INTERNET FROM THE HORN OF AFRICA: ETHIOPIA CASE STUDY

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Acronyms

AVU	African Virtual University
BITE	Bringing Internet To Ethiopia
COMESA	Common Market for Eastern and Southern Africa
ESTC	Ethiopian Science and Technology Commission
ETA	Ethiopian Telecommunication Agency
ETC	Ethiopian Telecommunication Corporation
ETTI	Ethiopian Telecommunications and Training Institute
ICT	Information and Communication Technologies
ISPs	Internet Service Providers
OAU	Organization for African Unity
PadisNET	Pan African Documentation and Information Service Network
UNECA	UN Economic Commission for Africa
VoIP	Voice over Internet Protocol
VSAT	very Small Aperture Satellite

1. Country background

1.1 Overview

The Federal Republic of Ethiopia, known in the past under the biblical name of Abyssinia, is one of the most ancient independent countries in the world. It has its historical origins in the Empire of Ethiopia, which according to legend was founded by Menelik I, son of King Solomon and Queen Sheba. Ethiopia is the only country in Africa which has never been colonized. For this reason it stands as a symbol for other African countries and has been chosen to host important regional African institutions, such as the Organization for African Unity (OAU) and UN Economic Commission for Africa (ECA).

Located on the Horn of Africa, in the eastern part of the continent, Ethiopia is bordered by Eritrea to the northeast, by Djibouti and Somalia to the east, by Kenya on the south and by Sudan to the west (see *Figure 1*). Its territory, of about 1.3 million square kilometers, consists of a massive highland complex of mountains and plateaus, divided by the Great Rift Valley running from southeast to northeast, and surrounded by lowlands, steppes or semi-desert.

Although a landlocked country today, Ethiopia used to have access to the sea through Eritrea, formerly one of its provinces. After the referendum of 1993, however, Eritrea became independent, leaving Ethiopia without a coastline. Due to recent conflicts with Eritrea, almost all of Ethiopia's surface import/export traffic passes by road or rail through Djibouti.

Ethiopia has extremely varied climatic conditions due to its location close to

Figure 1: Ethiopia

Source: CIA World Factbook 2001, http://www.cia.gov/cia/publications/factbook/.

the equator and to the fact that most of the country lies at some 1,500 metres above sea level. The territory can be divided into three main climatic zones: the cool zone, where the temperature ranges from zero to 16 degrees Celsius, the temperate zone, where most of the population lives, which is typically situated at between 1,500 and 2,600 metres with average temperatures of around 20 to 25 degrees, and the hot zone, mostly located in north east and south eastern lowlands, where the climate is tropical and arid. The rainy season is from April to September. However, there are many semi-desert areas and the country has a history of severe drought. The last drought took place in 2000, and was considered one of the worst droughts of the last 15 years. It affected more than eight million people in Ethiopia, causing severe famine and starvation in the country as a whole, with the worst of the devastation affecting the lowlands.[1]

Transport is another major problem in Ethiopia. The country has the lowest road density per capita in the world. The poor development of this sector has hampered economic development and remains an obstacle to economic integration, and at the same time creates additional need for improved electronic communications. Only 21 per cent of the road network is paved, with few interconnecting links between adjacent regions and an undeveloped feeder road network. As a result, large parts of Ethiopia are isolated and dependent on pack animals for transport. A basic rail service links Addis Abeba with Djibouti via the eastern Ethiopian city of Dire Dawa. Passenger and cargo air transport services are provided by Ethiopian Airlines. Its international flights link the country with 43 cities on three continents, and its domestic service links 38 airfields and 21 landing strips with Addis Abeba.

1.2 Demography

The first census in the country was carried out in 1984, when the population amounted to some 42 million inhabitants, including Eritreans. In 1994, the date of the second census, there were about 49.22 million inhabitants (excluding Eritrea). The growth rate of the last ten years has been on average 2.7 per cent a year, and in 2001 the population was estimated at about 65.4 million inhabitants,[2] making the country the third most populous in Africa.

Table 1: Population indicators			
	1997	**1998**	**1999**
Total population	59'750'000	61'266'000	67'782'000
Population, female (% of total)	50	50	50
Rural population	84%	83%	83%
Population growth	2.57%	2.51%	2.44%
Illiteracy rate, adult total	65%	64%	63%
Population density	60	61	63
Age distribution			
Population ages 0-14, total	27'587'526	28'410'646	29'184'940
Population ages 15-64, total	30'516'592	31'217'890	31'855'770
Population ages 65 and above, total	1'637'536	1'630'742	1'617'957

Source: World Development Indicators, World Bank.

There are six major ethnic groups in Ethiopia, each with its own language. The official language of Ethiopia is Amharic. However up to 286 different dialects are spoken in the country and there are 25 official languages of instruction.

The largest city is the capital, Addis Abeba, with a population of 2.5 million, followed by Dire Dawa, with 0.23 million. The majority of the population, around 83 per cent, lives in rural areas. There are about 12 million households in the country, with the average household consisting of 5 people.

Ethiopia has a young population, with only 2.9 per cent of the total over 65 years of age and about 45 per cent under 15. This is partly due to a female fertility rate of 6.8 per cent and an estimated life expectancy of just 43-45 years (see *Table 1*).

1.3   Economy

On 28 May, 1991, the Transitional Government of Ethiopia took over an essentially State-owned and operated economy, and began to rebuild the institutions and infrastructure needed to lead the country's development. Since then, the country has undertaken a programme of economic reform, aiming to stabilize and liberalize markets, and the Ethiopian Investment Authority and the Ethiopian Privatization Agency have been established. In the same year, the Government started selling State-owned enterprises, including the power supply company. Ethiopia issued new laws opening banking and insurance to the domestic private sector and most State-owned retail shops, hotels, and restaurants are now private. To date, about 180 government entities have been privatized.

Ethiopia's gross domestic product (GDP) in 1999 stood at around USD 6.5 billion, corresponding to about USD 620 per capita (in purchasing power parities), ranking it as one of the poorest countries in the world. The Ethiopian economy is heavily dependent on agriculture,

Table 2: GDP per capita in PPP$ (selected African countries)					
Countries	**1995**	**1996**	**1997**	**1998**	**1999**
Botswana	5'843	6'189	6'554	6'569	6'872
Ghana	1'710	1'767	1'792	1'808	1'881
The Gambia	1'451	1'462	1'492	1'497	1'580
Central African Republic	1'128	1'076	1'106	1'125	1'166
Kenya	1'027	1'046	1'037	1'010	1'022
Uganda	999	1'069	1'081	1'094	1'167
Burkina Faso	836	875	896	916	965
Madagascar	801	793	786	776	799
Eritrea	787	825	822	880	881
Zambia	754	788	784	753	756
Rwanda	736	833	799	837	885
Mali	678	692	723	719	753
Mozambique	658	682	733	796	861
Ethiopia	**563**	**610**	**630**	**595**	**628**
Malawi	546	568	574	570	586
Tanzania	472	484	484	482	501

Source: World Development Indicators, World Bank.

which accounts for approximately 50 per cent of the national GDP, 90 per cent of exports and employs 80 per cent of the workforce. Industry and manufacturing still have a minor role in the formal economy, accounting respectively for 11 and 7 per cent of GDP (1999 data).[3]

Most of the revenues from agriculture are derived from coffee, which is estimated to constitute 60 per cent of national exports and contributes 10 per cent of national GDP, providing a livelihood for more than 15 million people, i.e. about 25 per cent of the total population.

From 1993-1998, the country achieved an annual average economic growth rate of 6-7 per cent and an annual average inflation rate below 4 per cent. Despite the wide reform programme, the Ethiopian economy weakened in the late nineties, following a three-year drought and the conflict with Eritrea in 1999, during which increased military expenditure further harmed the economy, classified by the World Bank as 'severely indebted'. Ethiopia also has a large current account deficit resulting from a highly negative balance of trade and a high ratio of debt outstanding to exports and GDP. In April 2001, Ethiopia, classified by the UN as a least developed country (LDC), was permitted to reschedule two-thirds of its international debt until 2004.

In 1999 imports accounted for USD 1.3 million, and mainly comprised machinery, manufactured goods and chemicals, while exports, which in 1998 totaled less than half of imports, consisted of coffee, as well as oil seeds, hides, skins, sesame seeds, pulses, chat/qat, live animals, honey and beeswax, fruits and vegetables.

To achieve long-term economic and social development goals, and to feed a rapidly growing population, the Government of Ethiopia focuses on agricultural development as the catalyst for economic growth and is increasing reliance on free market forces and the private sector to expand exports and supplant imports. Ethiopia is a member of Common Market for Eastern and Southern Africa (COMESA).[4]

1.4 Human development

Ethiopia ranked 158 out of 162 countries in the UNDP's 2001 Human Development Index. Indicators of human development for the country are shown in the UNDP report on the country at http://www.undp.org/hdr2001/indicator/.

Ethiopia ranks very low in almost all the indicators, particularly in respect to life expectancy and literacy rate, in which the country is among the last entries. This is also reflected in a high human poverty index (HPI, see *Table 3*).This index measures deprivation in three main areas: longevity (percentage of people expected to die before age 40), knowledge (percentage of adults who are illiterate), and standard of living (percentage of populations without access to health services and to safe water, and of children under five who are under weight).

1.5 Political

Ethiopia has been through almost every form of government during the last century: the empire of Haile Selassie in the 1920s, the short-lived occupation by Italian armed forces in 1936, Lieutenant Colonel Mengistu's Marxist dictatorship

Table 3: Human Poverty Index	
Sudan	37
Tanzania	30
Uganda	41
Mozambique	50
Ethiopia	**56**

Source: UNDP Human Poverty Index, online at http://www.undp.org/povertyreport/.

from 1974 until 1991, and finally the current Federal Democratic Republic.

The first democratic elections, both federal and regional, were held in 1995 and the Federal Democratic Republic of Ethiopia (FDRE) was finally declared on 22 August 1995, after a four-year transitional government: for the first time in the country's long and rich history, the Ethiopian peoples were living under a government of their own choosing, and had a strong voice in government at the local, regional, and federal levels.

A Constitution was created, based on the Universal Declaration of Human Rights, political power was decentralized and the country was divided to nine regional administrations (Tigre, Afatm, Amaram, Oromia, Somali, Benshangui, Gambela, Harer and Southern), which enjoy considerable autonomy and have the right to secede. The federal Government is responsible for foreign affairs, defence and economic policy, while the other functions are delegated to the regions. Regions are further divided into zones, warada (districts), kebele (communities or farmer associations). There are about 550 warada in the country and government generally aims to reach down to this level.

