by building a sub-station in the regions of Somaliland and Puntland.
- **Sudan:** Canartel, the second largest operator in the country (a branch of the UAE Company ETISALAT) has launched a high speed Internet connexion service, called CANAR GO, using the EV-DO technology which can reach 4.2 Mbits/s.

- **Tanzania:** TTCL is launching a tender in 2007 for developing a high speed telecom network in fibre optics. While more SDH lines connecting Dar es Salaam with the province are expected, Tanzania is also participating with Kenya in the project of constructing an additional optic line.
- **Uganda:** Warid Telecom, based in the United Arab Emirates, has obtained a licence for providing mobile and Internet services, and planning to invest US\$ 200 Million in an operation and infrastructure development. This operator already established in Pakistan and Bangladesh aims at offering cheap services and at multiplying by 10 the teledensity for mobile phones (7.4% in 2006).

Private investments: Remain modest in most EAIO countries but tend to be diversified with new investors such as Egypt, Gulf States, China and India, increasingly attracted by the African markets.

A recent NEPAD initiative, the “Investment Climate facility”, includes concrete actions such as lowering transfer costs and harmonizing/improving banking procedures, which are likely to stimulate private investments.

2. BUSINESS ENVIRONNEMENT

2.1 Strong government support and improved legal frameworks

Various governments in the EAIO region have developed ICT policies since 2000 in order to meet the objectives of the UN Millennium and the goals set by the WSIS.

WSIS: The World Summit on the Information Society, held in Geneva, 2003, and in Tunis, 2005, has highlighted the significant role of information and communication technologies (ICT) in designing appropriate strategies for developing countries. The New Partnership for African Development (NEPAD) includes a strong focus on the dual strategies of *ICT Development* (ICTD) and *ICT for Development* (ICT4D).

See :<http://www.itu.int/wsis/index.html> and www.nepad.org

As a result of the WSIS initiative, Kenya⁵ has amongst others developed an ICT policy “*with a vision to create an e-enabled and knowledge-based society*”. The multi-stakeholder “Kenya ICT Action Network” (KICTANet) was approved in February 2006 leading to discussion groups with civil society organizations and the issuance of an “Information and Communications Bill” the same year. Some practical projects have been launched such as the establishment of telecentres, in cooperation with the Canadian Organization IDRC.

In **Tanzania**, an ICT policy has been formulated (2003), with sector-level ICT strategies and the development of appropriate legal and regulatory regimes meeting the requirements of international agreements such as WTO’s GATS on services and ITA on electronic commerce⁶.

A national ICT policy development process was initiated in **Uganda** already in 1998 by the National Council of Science and Technology (UNCST) and the legal and regulatory framework has been built progressively, including the Access to Information Act (2005) and the Copyright and Neighbouring Rights Act (2006). New legislations regarding electronic transactions and signatures are being designed.

In **Mauritius**, the Information and Communication Technologies Authority (ICTA) was set up in 2001 to regulate the ICT sector, in particular telecommunications, use of the Internet and data protection (see: <http://ncb.intnet.mu/govt>). The main legal instrument governing the ICT sector in Mauritius is the ICT ACT (2001).

These examples, often used as models by other African countries, illustrate the efforts of governments, in cooperation with private companies and civil society organizations, to develop an appropriate legal framework aimed at protecting local firms and attracting foreign investors. While the situation remains uneven in this respect from one country to another, especially concerning intellectual property, the momentum launched by WSIS ascertains that no government will take the risk of lagging behind.

⁵ AT THE CROSSROADS: ICT POLICY MAKING IN EAST AFRICA , IDRC 2005 see www.idrc.org (includes case-study on Kenya)

⁶ The difficulty for developing countries such as Tanzania to apply international regulations is described in the USAID report : “Implications for Tanzania of Accession to the World Trade Organization’s Information Technology Agreement” 2005

2.2 Liberalization of telecom services: opening the door to competition!

Monopolies for fixed telephone operations have come to an end in most countries, except in Djibouti (Djibouti Telecom), Ethiopia (ETC) and Eritrea (EriTel). The process of privatization has been effective for several years in Mauritius, Seychelles, Somalia, Sudan and Uganda, but in the remaining six countries delays have been experienced in terms of attracting private investors.

Mobile phones, using mainly prepaid cards, largely override fixed telephones in most African countries and the number of providers is increasing with the emergence of regional companies such as Vodacom, Celtel (branch of Koweit-based MTC) and MTN (South Africa). One might add that Ethiopia however still has a monopoly on mobile telephony.