In the 2000 elections, the Ethiopian People's Revolutionary Democratic Front, the same party which brought down the Government of Colonel Mengistu in 1991, won a majority in the House of People's Representatives with 472 seats out of a total of 548. Since the Republic has been declared, new economic policies have been brought into effect by the Government, with a view to revitalizing the country's economy through liberalization, privatization, and reorganization of different economic sectors.

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1 "Eyewitness: Where hunger reigns", BBC News Online, 30 April 2000. Online at
http://news.bbc.co.uk/hi/english/world/africa/newsid_731000/731316.stm.

2 Ethiopian Central Statistical Authority, Population and housing census of Ethiopia, Analysis Report, 1994.

3 The Statesman's Yearbook 2002.

4 COMESA website: http://www.comesa.int/

2. Communication technology status

2.1 History and status of telecommunications in Ethiopia

Established over a century ago, the Ethiopian Telecommunication Corporation (ETC) is the oldest public telecommunication operator (PTO) in Africa. Although initially private, the company was placed under government control at the beginning of the twentieth century, and was later brought under the control of the Ministry of Post and Communications. Already in 1952, telecommunication services were separated from the postal administration, and fell under the Ministry of Transport and Communications (today Ministry of Infrastructures).

The first long-distance telephone line in Ethiopia was established in 1894 between Addis Abeba and Harar. The network began to expand from then on, extending to other cities in Ethiopia. After the end of the war against Italy, Ethiopia established the Imperial Board of Telecommunications, whose activity was funded from domestic sources and from the World Bank. The Board had full financial and administrative autonomy and was in charge of the provision and the expansion of telecommunication services in Ethiopia. Today, the backbone network is constituted from a variety of microwave, satellite and also fiber optic links. International access is provided by satellite and the PANAFTEL terrestrial microwave network, connecting Ethiopia to other Southern and Eastern African countries via links to some neighbouring countries (see below).

The Imperial Telecommunication Board, which became the Ethiopian Telecommunication Authority in 1981, was placed in charge of both the operation and regulation of telecommunication services. In 1996, in the wake of the market reforms, the Government created a new separate regulatory body by Proclamation 49/1996, establishing the Ethiopian Telecommunication Agency (ETA), which has the objective of promoting the development of "*high quality, efficient, reliable and affordable telecommunication services*".

The same year, by Regulation 10/1996, the Council of Ministers set up the Ethiopian Telecommunication Corporation (ETC), to which all the rights and obligations of the former Ethiopian Telecommunication Authority were transferred. ETC would operate as a public enterprise under the authority/supervision of the ETA, with the principal duty of maintaining and expanding telecommunication services in the country and providing domestic and international telephone, telex, telefax and other communication services. In this respect, it is currently deemed by the Regulation to be the only operator of any telecommunication related service, including the provision of the Internet and public phones.

2.2 Network and capacity

Notwithstanding improvements in recent years, the telecommunication network in Ethiopia is still among the least developed in the world: with only 324'729 fixed lines in service in 2001, teledensity reached only 0.54 per cent, despite the 20 per cent growth realized in the last two years (see *Figure 3*).[1] Further improvements are foreseen in 2002, when ETC is planning to connect 80'000 new lines. However, there is a large difference among urban and rural areas, with about 60 per cent of telephones concentrated in the capital city, accounting for less than the three per cent of the total population.

Figure 1: ETC transmission system chart

Source: ETC Transmission Division.
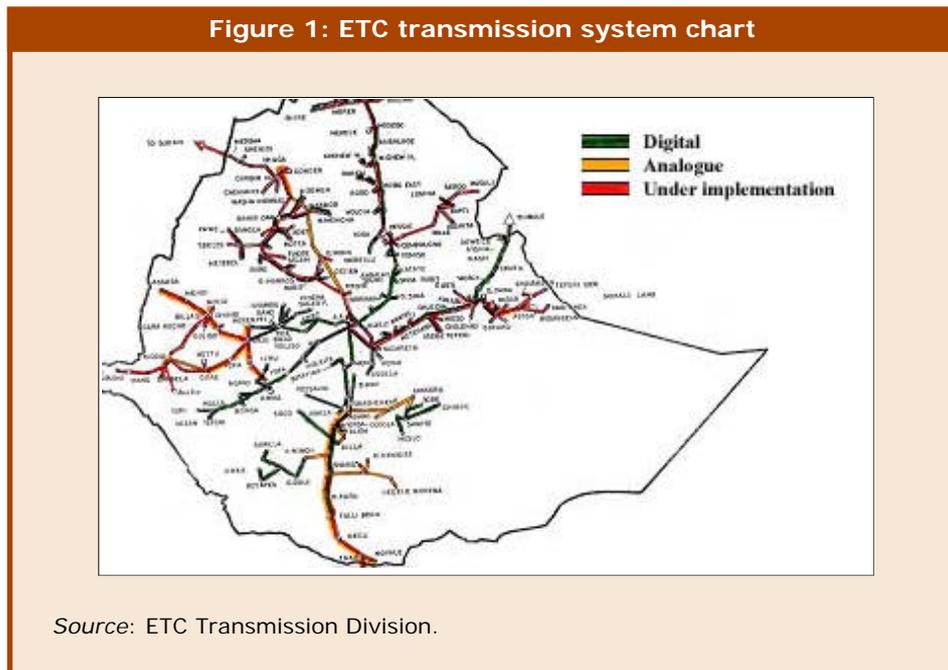
The domestic network backbone is based on microwave links, analogue or digital, connecting almost all the regions of the country. Analogue lines are being gradually substituted with digital lines by ETC, which is developing several projects to extend digital links at least to the larger cities in the country. To complete the national network, in 1994, four high-capacity (comprising 60 channels) DOMSAT (domestic satellite) ground stations were installed in Addis Abeba, Humera, Mekele and Gode.

This network is relatively reliable, with most faults being due to power interruptions. In Addis Abeba the power network is down about once a week, while the situation is more difficult in the countryside. However, interruptions are usually brief, and the rate of failure not dissimilar from that of neighbouring countries.

For its international terrestrial links, ETC operates a 155Mpbs digital microwave link to Sudan and a 34Mbps link to Djibouti. A link with Somalia is planned. There is also an old 60-channel analogue link with Kenya, while Eritrea's analogue link was severed during the war and has not yet been restored. The circuits link Ethiopia to more than 20 countries through the PANAFTEL microwave network, in particular to other Southern and Eastern countries (Djibouti, Kenya, Uganda, Zambia and Tanzania). Most other international traffic is catered for via the Intelsat satellite earth station which currently has a capacity of 12'000 channels.

For technical purposes, the Ethiopian territory has been divided by ETC into geographical zones, not all of which correspond to administrative divisions. The zone enjoying the highest degree of connectivity is, as mentioned, the capital city and its surroundings, followed by the southern and the eastern zones, where other large cities, Nazareth, Dire Dawa and Harar, are located. The least-served area is in the southeast (see *Figure 2*): here, the territory consists of irregular terrain which is difficult to cover, and the—largely nomadic—population is too sparse to justify the cost of microwave links. In these circumstances, satellite technology complements the terrestrial network: 100 Gilat FaraWay 8 channels and 120 Gilat DialAway (2-8 channels) VSATs, which can also be powered using diesel generators or solar panels, are currently in

operation in the country, extending communication services to rural areas and supplementing the service in areas around Addis Abeba. The ETC is planning to increase the number of VSATs to 470 in the near future.

2.2.1 Fixed lines

The national switching capacity is 550'000 lines, of which about 340'000, i.e. only 61 per cent, are currently in use. ETC announced plans in 1998 to add a further 750'000 lines over the next 10 years which would raise teledensity to about 1 per cent. A fixed-line capacity of about 440'000 is to be allocated to urban areas (serving a total population of around 10 million) forecast for the end of 2002. There is still a large unsatisfied demand, with a waiting list of 153'000 for fixed lines in February 2002. The average waiting time to obtain a fixed line varies depending on the type of customer: there are separate waiting lists for business and residential users, with the latter having to wait for up to 8 years to obtain a telephone.

In some cases, WLL technology is used to connect certain areas: currently around 6'000 lines are

provided in Addis Abeba, operating in 4 of the 6 zones which make up the city. However, this system, though quicker to install, presents higher costs and a shorter lifetime (5 to 7 years), and uses a limited natural resource, the frequency spectrum. Moreover, the current WLL speed in Ethiopia (9.6 Kbit/s) allows only voice and fax communication, virtually excluding any Internet use. The system is therefore unlikely to be used widely in the country.

There are expected to be 1'500 public coin/card phones in operation by 2002 and 22'000 lines in ETCs public call offices. The number of clandestine phone shops (which charge a premium over ETCs tariffs) is unknown, though they can be in Addis Abeba.

The provision of terminal equipment is fully liberalized, subject to ETA type-approval which is required before ETC can install a telecommunication line. Satellite phones are not allowed, except under exceptional circumstances. Frequency monitoring is not yet carried out as ETA lacks the necessary equipment. Direct-to-home satellite television was not

Figure 3: Fixed and mobile lines network in Ethiopia and fixed-line growth rate in selected countries
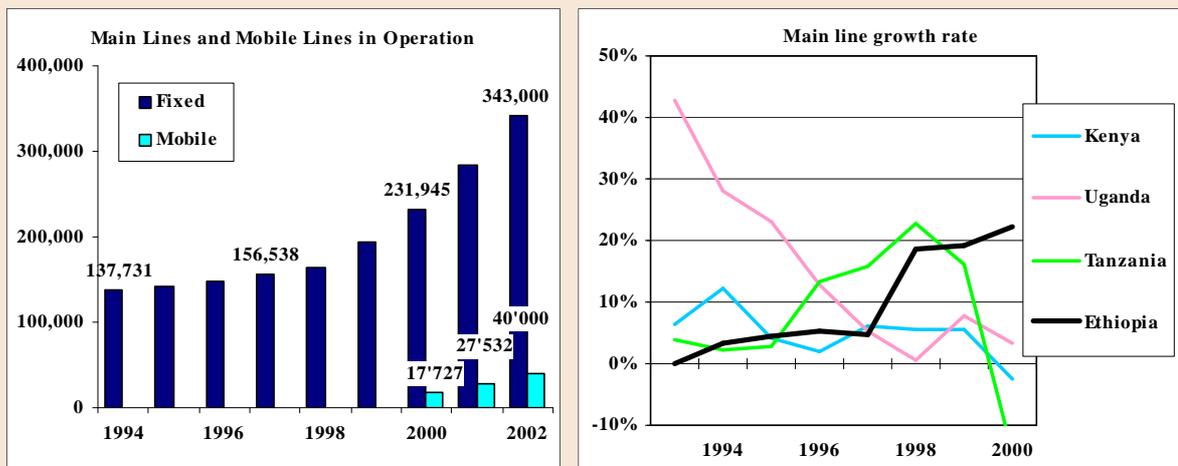
Note: Figures are for fiscal year ending 8 July. Figures for 2002 are projections.
Source: ITU World Telecommunication Indicators Database and Ethiopian Telecommunication Corporation.

allowed until quite recently, although there have been many clandestine installations. Recently, it became possible to obtain a TVRO licence, which costs Birr 1'000 for the initial application, and Birr 336 per year (respectively about USD 115 and USD 40).