End of Monopoly	Country	Name of new telecom company	Status	Notes
2008 (planned)	Burundi	Onatel	Privatization planned	GULFSAT obtained a license in 2001 and provides VSAT telephony in 11 locations;
	Madagascar	Telma	Being privatized	Celtel is active in mobile phones
2007	Rwanda	Rwandatel	Being privatized	Other telecom company: TERRACOM
2005	Sudan	Sudatel	Being privatized	Other telecom firm since 2005: CANARTEL (owned by UAE company ETISALAT)
	Tanzania	TTLIC	Privatized	In Zanzibar: ZANTEL operates exclusively. Other operators: Vodacom, Celtel and Tigo
2004	Kenya	Telkom Kenya TKL	Being privatized	Celtel active in mobile phones Shares in 2006 in mobile phones: Celtel: 33% SAFARICOM: 67%
2003	Mauritius	Telecom Plus	Privatized	Other main telecom company: Mahaganar Nigam Telephone
2002 and before	Comoros	SNPT/COMTEL	Being privatized	Monopoly ended in 1997 but COMTEL remains sole operator
	Seychelles	Cable and Wireless (Seychelles) Ltd	Privatized	Other telecom company since 2002: Hormud Telecom Somalia
	Somalia	Al Barakaat	Privatized	New license procedure introduced in 2006 to widen competition
	Uganda	Uganda Telecom Ltd (UTL)	Privatized	Other main telecom company: Celtel and MTN

Regulatory framework

With the market liberalization, and the entrance of new private competitors, many countries have introduced Regulatory Authorities to control and promote the sector.

Country	Regulatory Authority	Policy maker
Burundi	Agence de Régulation et de Contrôle des Télécommunications (ARCT)	Ministry of Defence
Comoros	-	Ministère du transport, tourisme, postes et télécommunications
Djibouti	-	Ministry of Communications and Culture
Ethiopia	Ethiopian Telecommunications Agency	Ministry of Infrastructure Development
Eritrea	Communication Department of the MTC	Ministry of Transport and Communications (MTC)
Kenya	Communications Commission of Kenya (CCK)	National Communications Secretariat - Ministry of Information and Communication
Madagascar	Autorité de Régulation des Technologies et de la Communication (ARTC)	Ministère des télécommunications, des postes et de la communication
Mauritius	Information Communication Technology Authority (ICTA)	Ministry of Information Technology and Telecommunications
Rwanda	The National Information Technology Commission (NITC) Rwandan Technology Agency (RITA)	Ministère des Transports, Postes et Télécommunications
Seychelles	Information Technology Division of the Department of Information Technology and Communication	Ministry of Investment, Industries and Technology
Somalia	Somalia Telecom Association acts as self-regulator	-
Sudan	National Telecom Corporation (NTC)	Ministry of Information and Communication
Uganda	Uganda Communications Commission (UCC)	Ministry of Information, Communication and Technology
Tanzania	Tanzania Communication Commission (TCC)	Ministry of Communications and Transport

2.3 Trade associations promoting international partnerships

The development of trade associations covering ICT companies is a recent phenomenon in the EAIO region. However, some countries have already established such organizations with promotional programmes (members' directories, business events, WEB sites and publications), and developed international cooperation and business contacts, notably in the framework of the World Information Technology and Services Alliance (WITSA), a consortium of over 60 information technology (IT) industry associations from economies around the world (see: www.witsa.org).

	Country	Association
WITSA members	Kenya	<ul style="list-style-type: none"> Computer Society of Kenya (CSK): www.csk-online.org
	Rwanda	<ul style="list-style-type: none"> Rwanda ICT Association (RICTA):
	Tanzania	<ul style="list-style-type: none"> The Tanzania ICT Association (TICTA) - www.ticta.org
	Uganda	<ul style="list-style-type: none"> Private Sector ICT Association (PICTA) - www.picta.org.ug
Other ICT professional organisations	Burundi	<ul style="list-style-type: none"> Association pour la Promotion des Nouvelles Technologies de l'Information et de la Communication Association pour la promotion des Nouvelles Technologies de l'Information et des Commnications (APNTIC) Association Burundaise pour la Promotion de Linux et des Logiciels Libres
	Comoros	<ul style="list-style-type: none"> Comores Informatique
	Ethiopia	<ul style="list-style-type: none"> Ethiopian Information and Technology Professionals Association (EITPA)/ICT Ethiopian ICT Entrepreneurs Association Ethiopian Free and Open Software Network Association
	Kenya	<ul style="list-style-type: none"> The Telecommunications Service Provider Association of Kenya (TESPOK) The Computer Society of Kenya (CSK) The Kenya ICT Federation Kenya ICT Action Network Kenya Telecentre Network ICT Village Business Software Alliance (BSA) Information Technology Associates Ltd (www.ltakenya.com) -Kenya Education Network (KENET) "emerging IOs" who have joined the Kenya ICT Federation (KIF): <ul style="list-style-type: none"> -Information technology Standards Association (ITSA) -Information Systems Audit and Control (ISAC) -EA Internet Association
	Madagascar	<ul style="list-style-type: none"> Groupement des Opérateurs des Technologies de l'Information et des Télécommunications (GOTICOM) Groupement des Entreprises Franches et Partenaires (GEFP)
	Mauritius	<ul style="list-style-type: none"> Mauritius IT Industry Association (MITIA): Association des Opérateurs TIC de Maurice (ACT):
	Uganda	<ul style="list-style-type: none"> UGABYTES Initiative - www.ugabytes.org ICT for Africa Rural Development (ICTARD) Uganda Software Services Association (USSA)

3. ICT SUB-SECTOR OPPORTUNITIES

3.1 Telecom and related services

Fixed-lines markets

Although the land line network spread rapidly during the 1990s, the fixed line teledensity is still low in the region. In **East Africa** the penetration rate is less than 2% for the total population, while in **the Indian Ocean** it reaches more than 25 %.