Directory services are updated every 4 years. Mobile numbers and Internet addresses will be listed in the upcoming 2002 directory, however a web-based version is not currently planned.

2.2.2 Mobile

In contrast to other developing or least developed countries, in Ethiopia the use of mobile phones is not yet widespread. The first, and still the only, mobile service in the country is the GSM facility launched by ETC in 1999 under the name of "Ethio Mobile". ETC initially underestimated the market for mobile services, which rapidly reached its maximum capacity of 28'000 subscribers, at which point new subscriptions were suspended (in mid-2001) until new capacity could be added. Initially, ETC also sold handsets, but has since dropped this as it was unable to fulfill customer demand for greater variety, resulting in a large number of users importing their own handsets. For the moment, mobile services cover the area of Addis Abeba and its surroundings, and the cities of Debre Zeit, Nazareth, Mojo and Sodore, for a total of 120 Km of road coverage. There are four gateways to the PSTN from the GSM 2002, after which time coverage will be expanded and new services will be implemented. Doubts remain, however, as to the demand for SMS, as the technology is designed to support Latin fonts, and will not enable messaging using the Amharic fonts used by the inhabitants of Ethiopia.

As with fixed-line and Internet services, ETC practices an unusual billing system: ETC calls each customer every month to communicate the amount of the bill, which then has to be paid directly at the ETC offices. Due to backlogs in the system, it seems that customers are typically paying bills four months later than the billed month (for example, bills for November 2001 were being paid in March 2002).

Nevertheless, the cost of the mobile service is relatively affordable in Ethiopia compared with other countries (See *Table 4*)—mobile to mobile calls are charged at 0.75 Birr per minute (about 9 US cents). The initial subscription fee is still relatively high, although the monthly rental is also below average (see *Figure 4*). Perhaps surprisingly, the low tariff is not a barrier to profitability, as is evidenced by comparing the service with Ghana's, which has 90'000 users with a higher usage dimensioning than the ETC service (18m Erlangs in Ghana compared with 25m Erlangs for ETC) and generates the same amount of revenue as Ethiopia's 30'000 users.

Notwithstanding the evident difficulty of ETC in satisfying the growing (quantitative and qualitative) demand for this service (the waiting list now is over 40'000), there are no plans to allow another operator to enter the market in the near future.

2.2.1 The digital data network (DDN)

ETC began to deploy a limited number digital circuits for customers in late 1999—following increasing demand for leased lines for Internet access, 5 lines were deployed that year, growing to 10 by December 2000, although 2 are used by ETC. X.25 has not been deployed in the country and so far is not envisaged. In 2001, a dedicated digital data network (DDN) service was developed which now provides the underlying infrastructure for ETC's Internet service and will provide other data-related services such as ISDN, data transmission for banking networks and distance education transmissions, in the near future. A total of 9 cities have been commissioned (Jimma, Bahir Dar, Mekelle, Desale, Sheshemene, Awessa, Nekemti, Nazareth and Dire Dawa), with a further 6 points of

Figure 4: Fixed and mobile telecommunication tariffs

1. **Fixed**	1 USD =	8.56 Birr
Connection fee	305 Birr	(35.6 USD)
Monthly rental:		
Business	17 Birr	(2 USD)
Residential	8 Birr	(1 USD)
Local calls	0.2 Birr for 6 minutes	(0.02 USD)
National long distance calls:	0.2 Birr/pulse	(0.02 USD)
Duration of pulse	*Normal**	*Reduced**
16-50 Km	60 sec	60 sec
201-300 Km	12 sec	18 sec
551-700 Km	6 sec	9 sec
International call tariff:		
Africa	13 Birr/min	(1.5 USD)
Europe	15.98 Birr/min	(1.87 USD)
Asia	19.68 Birr/min	(2.3 USD)
America	21.35 Birr/min	(2.5 USD)
2. **Mobile**		
Subscription	543 Birr	(63.5 USD)
Deposit for security	408 Birr	(47.7 USD)
Monthly rental	50 Birr	(5.8 USD)
Call charge:		
Mobile to mobile	0.75 Birr	(0.09 USD)
Mobile to fix	From 0.33 (local, off-peak tariff) to 2.72 (long distance, peak tariff) Birr/min (repectively 0.04 and 0.32 USD)	
International Call Charge	Call Charge for fixed telephones + 0.72 Birr/minute (0.04 USD)	

Source: ETC.

Table 4: Mobile cost and revenues (selected African countries)

Country	Cost of 3 minute local call (USD)	Mobile subscribers	Mobile revenue (USD)
Ethiopia	**0.26**	**28'000**	**8'262'896**
Uganda	0.36	188'568	49'705'072
Mozambique	0.46	51'065	22'486'678
Zimbabwe	0.50	309'000	45'708'048
Kenya	0.59	127'404	13'754'971
Zambia	0.68	98'853	1'532'318
South Africa	0.69	8'308'000	3'040'345'856
Ghana	0.90	130'045	2'521'334

Note: Data refer to year 2000. Data for Ethiopia are for 2001.
Source: ITU World Telecommunication Indicators 2002.

presence (PoP) located in the Addis Abeba area, including one ISDN switch in Arada. The network links between the PoPs are 2Mbps and local links can be provided at up to 1Mbps.

The provisional licence proposed by ETA for the DDN has the following targets, which if not met, are liable to a penalty of Birr 300 for connection point that is not installed:

Table 5: Digital data network in Ethiopia

No.	Regional Administration	Name of Town	Population Size	Roll Out Target* 2001/02	2002/03	2003/04	2004/05	2005/06
1	Tigray	Mekele	99,846	3	10	13	16	20
2	Amhara	Bahir Dar	99,024	6	17	22	28	34
	Amhara	Dessie	100,233	2	7	10	12	14
3	Oromia	Nazareth	131,677	2	7	10	12	14
	Oromia	Jimma	91,533	6	17	22	28	34
	Oromia	Debrezeit	75,573	2	7	10	12	14
	Oromia	Nekemte	48,676	2	5	6	8	10
	Oromia	Shashemene	53,642	3	10	13	16	20
4	S.N.N.P	Awassa	71,244	2	7	10	12	14
5	Addis Ababa	Addis Ababa	2,147,126	66	194	258	324	388
6	Dire Dawa	Dire Dawa	169,797	6	19	26	32	38
Total			**3,088,371**	**100**	**300**	**400**	**500**	**600**

* Refers to number of Customer Connection Points.

DDN Tariffs

Tariff for point to point Digital Leased line circuit for < 64kbps

	Initial Subscription (Birr)	Monthly Rental (Birr)
For 27xx NTU	5,523.00	69.00
For Local lead	1,400.00	41.00
For Port	--	832.00
For Node	--	884.00

Monthly rental charge in Birr for transmission of Digital Leased line point to point circuit

	A.A	Awassa	D/Zeit	Nazareth	Dessie	Shashe-mene	Mekele	B/Dar	Jima	D/Dawa	Nekempt
AA	100	1100	200	400	1250	1000	2500	1600	1300	1750	1235
Awassa	1100	-	970	940	2200	100	3550	2400	1000	2300	1550
D/Zeit	200	970	-	200	1350	870	2600	1800	1350	1650	1370
Nazareth	400	940	200	-	1425	825	2700	1985	1450	1500	1550
Dessie	1250	2200	1350	1425	-	2200	1315	1250	2450	1465	2035
Shashemene	1000	100	870	825	2200	-	3475	2500	1025	2215	1550
Mekele	2500	3550	2600	2700	1315	3475	-	1565	3515	2500	2900
B/Dar	1600	2400	1800	1985	1250	2500	1565	-	2175	2685	1450
Jima	1300	1000	1350	1450	2450	1025	3515	2175	-	2950	800
D/Dawa	1750	2300	1650	1500	1465	2215	2500	2685	2950	-	2930
Nekempt	1235	1550	1370	1550	2035	1550	2900	1450	800	2930	-

A 19.2Kbps International link costs USD 9232 / month with a 20 per cent reduction for COMESA, while a 64Kbps International link costs US 13,348 with a 30 per cent reduction for non-profit organizations.

2.3 Regulation and policy-making

Telecommunication and information technologies have not yet been considered a development priority in Ethiopia, which is still a relatively closed society, little affected by globalization, and is still emerging from almost two decades of communist military rule and the war with neighbouring Eritrea. The country is only now beginning to discuss liberalization of the sector and the promotion of free flow of information. Accordingly, all telecommunications infrastructure and value-added services are still owned by the State.

Telecommunications in Ethiopia fall under the authority of the Ministry of Infrastructures, a sort of '*supra*' ministry, which, besides telecommunications, also oversees postal services, energy, and transportation. The Ministry, and specifically the telecommunication department, is responsible for the definition of national telecommunication policy, excluding radio and television broadcasting, which fall under the authority of the Ministry of Informa-

tion and the associated Broadcasting Agency, which has just been established. In Addis Abeba, there are just three radio channels, which are still owned by the Government, and one TV channel, transmitting in Amharic, Oromo and Tygrigna. Foreign channels can be accessed via satellite dishes delivering subscription-based digital TV via the South Africa-based DSTV service. Since 1994, the press has been liberalized and today there are around ten private newspapers in the country, however, distribution is largely confined to Addis Abeba.

Following the 1996 Proclamation and Regulations, the Infrastructure Ministry also has control over the regulatory authority (ETA) to which it appoints the General Manager and approves the budget (Proclamation 49/1996). The Agency was created as an independent body to license and supervise telecommunication service operators, issue equipment standards and manage the use of radio frequencies. ETA operates as a governmental agency, with financial and political dependence. Administratively, the Agency is divided into three directorates (standards and quality control, licensing and frequency management) and has five services (legal, planning and programming, finance, public relations and audit service). A total of forty people are currently working in the organization, but only a small portion of them, about seven or eight, have professional qualifications.