As in many emerging countries, telephone fixed-lines are mainly concentrated in the urban centres. And while Governments have been attempting to overcome the gap in rural areas, the teledensity has remained very low in rural areas. In **Kenya**, over 60% of phone lines are concentrated in Nairobi and in **Ethiopia**, Addis-Ababa alone accounts for over 55% while the city represents 5% of the total inhabitants.

EAIO	Total Telephone Subscribers			
	Total (000s)	Total (000s)	Per 100 inhab.	Increase (%)
	2001	2006		2006/2001
Burundi	20.5	31.1	0.41	10.9
Comoros	8.9	16.9	2.12	17.5
Djibouti	9.9	10.8	1.56	2.1
Eritrea	31.2	37.5	0.82	3.7
Ethiopia	283.7	725.0	0.91	20.6
Kenya	309.4	293.4	0.84	-1.1
Madagascar	58.4	129.8	0.68	17.3
Mauritius	306.8	357.3	28.45	3.1
Rwanda	21.5	22.0	0.24	0.6
Seychelles	21.2	20.7	25.44	-0.5
Somalia	35.0	100.0	1.22	30.0
Tanzania	177.8	147.9	0.38	-3.6
Uganda	56.1	108.1	0.36	14.0
Sudan	448.0	636.9	1.72	7.3
For reference:				
Egypt	6 694.9	10 807.7	14.33	10.1
South Africa	4 924.5	4 729.0	9.97	-1.0

Source: Telecommunication indicators

Between 2001 and 2006, the growth of fixed lines subscribers differs much from one country to another. The average growth by year during this period was of 30% in **Somalia**, 20% in **Ethiopia**, 17% in **Madagascar** and 14% in **Uganda**, while in **Kenya** and **Tanzania** the number of subscribers has been decreasing every year. In these two countries, strong investments and restructuring roadmaps are underway to reverse the trend (Privatization of Telkom Kenya, extension of the fibre network by Tanzania Telecommunications Co Ltd).

In other countries the main projects are:

- In **Uganda**, UTL invested USD 60 millions to create 100.000 new lines.
- In **Madagascar**, TELMA is investing USD 20 millions to implement the national backbone.
- In **Mauritius**, the new Indian operator, Mahaganar Nigam Telephone is expected to invest USD 25 millions to roll out CDMA (code-division multiple access) network.

Mobile phone markets

In recent years, the telecommunications industry has been considerably modified with the phenomenal increase of mobile phones.

In the EAIO region, the development of mobile phones appears much higher than the growth of fixed telephone lines, which are often congested, deficient and more expensive.

Seychelles and Mauritius count among the highest rates of mobile phones per capita in Africa (bigger than Egypt and South Africa!), and Kenya, Tanzania and Sudan have exceeded the level of 1 per 10 inhabitants. A recent study additionally showed that 97% of Tanzanians had access to a mobile phone, while only 28% could access a landline.

EAIO	Total Cellular Mobile Subscribers			
	Total (000s)	Total (000s)	Per 100 inhab.	Increase (%)
	2001	2006		2006/2001
Burundi	33.4	153.0	2.03	46.3
Comoros	-	16.1	2.01	-
Djibouti	3.0	44.1	6.37	95.8
Eritrea	-	62.0	1.36	-
Ethiopia	27.5	866.7	1.09	99.4
Kenya	600.0	6 484.8	18.47	61.0
Madagascar	147.5	1 045.9	5.47	48.0
Mauritius	272.4	772.4	61.50	23.2
Rwanda	65.0	290.0	3.21	45.3
Seychelles	36.7	70.3	86.52	13.9
Somalia	85.0	500.0	6.08	55.7
Tanzania	275.6	6 240.8	15.99	86.6
Uganda	283.5	2 008.8	6.73	47.9
Sudan	103.8	4 683.1	12.66	114.2
For reference:				
Egypt	2 793.8	18 001.1	23.86	45.2
South Africa	10 787.0	33 960.0	71.60	33.2

Source: Telecommunication indicators

In other countries, the introduction of mobile phones is more recent and trends reflect take-offs since 2001. (NB: Comoros was reportedly the last EAIO country to introduce mobile phones). In Europe the ratio is nearly 1 mobile phone per inhabitant, and increasingly active persons have 2 mobile phones (1 for business and 1 personal).

In fact, two main key reasons explain this astonishing growth:

- **The rolling out of a mobile phone network is far cheaper** than building fixed-line infrastructures.
- **The introduction of prepaid technology.** This has revolutionised the telecommunication market in Africa by offering a more suitable service to variable demand and by removing the link between use and an account holder (with a physical address).