ETC is the incumbent public telecommunication operator and has a monopoly over all telecommunication services in the country (fixed, mobile, Internet and data communications). ETC has to carry out its functions in accordance with government policies and priorities, and its activities are supervised by a government-appointed body (Regulation 10/1996). Nevertheless, the Corporation operates as a commercial company, it has its own budget

Figure 5: Phone shop in Addis Abeba
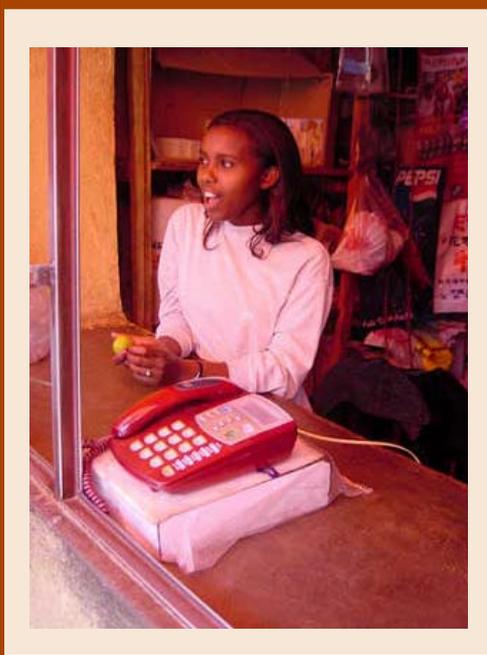
and board of directors, which decides the company strategy and designates the General Manager, whose nomination has then to be approved by the Government.

2.4 Privatization

Notwithstanding the monopoly of ETC, in recent years the Government has been planning to partially privatize the company, aiming to allow the participation of a strategic investor, which should bring new funding and new management techniques and skills to ETC. To permit private participation in telecommunication services, in 1998 the Government amended the Investment Proclamation, providing for private companies, national or foreign, to invest in the telecommunication sector in partnership with the Government (Proclamation 116/1998). The possibility of selling part of ETC shares to a private partner is currently being studied by a private consulting company, PriceWaterHouseCoopers (PwC), which is analysing the current status of ETC and the possible terms of the partnership. The results of the study were scheduled to be complete by the end of June 2002, to be submitted to ETC for a decision and a call for tenders. ETC's revenues last year amounted to around Birr 800 million, i.e. almost USD 100 million (*Figure 3*).[2] Investment in the telecommunication sector has to be approved not only by the Investment Authority, but also directly by the competent ministry (Ministry of Infrastructures).

Although there is clear intent by the Government to open ETC to private investment, there is still some uncertainty about the timetable for this change. It is also unclear what the entry conditions for the investor will be—sometimes a period of exclusivity lasting 3 to 5 years in the provision of telecommunication services by the monopoly company is guaranteed to the new entrant in exchange for a higher investment. If the Ministry grants exclusivity to ETC for all telecom services, this may generate more revenues for the exchequer, but demand may remain unsatisfied owing to the inherently inefficient nature of monopoly operations and the imperative of a quick return on investment for the international investor.

2.5 Licensing

Prior to the reform of the telecommunication sector in 1996, telecommunication service licences did not exist[3] in the telecom sector in Ethiopia: the service was under the control of the Government, which acted as operator, regulator and policy-maker. More recently, however, the necessity of opening the market to new investors created the need for a structured licensing system to establish conditions and requirements for the provision of telecommunication services, which implied the creation of a regulatory authority (ETA) with the power to "*license and supervise operators of telecommunication services*".[4]

Licensing procedures and guidelines were established under Regulation 47/1999, and a licence for each of the services currently provided by ETC has been drafted by the Agency on the basis of general principles of telecommunication services, i.e. high quality, efficiency, reliability and affordability. The licensee has a duty to comply with the conditions established in the licence regarding the quality of service, tariffs, and has to fulfil roll-out and service targets established by ETA in line with national telecommunication policy as set out by the Government.[5]

These licences, which have already been drawn up by the Agency and submitted, are still being discussed by ETC, which has not signed them. There is an apparent lack of agreement between ETC and ETA on some licence requirements, in particular those regarding the roll-out of services. The refusal of ETC to sign the licence, at least for the moment, and the inability of ETA to enforce its decisions, undermines the authority of the regulatory agency and points to the continued concentration of power with the incumbent, which is still the major and most influential

actor in the telecom field, both economically and politically.

The establishment of the agency and of a set of licences and conditions is nevertheless important in view of the entry of a new investor in the company. However, the question remains as to the control ETA will be able to exert over the operator in the future, on which the effective and rapid development of telecommunication infrastructures and services in the country will depend.

2.6   Sector liberalization

As indicated above, franchise over telecommunications services by ETC is almost total, except for the sale of customer premises equipment, which even for private use, is still subject to ETA authorization. The use of any telecommunication technology that would enable bypassing the local network is strictly forbidden. At the moment no licences are granted to private operators to sell or resell telecommunication services, whether basic or enhanced.

This also means that independent VSAT connections and satellite phones are not allowed, and call-back is illegal—punishable by a fine and 2 to 5 years' imprisonment.

With very few exceptions, VSAT terminals are used by ETC only, to connect less served and rural areas. In the last few years, three entities obtained a special authorization to have their independent VSAT link supplied by ETC: the Civil Servants College, which is running a distance learning course, the UN Economic Commission for Africa (UNECA), for its Internet connection, and the World Bank, in the framework of development activities in Ethiopia.

Even in the above-mentioned cases where exceptional authorization has been granted, the beneficiaries have to undergo several limitations: UNECA may use VSAT, but this is officially owned by the Government. The use of the satellite link is restricted to Internet and data transfers. Voice communications must always pass through the terrestrial network, and the connection may be used from

Table 6: Ethiopian telecommunication policy	
Telecommunication services	**Legal status**
Provision of fixed or mobile telephone services, Internet and data	ETC has sole franchise. Forbidden for private companies unless in partnership with the Government (currently being investigated).
Reselling of voice telecommunication services	Not allowed, but currently tolerated. There are many unadvertised phone shops in the country.
Reselling of Internet services	Not allowed for anyone except ETC to act as ISP.
Cybercafés	Not officially allowed, but there are several business-centre type Internet cafés in Addis Abeba, which are currently tolerated. Some have been closed for openly selling VoIP services. There is not a clear policy on the issue.
VSAT connections	Not possible for individuals or companies to have their independent VSAT connection.
Voice over Internet (VoIP)	Not allowed. VoIP services are illegally provided by some cybercafés in Addis Abeba.
Call back	Illegal, punishable with a fine and imprisonment.
Telecommunication equipment	Initially, ETC also had a monopoly on telephone handsets. Today, the authorization of ETA is required to use or sell imported equipment.

Source: Council of Ministers Regulation No. 10/1996; Proclamation No. 49/1996; Proclamation No.116/1998; Council of Ministers Regulation No. 47/1999. Online at http://www.telecom.net.et/~eta.

UNECA headquarters only, not from employees' homes. To have the privilege of an independent connection, UNECA is paying the Government a 'compensation' or 'bypass' fee. ETC is also concerned that UNECA allows journalists, students or other visitors to connect to the Internet from its facilities. The same is true for the College of Civil Servants: the service is available only inside the College, and is not made available for students externally, even though many resources of the College could be accessed directly by those who could not afford an Internet account. From home, students currently have to obtain a normal Internet subscription with ETC.

The environment for the reselling of services is more complex, the many phone shops in the streets and the quite visible Internet cafés seem to be tolerated by the authorities, although the operation of cybercafés is officially *discouraged* by ETC, which is concerned about the possible use of voice over IP (VoIP) and the consequent decrease of international traffic revenues.

Given the widespread practice of reselling communications services, ETA is currently planning to allow private entities to resell telephone services subject to the granting of a licence. ETA considers that in this way it could have control over resale, which is currently not supervised by the public authority. It is interesting to note that this process does not have the purpose of liberalizing the service and fostering competition but aims to

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Box 1: Phone shops: illegal and expensive

Despite concerns that the reselling of phone services could be detrimental to customers by being too expensive or without guarantee of quality or pricing, telephone shops are widely present in Ethiopia. The surprise is that the large number of shops in the market (often very close to one another) does

An ETC public phone area

in rural and remote areas, to cover 84 per cent of the population. The objective of this development project is to have at least one public phone for each farmer association, which is the smallest cell of the Ethiopian society.[6] However these targets have not yet been agreed upon

not seem to stimulate competition: all of them sell the service at the same price, at Birr 0.75 minute (0.09 US cents) (for local calls), about three times more expensive than the service provided by ETC's public payphones.

Explanations include the fact that telephone lines are difficult to obtain, that they are often too expensive for the average Ethiopian, and that the number of public phones is quite low: there are only about 1'500 public phones in the country and prepaid cards have not been around long, so communications had to be paid for with coins. ETC's provisional licence roll-out targets for the financial year 2001/2002, establishes that the number of public phones should grow to 6'500 in the next five years, and that 22'000 call offices are to be set up

by the ETC, which did not sign the licence, therefore they will not become effective until the entry into force of the licence.

The same dynamics are behind the spread of cybercafés and public Internet access points: the cost of computer equipment (there are only an estimated 60'000 PCs in the country) and Internet connection are too high for individuals, therefore many people use public points of access. ETC is planning to establish Internet centres around Ethiopia (one pilot Internet centre has been created in ETC headquarters in Addis Abeba, with two computers connected to the Internet and a fax machine), however there is evidence that this task is too burdensome for the company, which in the last two years has not been able to offer an adequate service to the population.

Source: ITU case study research.

give ETA more control over the market. Under the licence agreement, the Agency would fix price caps and establish specific conditions for the provision of the service to protect the customer (clear indication of tariffs, indicators of time, etc). This strategy reflects a certain lack of confidence in, or familiarity with, the market mechanism in providing the consumer with desired service levels.

Control over customer equipment covers any kind of telecommunication equipment, from the most complex router to the simplest telephone handset. Following the 1996 Proclamation, ETA also has to approve TVRO (television receive-only) and radiocommunication equipment, and can specify any other equipment that requires its approval. Approval is subject to compliance with certain standards, which have been specifically established by the ETA, and are listed in a two-volume compilation.

There are no blanket licences or general approval for telecom equipment: in the case of importation of equipment, the importer (a private individual importing an handset for private use, or a company importing equipment) must ask ETA for approval and may then sell or connect the equipment to the telecommunication system. Any person found in possession of equipment without authorization may have equipment confiscated by the Agency, and in any case ETC can refuse to connect unauthorized apparatus.

2.7 International traffic and revenues

International traffic has shown steady continuous growth in the past ten years. The main destinations for international calls are Europe, followed by United States and Asia. ETC had a total international outgoing minutes in 2001 of 13'580'200 and incoming minutes of 43'677'930. These generated a total international revenue of Birr 312'968'000 (*Figure 6*).

As for many other developing countries, international traffic (and especially incoming traffic) represents one of the major sources of revenue for ETC, accounting for up to 70 per cent of total revenues. However today, following the reduction of international settlement rates, and the spread of VoIP, the international portion of revenues constitutes less then the 40 per cent of the total, while a growing place is being taken by mobile and Internet services.

For the present, as ETC is the only operator, rebalancing of tariffs and interconnection are not an issue, and have not been dealt with by ETA.

Figure 6: The Ethiopian Telecommunication Corporation's sources of revenue

ETC revenues by source (thousand Birr)

	2000	2001	2002
■ Data and Internet	27,900	42,200	61,200
□ Mobile	68,000	104,600	108,000
□ International	293,400	313,000	302,000
■ Domestic	269,500	318,200	362,000

Mobile, Data and Internet 20%

Int'l calls 36%

Local and long distance domestic calls 44%

ETC revenues 2000/2001 (fiscal year ending 8 July): 802 million Birr (US$ 93.8 million)
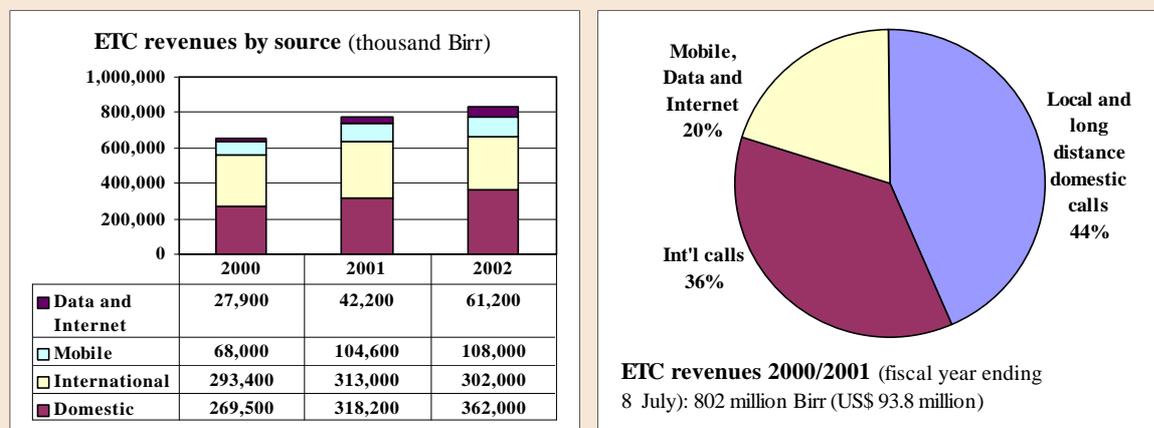
Note: Figures are for fiscal year ending 8 July. Figures for 2002 are projections. One million Birr = USD 116'822.
Source: ETC.

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[1] Ethiopian Telecommunication Corporation.

[2] Ethiopian Telecommunication Corporation.

[3] However for the use of radio frequencies a licence had to be granted by the Licensing and Standard Division of the former ETC. The same division also approved fax machines imported by users.

[4] *Proclamation No. 49/1996 to provide for the regulation of telecommunications.* Online at www.telecom.net.et/~eta.

[5] For the roll-out target see Annex 1 of the *License conditions for the provision of public switched telecommunication service*, ETA, 2002.

[6] See section 1 "Country background".

3. Internet strategy and policy

3.1 Status of the Internet

The use of the Internet in Ethiopia began in 1993 when the UN Economic Commission for Africa (whose headquarters are in Addis Abeba) established a store-and-forward e-mail service called PADISNet (Pan African Documentation and Information Service Network) which connected daily via direct dial calls to GreenNet's Internet gateway in London. Because no other services were available, the facility was heavily used by international organizations and NGOs, but also by some academics, individuals and private companies. At its peak the service had about 1'200 users.

In the following year, the US-based NGO, HealthNet, established a node at the Medical Faculty of the University of Addis Abeba, which provided e-mail access to medical researchers via the HealthSat/VITA Low Earth Orbit (LEO) satellite.

In 1996, a broadly constituted cross-sectoral national Internet working group supported by the Ethiopian Science and Technology Commission (ESTC), called Bringing Internet to Ethiopia (BITE), drew up a detailed national Internet proposal. This, together with the PADIS/HealthNet services, helped build significant demand for full Internet access which was ultimately provided by ETC in January 1997. Following a survey of the potential market, Global One was contracted to commission the service (called EthioNet), carry out training and provide the upstream International bandwidth (256Kbps initially) via ETC's existing satellite earth station and circuits to the United States (backhauled to central Addis Abeba via microwave). Because ETC did not have a leased line data service at the time, Internet services were limited to dial-up access and local website hosting and development.

The ETC took over the administration of the .et Top Level Domain (TLD) from the technical administrator at UNECA when the EthioNet service was launched, and although it has developed a tariff for hosting subdomains of .et, it has yet to allow registration of new subdomains.

Training for users is provided via the ETC's Ethiopian Telecommunications Training Institute (ETTI) and free telephonic technical support is given for setup and e-mail issues, while directing other support queries to its helpdesk e-mail address.

Within a month of its launch EthioNet had over 600 users and this grew to 1'750 by February 1998 (including 200 in other towns), 2'500 in December 1999 (when bandwidth was upgraded to 1Mbps, with an additional 1Mbps added in June 2000) and about 3'500 by March 2001, at which point the facility was deemed to have reached maximum capacity. In line with ETC's generally high level of service standards, and because performance levels would have suffered by adding more users, no more subscribers were accepted in anticipation of an upgrade to the service which was being planned with assistance from UNDP's Internet Initiative for Africa (IIA) programme. Although the project took some time to begin, UNDP provided funding of USD 900'000, with the Ethiopian Government contributing a further USD 700'000 to establish 8 more PoPs in the country: 4 large PoPs (64 dial-up modems) in Mekele, Bahir Dar, Awassa and Jimma, and 4 smaller ones (32 modems) in Dessie, Gondar, Lekemte and Dire Dawa. These PoPs were connected to the Addis Abeba Internet gateway via domestic satellite and became operational in June 2001.

Because ETC provides a local-call tariff from anywhere in the country to dial its Internet service, these points of presence (PoPs) are largely a cost-saving exercise to limit subsidization of long-distance calls. Also, when leased line Internet access is required outside Addis Abeba, the PoPs will be able to provide them much more efficiently from the 8 major cities. International link congestion is now quite severe during the day (see below), with the incoming bandwidth fully saturated from about 07:00 to 17:00 hours during which time about 20 per cent of the incoming packets are dropped. As a result, ETC is in the process of upgrading the link with an additional 2Mbps outgoing and 8Mbps incoming bandwidth to be provided by New Skies Satellite (NSS) for USD 25'000 per month using existing transponder leases. The existing 2Mbps (symmetric) international bandwidth is provided by France Telecom (FCR), for which it pays about USD 24'000 per month.

Due to delays in commissioning the upgrade to the service, a considerable waiting list of potential subscribers accumulated by the time the new service was operational. This took place in July 2001 and since then the number of accounts has grown to just over 6'000. The chart below (*Figure 7*) shows the number of accounts added and cancelled during the period July 2001 to February 2002. As can be seen, the growth in number of subscribers has tailed off considerably in last few months, indicating that the backlog was cleared by about October 2001 and the potential dial-up user-base is beginning to reach its peak. EthioNet estimates that there are 10 users per dial-up account, giving the total number of users at about 60'000. Most other ISPs estimate between 3 and 7 users per dial-up account, so this estimate is probably optimistic.

Despite the availability of the nationwide local call tariff for dial-up Internet users, the distribution of Internet users is still strongly skewed to the capital, with subscribers outside of Addis Abeba accounting for only about 6 per cent of the total user base. This is partly attributable to the low level of computerization outside the

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Figure 7: Internet accounts added or canceled (by year)
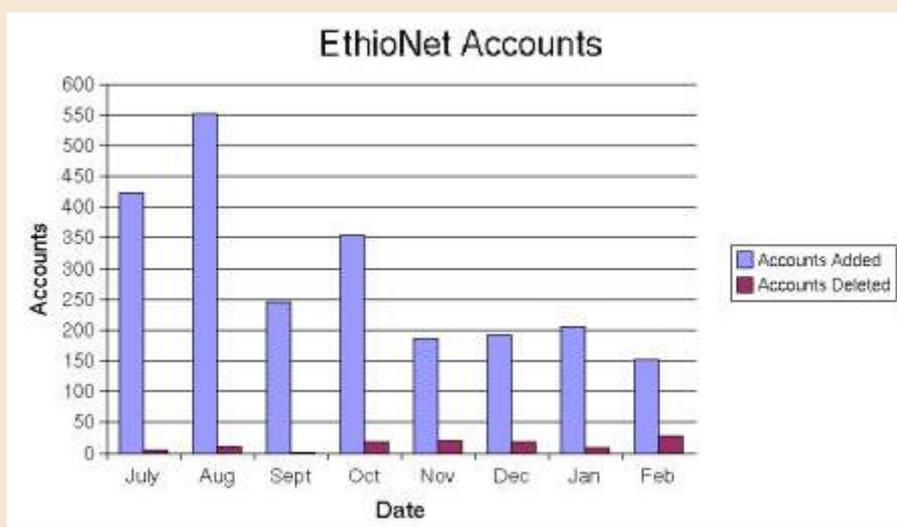
Source: Ethio Internet.

capital, but is probably more related to the limited availability of telecom infrastructure. ETC does give line installation priority to signed up EthioNet subscribers who also require a telephone line, but this is still subject to availability of infrastructure. Unfortunately, the wireless local oop (WLL) system that has been deployed in some areas does not adequately support data communications.

These are not problems simply confined to areas outside the capital—even in Addis Abeba lack of phone lines and access to computers is a severe problem for many potential customers, as is demonstrated by the usage statistics on the international link. Traffic falls off dramatically between 1700 hours and 0800 hours, showing that there is limited residential consumer use, with most of the activity taking place during office hours using business phone lines and computers.

As of December 2001, 66 per cent of the user-base comprised private accounts, 5 per cent was government, 20 per cent international organizations, embassies and businesses, and 9 per cent academic, health and agriculture. In the two years between December 1999 and December 2001, the total number of dial-up minutes per month more than doubled, from 3'443'549 to 7'768'617, which translates to a small decrease in usage during that period, from 23 to 22 hours per month per user. During the same period the number of accessible dial-up lines grew from 224 to 1'088, of which 384 are now located outside Addis Abeba. Monthly revenues during this period increased 190 per cent, from 2.3M Birr/month to 4.4M Birr/month. Interestingly, almost all of this increase took place between March and December 2001, during which time the user-base grew by 160 per cent.