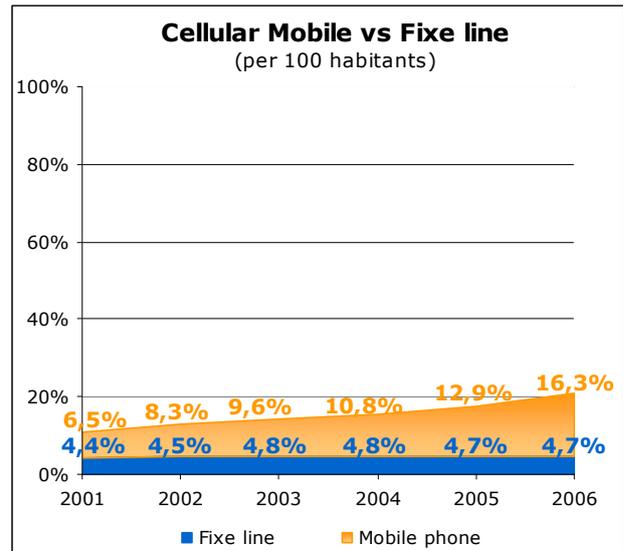
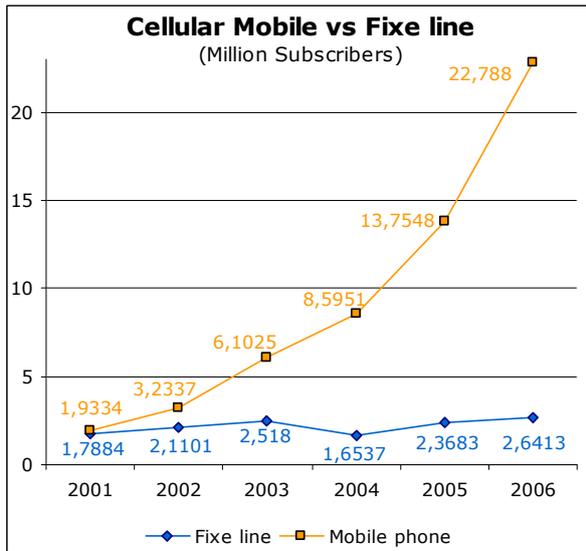
This growth is expected to continue into the future as operators are facing a fierce competition to attract new customers through several criteria, including service charges and air time rates.

Forecasts:

Despite the exponential rate in mobile phone markets in EAIO countries, the penetration rate is still very low (16,3%) compared to other regions in the world. Future challenges encompass:

- **Network development:** Anticipating the increasing demand by first of all strengthening capacities in urban areas but also by improving network access in rural areas

- **Prices:** Although competition on the mobile markets has caused a general fall in the prices (more than 100% in Kenya since 2001) communication costs are still high compared to average wages.
- **Regulatory frameworks:** The telecommunication environment in some countries is still complex and the competition inexistent or weak and this slows down market progress.



Source: Telecommunication indicators

3.2 Booming Internet services

In the early 2000s, the Internet in most countries was not only characterized by low speed connections and expensive communication services, but also by poor quality service delivered by Internet Service Providers. While a large part of the population, especially in the rural areas, is still experiencing these setbacks, the situation has improved over recent years in the most important cities. Wireless applications are generally the most suited to the economical environment in Africa as it is less expensive than fibre based solutions.

In some cases, the prevalent high telephone costs have stimulated the use of the Internet (email and voice mail) as an alternative cheap solution for international communications and the number of cybercafés or telecenters has mushroomed even in some remote locations.

The number of Internet users per capita is generally low in the region, but skyrocketing trends are shown in the following table, tracing the development between 2000 and 2006 in absolute and relative terms. One should naturally note that **Mauritius** and **Seychelles** stand apart as small countries with a relatively high income per capita, a high tele-density and a high level of literacy. And it should not be forgotten that the total number of Internet users is difficult to measure as it gathers dial-up subscribers, shared dial-up accounts along with the relatively high use of public access (telecenters, and cybercafés).

EAIO	Total Internet Users					Internet Broadband Subscribers	Number of PCs
	Total (000s)	Per 100 inhab.	Total (000s)	Per 100 inhab.	Increase (%)	Total (000s)	Per 100 inhab.
	2001		2006		2006/2001	2006	2005
Burundi	7.00	0.10	60.00	0.77	757.14	-	0.50
Comoros	2.50	0.34	21.00	2.56	740.00	-	-
Djibouti	3.30	0.51	11.00	1.36	233.33	-	-
Eritrea	6.00	0.16	100.00	2.19	1 566.67	-	0.80
Ethiopia	25.00	0.04	164.00	0.21	556.00	0.20	0.30
Kenya	200.00	0.64	2 770.30	7.89	1 285.15	-	0.90
Madagascar	35.00	0.21	110.00	0.58	214.29	-	0.50
Mauritius	106.00	8.83	182.00	14.49	71.70	21.90	16.20
Rwanda	20.00	0.25	65.00	0.70	225.00	-	-
Seychelles	9.00	11.58	29.00	35.67	222.22	1.30	-
Somalia	6.00	0.08	94.00	1.11	1 466.67	-	0.60
Tanzania	150.00	0.47	3 500.00	9.46	2 233.33	2.10	9.00
Uganda	60.00	0.17	384.30	1.00	540.50	-	0.70
Sudan	60.00	0.24	750.00	2.51	1 150.00	1.20	9.00
For reference:							
Egypt	600.00	0.93	6 000.00	7.95	900.00	205.50	3.80
South Africa	2 890.0	6.27	5 100.00	10.75	76.47	165.30	8.50
All Africa	6 231.50	0.78	43 397.40	4.74	596.42	1 091.00	-

Source: ITU, ICT indicators

It is worth noting that Mauritius has an exceptionally high number of PCs and broad band connections and that the growth of Internet usage has been particularly high in Sudan, Eritrea, Somalia, Kenya and Uganda since 2001, thus reducing the considerable discrepancies between African countries.

Internet Service Providers

After the end of national monopolies, the demand for Internet connections has increased considerably. Although Internet Service Providers were originally run by phone companies, many new ISP's are now entering the market and in many countries ISPs are facing tough competition to attract new subscribers.

The majority of the African users are accessing the Internet via Dial Up connections. Most ISPs however offer broadband services, but except for the case of Mauritius, they remain very expensive for the population at large. Prices differ in the region, depending on the telecom infrastructure and the general market development. To exemplify, one might note that in Tanzania, an ADSL (512k) subscription costs 180 €/month while in Kenya, an ADSL (1024k) costs 1500 €/month.

Some ISP's offer additional services such as domain name registration and web hosting. The most innovative and attractive service, offered by some ISPs, is Voice over Internet Protocol (VOIP) service which presents an important alternative for international telephony. This market should explode over the next couple of years.

Country	Date of first connection	Number of ISP	Technologies used
Burundi	1998	3	Dial-up, VSAT
Comoros	1998	1	Dial-up, CDMA
Djibouti	1996	1	Dial-up, ISDN, ADSL, Broadband, WiFi
Ethiopia	1997	1	Dial-up, ISDN, ADSL, Broadband, VSAT, WiFi, CDMA
Eritrea	1999	5	Dial-up, ISDN, ADSL, Broadband, WiFi
Kenya	1994	72	Dial-up, ISDN, ADSL, Broadband, VSAT, WiFi, CDMA
Madagascar	1996	4	Dial-up, ISDN, ADSL
Mauritius	1996	4	Dial-up, ISDN, ADSL, Broadband, VSAT, WiFi, CDMA, WAP, optic fibre
Rwanda	1997	4	Dial-up, ISDN, ADSL, Broadband, WiFi
Seychelles	1996	2	Dial-up, ISDN, ADSL, Broadband, WiFi
Somalia	1999	22	Dial-up, ADSL, LRE , Wireless and Satellite services, VOIP
Sudan	1996	23	Dial-up, ISDN, ADSL, Broadband
Uganda	1995	17	Dial-up, ISDN, ADSL, Broadband, VSAT, WiFi, CDMA
Tanzania	1995	21	Dial-up, ISDN, RTC, ADSL, Broadband, VSAT

Internet Cafés and Telecenters

Throughout Eastern Africa and the Indian Ocean Internet cafés and Telecenters have generally been spreading fast and they are today a widespread phenomena in the region. This is naturally due to the fact that Internet Cafés remain a much cheaper solution for users than acquiring not only a Personal Computer but also paying a fixed telephone line with an Internet subscription. The first Internet Cafés opened in the late 1990's, and since then the demand has encouraged a true proliferation of the market. As an example we might mention that in Kenya there are more than 2000 Internet Cafés, in Tanzania around 800 and Addis Ababa, the capital of Ethiopia counts for more than 378 Internet Cafés alone.

3.3 Software and ICT Services

The IT industry in EAIO is characterised by a few large companies and a majority of smaller IT companies. Most of these companies import and sell hardware, equipment and software from abroad, as well as provide basic networking and consulting services. In addition, large international IT companies such as HP, IBM, Microsoft, Oracle, SAP, Sybase and Samsung are also represented.

Networking services

Some providers offer Virtual Private Network (VPN) solutions for companies in order to install a wide area network facilitating the communication with remote offices within the country or abroad. This solution enables them to link their head offices with the branch network, manage electronic data transit, data recovery and video conferencing over the Internet Protocol network. In Mauritius and Seychelles, VPN has become a current solution to internal communication needs. In Eastern Africa the phenomenon is most recurrent in Kenya, where Access Kenya and Internet Solution are the most used service providers, while in Tanzania a single VPN network has been created, connecting offices in Kenya and Tanzania. In Madagascar, the forthcoming installation of further VSAT terminals should result in the creation of VPN solutions and one might conclude that, as a whole, Virtual Private Networks are planned or are currently being installed or expanded all over the EAIO region by different providers.

Software design and implementation

Most local application development focuses on business applications such as accounting, payrolls and billing. The most important players include Technologies Ltd., Fintech and Symphony in **Kenya**, CATS in **Tanzania**, Crystal Clear, Digital Solutions, True African in **Uganda** and Blanche Birger, FRCI, Happy World, Harel Mallac and SIL in **Mauritius**. In this last country the software business may prosper very much from the outsourcing boom.

In addition, very few African companies are implementing ERP and supply chain solutions. This is mostly done by multinational companies operating through small regional and national offices with imported human resources.

Business Process Outsourcing (BPO)

Business Process Outsourcing is an emerging market and has generally become a key strategic focus area for the ICT sector.

Mauritius is the leading player in BPO activities in the region. The political will to attract offshore services for companies in Europe and North America has created a favourable environment for business in the BPO sector. To date, over 230 companies are active in this sector, employing around 7000 people. The main activities are call centres and outsourcing activities such as accounting, finance, sales and marketing.

In other countries, call centres have been identified as a major ICT opportunity for the region and this activity is emerging in **Kenya**, **Madagascar** and **Uganda**.

The extension of the future submarine cable to the Eastern part of the continent is expected to make call centers and BPO more attractive as the region has the key components for an outsourcing hub with an educated labour force fluent in English (French for Madagascar), low wages and proximity in terms of time zones.