EthioNet has provided ten 64Kbps leased lines so far, with most having been made available to government organizations and some international organizations such as UNECA. There is a waiting list of about 55 for

additional leased lines, however these will only be deployed once the tariff and procedures for allocating leased data lines are finalized by DDN.

EthioNet also has a Web development and hosting unit called EthioPages. It currently hosts websites for a total of 69 organizations, including 18 NGOs, 23 government organizations and 27 private companies (see Table 7).

3.2 Pricing structure for Internet services

The tariff for the EthioNet's dial-up service is based on five subscriber categories as shown in Table 8 (C1-5). The fees established at the launch of the service were based on the expectation of fewer customers and were subsequently revised downwards by 25-50 per cent in November 1997 and have since remained as Table 8.

Website development is also provided by ETC and has a complex pricing strategy:

- Uploading & verifying pages - 25 Birr per screen page.
- Web page Development (Text file) - 100 Birr per screen page.
- Scanning artwork - 50 Birr / image.
- Scanning artwork with animation - 300 Birr per image.
- Multimedia file creation (wav, PDF, jpg etc) - Birr 150 per image/file.
- Real Audio media production - 40 Birr/ file hour
- Real Video production at 50 Birr/ file hour.
- Interactive web page customized format using HTML Coded Forms (CGI, Java etc) - 200 Birr per page and 5 Birr per custom field.
- Logo design - 80 Birr/image.
- Database development - 80 Birr/ hour.
- Banner advertising - 400 Birr/ month.
- Hard disk rental - 17 Birr/MB/ month (html), and 42 Birr/MB/ Month for multimedia files.
- Web page formatting using Tables - Birr 50 per file and 2 Birr per table element.

Table 7: Websites hosted by ETC		
NGO	**Government**	**Business**
AAU Technology Fac.	AAMP	Abeba Gidey PLC
Abebech Gobena	BDU	Afro Ostritch PLC
Alemaya University	DPPC	Altastar PLC
APAP	Ethiopian Map Authority	Ambass Enterprises
CFAO-EOC	Ethiopian News Agency	Ergib Trading plc
Debrebirhan Public Lib.	Experience Eth. Travel	CPU
GC MS	EPA	EET
GTZ-IFMP	EIC	ELICO
IB CR	ESTC	Ethiopia Today
Italian Cult. Inst	ETA	Habesha Trading
Jimma University	Ethiopian Trade Point	Jiva Comp. Academy
Unresco	FEMSEDA	Lalibela Hotels
UNCDF	MTSE	Nature Lovers Tour Operator
UNDP-EUE	National Bank	NTC
Wolisso City Council	NCIC	Pact Ethiopia
UNFPA/CST AA	TCDE	Sheba Tannery
The British Council	US Embassy	St. Gabriel Hospital
Forum for Street Children	Walta Info. Center	Sur Construction S.C
	Royal Netherlands Embassy	TCDE
	Ministry of Information and Culture of Ethiopia	Thomas Chako
	Ethiopian Foot Ball Federation	United Tebarek
	Ethiopian Customs Authority	WARYT
	Enweyay Civic and Social Education Center	Yenegew Sew
		Axum International Tour and Travel
		Ross Training Resource Center
		Dire Dewa Food Complex
		Infotec PLC

Source: CIA World Factbook 2001, http://www.cia.gov/cia/publications/factbook/.

	Setup	Monthly subscription	Service	Additional hours
Individual/Private Company (C1)	56 USD	19 USD	8 free hrs a month 1MB free storage	4 USD
Individual/Private Company (C2)	75 USD	34 USD	15 free hrs/month 1MB free storage	4 USD
International NGO's, Embassies and Business Sectors (C4)	113 USD	75 USD	40 free hrs/month. 2MB free storage	4 USD
Public Education, Health and Agricultural Sectors: (C5)	38 USD	25 USD	40 free hrs/month 2MB free storage	2 USD
Other non-profit organizations (C3):	56 USD	38 USD	40 free hrs/month 2MB free storage.	2 USD
Additional hard disk space	2 USD month per MB			
Additional e-mail boxes	5 USD month (C3, C4 and C5 accounts qualify for 2 free e-mail addresses)			
Installation or configuration of the dial-up account by bringing the machine to EthioNet's premises costs	20 USD			

Table 8: Internet service costs

Source: Ethio Internet.

- Image map layout - 150 Birr.

EthioNet customers automatically have web space under their username - www.telecom.net.et/~userid. EthioNet has also recently provided for domain registration under the .com.et domain. Currently it is possible to register www.telecom.net.et/company_name for Birr 17 per month. Registration of www.company_name.com.et costs Birr 417 for setup and Birr 500 per year.

Leased line fees have been provisionally set at USD 500 for 500 connection, USD 200 for setup and USD 1'000 per month for 64Kbps CIR on the international link. Uncommitted bandwidth or reduced charges for lower bandwidth on the International link are not currently envisaged. IP address space will be billed at Birr 18 per year per IP number and leased line customers qualify for up to 10 free e-mail addresses on the telecom.net.et mail server.

While US Dollar rates are quoted for most tariffs, these are payable in Birr at current rates of exchange for Ethiopian nationals and businesses owned by Ethiopians. The tariffs are also payable in Birr for foreign nationals and organizations, but the National Bank of Ethiopia keeps account of these payments for ETC's hard currency allocation. An additional 15 per cent sales tax is added to the total payment. Bills are currently issued and paid in Addis Abeba. Because it is not yet possible to conduct wire transfers between bank branches, the outlying areas have difficulties in getting the payment to Addis on time, resulting in extra collection overheads. Plans are being made to have bills issued at the local PoPs where administration and support technicians will be stationed.

All of the cybercafés in Addis Abeba surveyed charged the same rate for Internet access - Birr 0.75 per minute

and Birr 1 per black&white page printed and Birr 8 for colour. Other commonly used charges are Birr 0.35/ page for photocopies (0.25/page for more than 1'000 copies), Birr 7 per A4 scan or Birr 5 per scan for more than 5.

Calls to the Internet from anywhere in the country are charged at standard local call tariffs - Birr 0.28 per 6 minutes, or approximately 0.33 US cents per hour, among the lowest local call tariffs on the continent.

This gives an average total monthly costs for a private dial-up subscriber using 22 hours a month (excluding telephone line rental which is Birr 8 per month for residential lines and 17 Birr per month for business lines) at USD 69.3, which, despite the low local-call tariff, is amongst the highest in Africa due to the high subscription charge.

Import duties for PCs and IT related equipment are divided into two categories:

a) If PCs are imported for telecommunications-related and office activities, the import duties will be 5 per cent;

b) If PCs are imported for resale by any business, then the import duty will be 40 per cent.

Plans are currently being made by ETC to revise dial-up rates downwards, to introduce per-minute charging (instead of the flat rate regardless of number of hours used up to the maximum) and to reduce the number of tariff categories to two (merging C3 and C5). In addition it is anticipated that a prepaid option will be made available, most likely using the Rodopi platform (www.rodopi.com). This will also likely help address bill collection problems, which have resulted in a significant level of non-payments.

In 2001, ETC derived a total revenue of Birr 42'200'000 for data and Internet services, the bulk of which most likely comes from the Internet service as the data service has only

recently been launched. These revenues are forecast to grow by 45 per cent in 2002, to 61'200'000. While still only representing 0.5 per cent of ETC's total revenues in 2001, data and Internet revenue is the fastest growing component.

3.3   Regulatory status of Internet

In January 2002, a five-year licence was proposed by the regulatory agency, ETA, for ETC to operate an Internet service, for a licence fee of Birr 100'000, however, as with the other telecommunication licences, ETC has not yet signed. Some initial discussions have also taken place to issue private ISP licences, for which the same fee is envisaged, however currently there has still been no decision as to when these licences will be issued.

Some of the interesting features of the licence include:

•   The Licensee shall obtain approval in writing from the Agency to make substantive change to the Network or Network Architecture from the construction and physical description of the Network contained in the approved Licensee's proposal.

•   The Licensee shall take measures on its own and as and when directed by the Agency at its own cost to bar carriage of telephone and fax traffic over Internet by the subscribers.

•   The Licensee shall not transmit any message or communication, which infringes literary and artistic ownership in any form or inconsistent with the laws of the Federal Democratic Republic of Ethiopia.

•   Logins where the identity of logged-in user is not known should not be permitted.

Detailed rollout targets for the licence holder have also been defined which

require ETC to provide an additional 36'000 subscribers in areas outside Addis Abeba by 2005/2006. If the licensee fails to achieve the rollout target for the Internet, it must pay ETA a penalty of Birr 300 for each missed subscription in each year. Similarly, there are penalties for not meeting service level requirements.

Aside from a privacy policy forbidding disclosure of user details, EthioNet has also had an Acceptable Use Policy (AUP) from its inception, which includes the stipulation that anonymous transmissions are prohibited and that accounts are non-transferable or cannot be shared with third parties outside the same organization. This latter condition was considerably abused during the period in which no new accounts were being accepted, because the Global One technical implementation did not bar simultaneous use. Thus the same account was resold many times by some users.

3.4   Universal access

A study by the ETA of universal service needs and goals is currently under way. Much of the ETC's current strategy, as directed by government, is informed by traditional universal service objectives - i.e. to roll out voice services to every district (Warada) and ultimately to the smallest administrative unit, the Kebele (farmers' association). Basic voice services are seen as the primary concern to be addressed, rather than to use scarce resources for more limited demand for advanced services. This is also seen as a reason for ensuring that ETC retains a monopoly in all services so that the funds for rolling out services in rural areas are not syphoned off by foreign, cream-skimming competitors focusing on the more lucrative urban areas.

Currently, the only official government activity to promote public access to the Internet is the ETC cybercafés located in downtown Addis Abeba. More recently, the British Council has obtained permission to operate a cybercafé, as part of its library, on its premises in the city. The British Council has also assisted in the establishment of a multi-purpose community telecentre in Wolisso, a town 116 km from Addis Abeba, through a joint project with the ESTC and with funding from the British Embassy. The telecentre provides communities in Wolisso with Internet browsing and e-mail services including other communication facilities such as fax and telephone. As part of the same project, there is a plan to set up another two telecentres at Debre Berhan and in Tigray. More recently, the Agence de la Francophonie (OIF) has begun plans to open a cybercafés with 12 PCs in Addis Abeba which will offer access to French online materials for free.

Private cybercafés have so far been discouraged because of their contravention of the current telecommunication policy. This is exacerbated by ETC's concern that these are providing VoIP services and a number have been shut down. Nevertheless, there are dozens of cybercafés in Addis Abeba unofficially providing Internet browsing and e-mail services, including in major hotels and organizations such as the Hilton, and the Chamber of Commerce. Many of them offer a wide range of business services such as photocopying, printing, fax delivery, stationary and IT products.