3.3 E-services

In addition to the mentioned growth of infrastructure and general ICT services, the value added services (VAS) offer high prospects for most mobile operators due to the strong increase of mobile penetration rates. Many services are already being used in many sectors and could expand in others:

- **Health:** In Kenya and Tanzania, the doctors from the African Medical and Research Foundation are using phones to diagnose patients living in remote areas. The same scheme is being implemented in Rwanda.

E-services in terms of healthcare and medical supplies could equally be a market of expansion in Eastern Africa and the Indian Ocean.

- **Fishing and farming:** Mobile services provide marketing and financial services for farmers and fishermen. They can check market prices through SMS-based information service.
- **Banking:** E-banking generally remains to be developed in the EAIO region. Commercial banks are however beginning to introduce electronic banking services such as office-banking, home-banking, internet-banking or tele-banking. These electronic services naturally allow the costumers to instantly access their account balance and other information on an on-line basis using a telephone or a PC.

In **Kenya**, such services have become recurrent in the different commercial banks and the public is generally taking to the idea. The National Bank of Kenya (NBK) has for example recently launched a mobile phone banking service for checking credit balances and utility bill payments. Some **Tanzanian** banks are also providing e-banking. While **Madagascan** legislation has so far hindred the phenomenon to spread to the green island, the developed has not escaped Mauritius, where two types of electronic banking services have emerged rapidly in the banking sector; phone banking and Internet banking. Several banks have launched their websites in **Mauritius** and others are likely to follow suit soon. The services which are actually being provided through Internet banking include overview of and inquiring of accounts, making inter-account transfers, effecting payments to third party accounts, ordering cheque books and opening of accounts. In addition to these facilities, application for loans can be made through the Internet. In order to regulate properly within this remarkable expansion, the Bank of Mauritius is in the process of issuing a specific guideline to banks on the appropriate framework for establishing their electronic banking and electronic money business.

While traditional banks thus offer mobile banking as an added service to existing customers, is it a fact that large parts of the African population with mobile phones have no bank account. New banking VAS are emerging and targeting this very large market. M-PESA in **Kenya** for example provides an affordable and safe way to transfer money by SMS anywhere in the country (deposit, withdrawal and transfer money). Many Africans already use prepaid air time as virtual money. Pilot schemes are also being developed aiming the usage of mobile phones in order to deliver micro-credit loans to poor people in places that lack anything resembling a bank branch. Micro and medium size commerce: Mobile phones could easily change logistical issues for small businesses in rural areas by offering market proximity through new services: VAS ordering system, arrangements in advance with potential customers or suppliers.

- **Governance:** E-services or mobile services provide a new platform through which people are able to access government information and services, using text, data, and audio browsing techniques and it is generally evolving throughout the entire region.

Several Eastern African governments are launching e-governance initiatives, but it is not surprising that **Mauritius, Kenya and Uganda** have the most developed e-governance systems in place. Kenya has additionally presented an ambitious e-governance strategy in line with the national development strategy for wealth creation. The E-governance priorities include: institutional structural and operational reforms, review of regulatory and legal framework and development of a reliable and secure infrastructure. The ICT e-governance priorities focus on communication channels which include; Government to Government (G2G), Government to Business (G2B) and Government to Citizens (G2C). Because e-governance has developed consequently in **Mauritius**, The Commonwealth Secretariat (Governance and Institutional Division), in association with a number of Commonwealth Governments and COMNET-IT (Commonwealth Network of Information Technology for Development), is currently supporting the development of an e-Governance Master Plan for Mauritius. This project is being led by the Centre for Electronic Governance and resourced through the direct contributions from other governments.

A movement towards e-governance has thus generally spread throughout the entire region, even in Somalia where the Indian company Sobha Renaissance Information Technology (SRIT) was in 2005 charged with (on a US\$25 million contract) for the installation of 'ePassports' and 'eAuthentications'.

Main WebSms operators in the EAIO Region

Country	WebSMS operators
Burundi	Telecel
Ethiopia	ETMTN
Kenya	KenCell Safaricom
Madagascar	Madacom Orange (Antaris,SMM)
Mauritius	Cellplus Emtel
Rwanda	Rwandacell (MTN)

Country	WebSMS operators
Seychelles	Cable and Wireless Telecom Seychelles (Airtel)
Sudan	SDN (MobiTel)
Tanzania	Celltel, MIC (Mobitel) Tritel Ltd., Vodacom Ltd. Zantel Ltd.
Uganda	CelTel (Clovergem) MTN Uganda Telecom (UTL Telecel)

3.4 Great efforts on ICT education

The expansion of ICT markets largely depends on the level of computer literacy of the population. With a relatively young and fast-growing population in Africa (as mentioned more than 40% of the total population is younger than 14 in all countries, except in Mauritius) one might believe that efforts at the primary school level are likely to stimulate the ICT market on a short and medium-term.

Eastern Africa and the Indian Ocean, as for the most part of Sub-Saharan Africa, however generally lack national computer education policies and standardisation remains a major problem. Governments are however becoming more aware of the problem and public and private schools are focusing more on IT courses. The demand for skilled IT personnel has nonetheless been increasing for a longer period of time, and a lot remains to be done in terms of e-education and e-training. Opportunities in this sector are therefore plentiful.