Figure 8: Cybercafés in Addis Abeba

Source: CIA World Factbook 2001, http://www.cia.gov/cia/publications/factbook/.
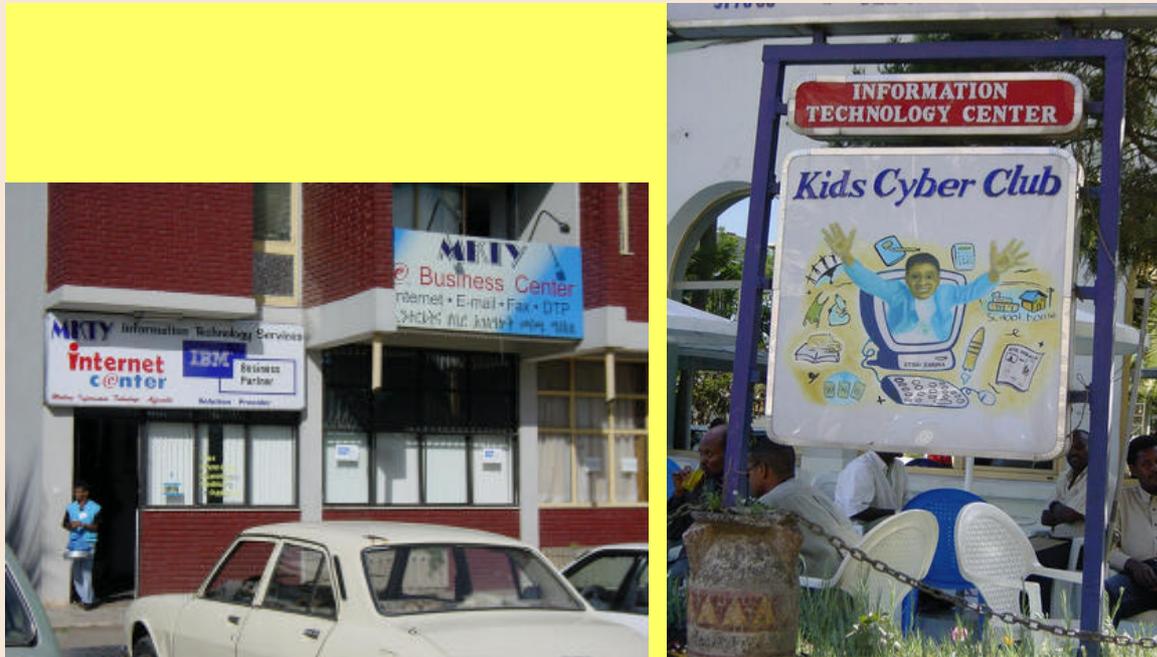
4. Information and communication technologies and the nation

Ethiopia has yet to promulgate any substantive high-level national ICT policies, although a National Information Policy is now being developed. In June 2001, the British Council hosted a conference on ICTs and development entitled "Ethiopia in the Knowledge Age", which brought together 350 key policy-makers in government, development agencies, academics, NGOs and the private sector. The event was supported by the Commonwealth Telecommunication Organization's Building Digital Opportunities programme and a variety of local institutions. The participants undertook a thorough review of the issues and a series of important recommendations emanated from the conference, including the need for a national ICT task force and this particular joint CTO/ITU case study. Further details of the recommendations can be found on the conference website.[1]

4.1 Education

With low levels of literacy and the limited number of school leavers (1999 rates of primary school enrollment are half the Sub-Saharan average), improving the educational system is a high priority for Government. In particular, the standard of English language instruction is low - there are 25 official languages of instruction (with three different scripts), which makes the use of ICTs problematic for many, as these scripts are not supported by standard software.

The basic education system has so far been virtually untouched by the Internet. Of the 12'000 primary schools, only 9 had Internet access at the end of 2001. Perhaps more surprisingly, only 10 of the 424 secondary schools had access. The Department of Education is in the process of undertaking the massive task of upgrading the skills of its 120'000 primary school teachers and 14'000 secondary teachers and is thus concentrating on various teacher training and capacity building initiatives. In early 2002, the Department of Education awarded a Birr 2.1 million tender to four local computer suppliers for the provision of 170 workstation computers, 4 servers, 9 laptops and related equipment under its Basic Education System Overhaul (BESO) project. The equipment, which is funded by USAID to support capacity building in teacher training and reforms of the primary education system, will be installed at the Teachers Training Institute (TTI) and the Teachers Training College (TTC). The Department is also planning to introduce ICT training in secondary schools.

The UNDP is planning a project to link 400 of the high schools to the Internet in a USD 6 million proposal. Discussion about the use of VSAT for the project have not borne fruit yet and it is expected that the project will start with the 30 per cent of the schools that have phone lines. The intention was to provide community access facilities to offset the operating costs for the schools, but this is currently constrained by the Telecommunications Act restrictions on resale of services. UNDP is also currently providing ICT capacity building for the Ministry of Education, to establish a LAN and WAN at the ministry headquarters and to carry out training.

The tertiary education system comprises 6 national universities and 3 polytechnics with a total of approximately 86'000 students, of which there were 113 IT graduates in 2001. Addis Abeba University (AAU) is the largest tertiary institution and is also host to one of the World Bank's African Virtual University (AVU)[2]

facilities which has proved popular among students who have shown willingness to pay up to USD 200 per course for access to the one-way video-conferencing service, which has an audio return-path for speaking to the lecturers. A variety of programming, computer literacy and computer hardware maintenance courses are taught via the facility. Connectivity is provided by VSAT and is one of the only telecom links operating independently of the ETC. Currently, AVU Ethiopia is hoping to win a bid for course content development for all of the AVU units in Africa. The AAU provides a degree and diploma programme in computer science and has changed its former department of Library Science to an Information Systems degree program. There are also a variety of private IT training colleges, of which Micro Link, CPU colleges, Ethilink and HelcoE are among the most well known.

The Ethiopian Science and Technology Commission (ESTC), which is hosted by AAU, provides support for ICTs and networking in the academic and research sectors via its National Computer and Information Centre. While the ESTC has sensitized most of the academic and research institutions (including those outside the capital) to be aware of the potential of electronic communications, the lack of available funds has been major limitation on usage when combined with the high cost of access to ETC's Internet service. To address this, ESTC has had a plan since mid-1996 to establish a full Internet hub—called AAUNet—on the Addis Abeba University campus which would form the nucleus of a phased expansion toward a national academic and research network linking the 6 universities and 18 national research centres.

A British NGO, Ethiopia Aid, has already installed a USD 1.2 million fibre optic backbone linking the 5 AAU campuses (the Black Lion Hospital, the Medical Faculty and the Veterinary school 40 kms away will be linked in the second phase). However, EthioNet has not been keen to supply the

Internet link because the other tertiary academic facilities are independent entities and this would imply resale of EthioNet's service by AAU. EthioNet has been unwilling to hand over the .edu.et domain to the University of Addis Abeba as it believes the domain should not be controlled by an interested party, but should be administered by an independent agency.

ESTC also has a number of other ICT-related programmes:

- To deliver education to workers via extension programmes and evening study, once ESTC's existing computer lab is expanded.

- To upgrade the skills of teachers in service during summer holidays. There is currently a print-based programme, but ESTC would like to use the TV network and the Internet to deliver distance education. Negotiations have taken place with the Educational Media Agency to produce interactive distance education materials, but the fees quoted for production of USD 1.2 million were deemed excessive, so ESTC is planning to set up its own multimedia lab at the University.

- To collaborate with ETC's distance education labs based around the country.

The School for Information Studies in Africa is also based at the University of Addis Abeba. It has established a research programme on African Information Society issues, and is also the national centre for the support of the UNESCO developed full-text database system, CDS/ISIS.[3]

The Institute of Ethiopian Studies is being assisted by the Faculty of Afro-American Studies (FAS) at Harvard University to establish the Ethiopian Art and Architecture Database Project. The Project plans to build a comprehensive photographic archive and database of Ethiopian art and

architecture. Developed in consultation with the Ethiopian Church, the Ministry of Culture, and other relevant authorities FAS is seeking to raise USD 1.3 million to cover the initial three-year phase.

4.2   Health

Health care is very underdeveloped in Ethiopia, which has one of the lowest health status indicators in the world. According to a report by the telemedicine working group, infant mortality is 105/1000, maternal mortality rates are between 560 and 850/100'000 and life expectancy is estimated to be between 47 and 54 years. Health services are only accessible to about 50 per cent of the population (due to bad or nonexistent roads it can take up to two weeks for someone to travel to the capital from a remote area) and most of the medical experts are concentrated in the major cities.[4]

The establishment of the HealthNet node in the early 1990s provided an initial impetus to the use of the Internet in the health sector, however because of the limited bandwidth and restriction of service to e-mail, this did not have widespread impact. There are a total of 110 hospitals in Ethiopia, of which only 38 had a dial-up Internet connection by end 2001 and no hospitals were using the Web for administrative purposes. Of the 311 pharmacies in the country, 8 had Internet access and none of the 4'818 health service clinics appear to be online.

A National Telemedicine Co-ordinating Committee has been set up as part of the ITU's telemedicine project in Ethiopia to support the development of a national telemedicine network, which aims to initially connect 10 outlying hospitals and the AAU Faculty of Medicine. Telemedicine equipment to facilitate remote diagnostics is to be installed at each hospital. ITU is planning to provide telemedicine software and digital cameras to each hospital, along with a central telemedicine workstation to the Faculty of Medicine. ETC has been supporting the project with the development of a design for the network, upgrading of telecom links where necessary and making 50 free hours per month of dial-up Internet access available to the hospitals involved in the project. The project was planned to begin in December 2000, however due to executive personnel changes in the health ministry, which have delayed final approval for the project, the initiative has not yet started.

4.3   E-commerce and trade

E-commerce and the use of the Internet in trade is at a very early stage of development in Ethiopia. E-commerce related laws and regulations such as privacy protection and digital signature have yet to be adopted, however, the draft Information Policy currently under consideration is expected to outline steps in this direction. There are no credit cards available in the country, or branches of any international commercial banks, which even makes it impossible for foreign visitors to obtain a credit card cash advance.[5] Automatic Teller Machines (ATMs) are also currently not widely in use, although the major state owned bank - the Commercial Bank of Ethiopia is about to run an 8 ATM pilot using Amharic customization. The Bank initially planned to introduce a credit card, then decided instead to develop a smart card service. Initial bids for the supply of the smart card were rejected due to lack of EMV compliance and a re-tender is expected next year.