Primary schools

Few primary schools have access to Computers or to the Internet, and even though some countries such as Kenya have introduced computer education, it remains an optional subject for secondary school students. As a general rule, one might conclude that neither formal teaching nor official curricula exist for IT training in the public primary schools of Eastern Africa and the Indian Ocean. In conclusion, a majority of the students that graduate from schools - as well as from universities - are computer illiterate.

NEPAD Initiative: On-line schools:

In cooperation with Fujitsu Siemens Computers that offer PCS and Oracle and MICROSOFT offering software, the "one-line school initiative" launched in 2005 by NEPAD targets half a million schools in Africa with basic training on text processing, spreadsheets, WEB navigation, and graphic presentations. Kenya is one of the pilot countries in the first phase of the project.

Universities

Universities are introducing more courses in ICT-related subjects and the different departments for Computer Science are generally becoming more important players. African Governments are thus beginning to realize the importance of specialized education programmes at the national level⁷ and some countries in the EAIO region have therefore set up these high level institutions in cooperation with American, European, South African Universities, which attract students from neighbouring countries.

⁷ See in particular: *Building ICT4D capacity in and by African universities* by R. D. Colle, Cornell University, USA: *International Journal of Education and Development using Information and Communication Technology (IJEDICT)*, 2005, Vol. 1, Issue 1, pp. 101-107.

We can notably mention the following:

- Ethiopia:** University of Addis Ababa, Faculty of Informatics, and the Graduate School of Telecommunication and Information, sponsored by the national telecom operator ETC;
- Kenya:** University of Nairobi;
- Mauritius:** University of Mauritius and the University of Technology;
- Rwanda:** University of Rwanda;
- Tanzania:** University of Dar es Salaam;
- Uganda:** University of Makerere;

Private IT Training schools

Private IT education is also gaining terrain in the region. Private IT Training schools have emerged in wide numbers and they provide courses to a large public mainly in basic computer skills and software. In Kenya, the private IT training company called Diamond Systems Ltd additionally runs several IT centres at Universities, while in Ethiopia the Ministry of Education has accredited new private colleges to train IT students.

The trend is thus changing towards more focus on IT education and training. Mauritius has for example instigated a general harmonisation of the national IT education, comprising primary and secondary school level teachers and students as well as a targeted part of the working population. In Ethiopia, the Government has even created a Ministry of Capacity Building in order to answer the demand for skilled manpower.

In Eastern Africa and the Indian Ocean the number of skilled persons in the field of IT is far lower than the demand of the market and the development of ICT industries naturally largely depends on the availability of qualified staff. Even though software developers in the respective countries generally note the lack of personnel for handling particular software languages, the problem appears to be worse when it comes to hardware and telecom engineers. The labour market for fresh IT students is therefore relatively good, and with some additional adjustments in the IT infrastructure some have even estimated an outsourcing boom for a country like Kenya thanks to its low wages and well-educated workforce proficient in English.

4. PROSPECTS

The ICT sector of the EAIO region has experienced a profound upheaval throughout the last decade. This development is to a large extent due to a general political determination to reduce the digital divide and continued Government commitment to provide an enabling environment for ICT investments. Meanwhile, the general sectarian changes include the end of monopolies and the privatisation of main public operators, a true investment boom in mobile networks with the introduction of new private operators and the emergence of new technologies particularly well suited for the African environment.

East Africa and the Indian Ocean have thus experienced a general development of infrastructures (VSAT, Optic cables, wireless and the future EASSy project) and an extension of networks as well as a modernisation of the communication equipment. This progress, coupled with political stability in the region and a development of rather progressive ICT legislations on a national as well as regional basis, should facilitate continued growth of the ICT sector in Eastern Africa and the Indian Ocean. In addition, ongoing developments in the region – such as rehabilitation of the general infrastructure in terms of electricity, airports, seaports and roads - might have a positive impact on the economy as a whole as well as provide important spin-off benefits for the ICT sector.

The demand for ICT tools is thus constantly growing and **the East African market still offers several openings for supplying the market with new products**. There are therefore multiple and lucrative investment opportunities in the different services of the ICT sector. A particularly interesting sector is **mobile communications technologies**, which remains predominant in the region since it is well suited for the East African context. Even in rural areas, and despite the low level of income amongst the population, there is thus a real demand for mobile telecommunication services. One might add that the African market is open for innovative technical solutions **overlapping mobile telecommunication with internet access services**.

The **software sector** is also dynamic in Eastern Africa and the Indian Ocean, while a niche that is open for being developed is **e-services**; with many governments in the region stressing the importance of e-governance, several companies and sectors such as **banking and tourism** have also slowly begun showing interest for internet services.

Additional advantages for investing on the East African ICT market is the mainly Anglophone work-force in the region and the general regional cooperation for developing the ICT business. In addition to the regional infrastructure projects, the East African Community has for example re-launched its politics of non-tariff barriers on cross-border trade, the harmonisation of standards and good specification within the region. One might therefore conclude that opportunities are plentiful on the ICT market in Eastern Africa and the Indian Ocean, the sector is booming and many areas and solutions remain to be explored and developed. The demand for ICT services is generally much higher than what the current companies and operators can deliver and investment perspectives can thus only be estimated as being positive.

5. BIBLIOGRAPHY

Document	Authors/Sources	Year	Type
DigiWorld Yearbook www.idate.org	IDATE	2007	Yearbook/Internet
East and Central Africa Hub Highlights www.ecatradehub.com	United States. Agency for International Development (USAID)	2007	Periodical/Internet
PICTA Bulletin www.uneca.org/aisi/picta/pictabulletin/	UN. Economic Commission for Africa	2007	Periodical/Internet
Measuring the Information Society 2007 report and database of ICT indicators www.itu.int	International Telecommunications Union (ITU)	2007	Monograph/Internet
L'Economie mondiale 2007 and Chelem database www.cepii.org	CEPII Paris	2007	Monograph/Internet
EASSy Final report, Detailed and Feasibility study www.eafricacommission.org/docs/EASSy_DFS_Report.pdf	E-Africa Commission	2007	Monograph/Internet
ICT Country profile (Ethiopia, Kenya, Mauritius, Uganda, Tanzania) www.missioneco.org	Missions Economiques, MINEFI - DGPTE Mwakalinga, Hebron Anania and Krist, William	2007 /2006	Monograph/Internet
Implications for Tanzania of Accession to the World Trade Organization's Information Technology Agreement http://www.ecatradehub.com/reports/rp.downloads/2006.WTO.ITA.Tanzania.pdf	USAID. East and Central Africa Global Competitiveness Hub	2006	Monograph/Internet
The Digital Divide : ICT Development Indices Report www.unctad.org/Templates/Download.asp?docid=5878&lang=1&intlItemID=2068	UNCTAD	2006	Serial/Internet and hard-copy
Connecting Sub-Saharan Africa : A World Bank Group Strategy for Information and Communication Technology Sector Development	Guislain P ... [et al.] World Bank	2005	Monograph and hard-copy
ICT and Large-scale Poverty Reduction : Lessons from Asia, Africa, Latin America and the Caribbean 162.23.39.120/dezaweb/ressources/resource_en_25250.pdf	Warnock K ... [et al.], eds. Swiss Agency for Development and Cooperation (SDC)	2005	Monograph/Internet and hard-copy
Telecentres, Access and Development : Experience and Lessons from Uganda and South Africa www.idrc.ca/en/ev-87255-201-1-DO_TOPIC.html	Parkinson S African Export- Import Bank (Afreximbank)	2005	Monograph/Internet
From the Digital Divide to Digital Opportunities : Measuring Infostates for Development www.itu.int/ITU-D/ict/publications/dd/summary.html	Sciadas G ... [et al.] - ITU	2005	Monograph/Internet
Industrial development, trade and poverty alleviation through South-South cooperation https://www.unido.org/file-storage/download/?file%5fid=62769	UNIDO	2005	Monograph/Internet
At the Crossroads : ICT Policymaking in East Africa http://www.idrc.ca/en/ev-90304-201-1-DO_TOPIC.html	Etta, Florence and Elder, Laurent, International Development	2005	Monograph/Internet and hard-copy

ICT Investment Opportunities in East Africa Country Specific Market Analysis: Kenya, Tanzania, Uganda, Mauritius www.trigrammic.com	Research Centre (IDRC) James T., Kartano K., Mutinda T. Trigrammic	2004	Monograph/Internet
Diagnostic report East Africa Information & Communication Technology	Lamtrac AB, CDE/SIDA	2004	Monograph/ hard- copy
Connected for Development : Information Kiosks and Sustainability www.unicttaskforce.org/perl/documents.pl?id=1361	Badshah A, United Nations. ICT Task Force	2004	Monograph/Internet and hard-copy
The Impact of Mobile Phones In Africa http://www.commissionforafrica.org/french/report/background/scott_et_al_background.pdf	Commission for Africa	2004	Monograph/Internet
African Media and ICT4D: Documentary Evidence: A baseline study on the state of media reporting on ICT and information society issues in Africa www.uneca.org/aisi/docs/MediaStudy.pdf	Stanbridge R, Ljunggren M, UN. Economic Commission for Africa (UNECA)	2003	Monograph/Internet and hard-copy

ICT for African Development: An Assessment of Progress and Challenges Ahead	Okpaku J O, ed. United Nations. ICT Task Force	2003	Monograph/Internet Only
E-Strategies: National, Sectoral and Regional ICT Policies, Plans and Strategies	UN. Economic Commission for Africa. Sub-committee on Information and Communication Technology	2003	Monograph/Internet and hard-copy
African Connexion	United Graphix.cc	2003	Periodical/Hard-copy
Coalition of Resources for Information and Communication Technologies	UNCTAD	2002	Monograph/Internet and hard-copy
Information and Communication Technologies	United Nations Non-Governmental Liaison Service	2000	Monograph/Hard-copy
Linking Africa to a Changing World	Otsubo S, African Development Bank (AFDB)	2000	Monograph/Internet and hard-copy
Towards an SME e-ACCESS and usage across 14 African countries: http://www.researchictafrica.net	Research ICT Africa, (RIA)	2006	Report and Internet
ICT Investment Opportunities in East Africa: http://www.csk-online.org/html/ict_report.php	International Finance Corporation Country Reports: Kenya and Mauritius	2004	Report and Internet