The Commercial Bank, as well as the privately-owned Dashen Bank, have also begun networking their branches in Addis Abeba and plan to extend this to the region with the new DDN network in the coming months. Currently, the banks must use international direct dial to participate in SWIFT, CitiBank and Western Union financial transfers, and this is becoming a significant problem, as well as being costly. In other countries the airlines nework - SITA - is used, and although a SITA PoP exists in

Addis Abeba for use by the airlines, other agencies are not allowed to access it.

The Ethiopian Trade Point was established in October 1997 with assistance from UNCTAD to collect and disseminate trade information using ICTs to facilitate foreign trade procedures and to implement an electronic trading system, but because of the limitations described above, this has made little progress.[6] Similarly, these and other factors such as the war with Eritrea have contributed to the very limited amount of tourism in Ethiopia (particularly in view of the country's potential to attract tourists) and although there are some websites promoting tourism, these are small standalone sites created by private operators of tours and accommo-dation.[7]

Despite the barriers to e-commerce, one or two companies have adopted some innovative techniques to exploit the potential of the Internet for e-commerce.[8] The most well known of these is EthioLink's 'reverse e-commerce' service (EthioGift), which allows the Ethiopian Diaspora (many of which do have credit cards) to purchase items, including goats, for delivery to their friends and relatives living in Ethiopia.[9]

4.4 Government

In 2001 there were estimated to be about 349'650 civil servants in the Ethiopian Government, of which only 20 per cent have post-high school education. About 50'000 (14 per cent) had PCs and an estimated 2'200 had e-mail (based on 735 government EthioNet accounts each having 3 users).

Through the European Union Delegation, the International Parliamentary Union (IPU) has made considerable funds available to the Ethiopian Federal Parliament and the Federation Council for a project called Development and Upgrading of the Parliamentary Information System (DUPIS). The Birr 8.24 million contract has yet to be finalized following controversy over the award of the tender.

The Ethiopian Civil Service College has recently been supported by the World Bank's Global Development Learning Network (GDLN) to establish a sophisticated VSAT-based peer-to-peer videoconferencing and distance learning centre at its premises on the outskirts of Addis Abeba. The Civil Service College was set up in 1995 to provide training for civil servants, however the GDLN facility (which is part of a network of 29 centres around the world, including 6 others in Africa) is open to anyone. The two-way videoconferencing facility is housed in a classroom capable of taking up to 40 students and a variety of courses have been held for about 1'200 students so far, for which they pay about 25 per cent of their salary. The centre also houses 8 PCs on a network with a direct VSAT link to the Internet. The College operates without strongly promoting its capacity to the public or enhancing its services (for example by allowing students to connect directly from home instead of only from the university), because the College managers are somewhat unsure of their status with regard to ETC's monopoly on services.

4.5 NGOs and international organizations

The British Council and the Christian Relief and Development Association (CRDA) have recently established DEVINET to support the development of civil society through collating and publishing information on a website generated by NGOs and other development organizations in Ethiopia. DEVINET also aims to support NGOs in developing their own websites and to improve their use of Internet resources.[10]

The UN Economic Commission for Africa (UNECA) in Addis Abeba is the location of the headquarters of this organization, which has long supported electronic networking in the region through its Pan African Documentation and Information Service (PADIS) which has now been

subsumed under the new Department of Information Services and Documentation (DISD). DISD is now spearheading the African Information Society Initiative (AISI).[11] In the mid-1990s, PADIS managed a variety of development databases, a store and forward electronic mail host as part of the CABECA project. Last year, CISCO, the Internet equipment manufacturer, has worked with UNECA to establish a Network Training Academy which has already seen its first set of graduates. UNECA has a leased line to ETC as well as its own 1Mbps VSAT Internet connection directly linking it with New York.[12]

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[1] See: http://www.ethiopiaknowledge.org/.

[2] See: http://www.avu.org/.

[3] Contact: sisa.aau@telecom.net.et.

[4] Telemedicine in Ethiopia. ITU Project document prepared by Dr Leonid Androuchko.

[5] Dashen Bank claims to provide this service to visitors at its Sheraton branch, but the service appears to only be available to Sheraton residents for settling bills and Dashen must send the credit card slips out of the country to deposit them, as does the other international hotel - the Hilton.

[6] Melaku Legesse melaku.leg@telecom.net.et.

[7] A general tourism website was developed by a UNECA staffer at http://www.tourethio.com.

[8] A coffee promotion website is at www.cofeemocha.com.

[9] See: http://www.ethiolink.com/EthioGift - this example is often quoted by the president of the president of the World Bank in his presentations to underline innovative techniques for using the Internet.

[10] See: www.devinet.org, or devinfo@devinet.org.

[11] See: http://www.bellanet.org/partners/aisi.

[12] See: http://www.uneca.org.

5. Conclusions and recommendations

5.1 State of the Internet in Ethiopia

The Mosaic Group has developed a framework for characterizing the state of the Internet in a nation. They consider six dimensions, each of which has five ordinal values, ranging from zero (non-existent) to 4 (highly developed).

The dimensions are as follow:

- Pervasiveness: a measure based on users per capita and the degree to which non-technicians are using the Internet.

- Geographic dispersion: a measure of the concentration of the Internet within a nation, from none or a single city to nationwide availability.

- Sectoral absorption: a measure of the degree of utilization of the Internet in the education, commercial, health care and public sectors.

- Connectivity infrastructure: a measure based on international and intranational backbone bandwidth, exchange points, and last mile access methods.

- Organizational infrastructure: a measure based on the state of the ISP industry and market conditions.

- Sophistication of use: a measure characterizing usage from conventional to highly sophisticated and driving innovation.

Ethiopian values for these parameters are shown below (for the methodology see Annex 1).

5.1.1 Pervasiveness

Pervasiveness in Ethiopia is rated at 1, *experimental.* Even assuming an optimistic estimate of 60'000 Internet users out of a population of almost 55 million, the user rate is of only 0.092 per cent. The user

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Figure 9: State of the Internet in Ethiopia

Dimension	Value
Pervasiveness	1
Geographic Dispersion	1.5
Sectoral Absorption	0.5
Connectivity Infrastructure	1
Organizational Infrastructure	1
Sophistication of Use	1
TOTAL	**6**
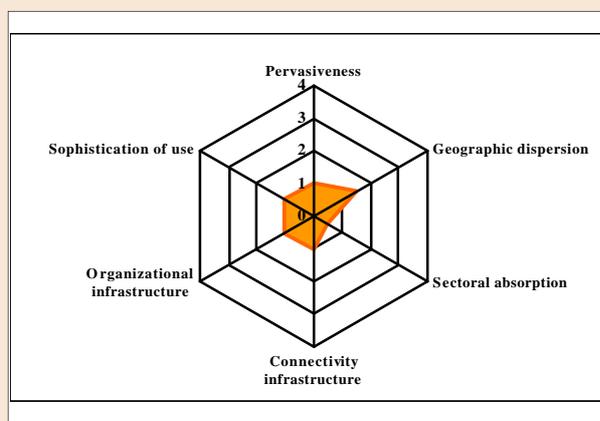
Source: ITU adapted from Mosaic Group methodology. Online at http://som.csudh.edu/fac/lpress/gdiff/quest.htm.

community does not only include network technicians, but it is also extended to a limited number of students, civil servants and private company users are, however, mainly concentrated in Addis Abeba, with only 6 per cent of users located outside the capital.

5.1.2 Geographic dispersion

Geographic dispersion is rated at 1.5, between *single location* and *moderately dispersed*. There are 8 towns outside the capital city with PoPs, and Internet access is available nationwide at the local call tariff. However, the small number of telephone lines and computers, particularly outside the capital, is a serious barrier to Internet diffusion.

5.1.3 Sectoral absorption

Sector absorption is rated at level 0.5, rare. The ranking is a function of the level of connectivity in government, education, health care and business. Ethiopian universities have Internet access, although the number of accounts is very limited, and there are no leased line connections. Primary and secondary schools are virtually untouched by the Internet, with only 9 out of 12'000 primary schools and 10 out of 424 high schools having access. A few government departments have rather simple websites and the usage by private companies is minimal. There were only 38 hospitals out of 110 with dial-up Internet connection in 2001, and Internet use is usually restricted to e-mails.

5.1.4 Connectivity infrastructure

Connectivity infrastructure is at level 1, *thin*. International Internet connectivity is 4 Mbit/s outgoing and 10Mbps incoming. There is no national Internet backbone, nor domestic Internet exchange point (actually not necessary with only one ISP). There are only about 10 Internet leased lines currently in place and broadband Internet access is not available.

5.1.5 Organizational infrastructure

The organizational infrastructure is at level 1, *single*. The Ethiopian Telecommunication Corporation is the sole Internet service provider, it is owned by the Government and has the complete monopoly on the Internet service provision market.

5.1.6 Sophistication of use

Sophistication of use is at level 1, minimal. Internet is used by a small part of the population, mainly for conventional applications, such as e-mail and web search. There are a few websites in the local language, and the development of new applications is not planned for the moment.

5.2 Sector liberalization strategy for Government

Aside from very low levels of economic development in Ethiopia, the diffusion of the Internet has also been constrained by the legal monopoly of ETC in all telecom-related services, along with the lack of policy clarity over the provisioning of value-added services such as web design, site hosting or cybercafés. The recent institution of a regulatory authority and the plan to study the partial privatization of ETC are important steps towards an open market, and will help the development of telecommunication-based services in Ethiopia. However the need for ETC to retain its monopoly in services should be carefully examined by the country's policy-makers.

The justification for continuing these monopolies is usually to ensure that sufficient income is generated to roll out infrastructure without it being syphoned off by competitors. Although this strategy may be logical, experience since the FCC's breakup of AT&T, has shown that the only way of ensuring efficiency of service delivery is to bring self-interest into play by opening the markets and using competition to do much of the regulating. This strategy also helps address the limited resources of all

government policy-makers and regulators worldwide (even the FCC), who do not have the capacity to keep up with the rapid technological change in order to fully enforce regulations.

Furthermore, a large and powerful regulatory apparatus is not as necessary in a country like Ethiopia as it is in some developed countries, for the reason that less developed countries do not generally have huge public incumbent telecommunication operators that need to be transferred into a competitive environment. Rather, new operators entering a competitive environment without a massive incumbent, should normally be able to self-regulate to a much greater extent.

Another major difference between developed, and developing, country monopolies is that developing countries are not encumbered with old technologies which are already being used by the majority of the population. Instead, new companies can make use of next-generation technologies which are usually cheaper, allowing much smaller companies to enter the marketplace. Today, even partial self-provisioning can occur - as demonstrated by the rapid growth of the Internet, WiFi and mobile telephony, this is now becoming a model that can be used more widely in the telecom sector.

In practical terms, while competition in the telecom sector may indeed result in some overlap and duplication of resources by the different competitors, the overall operation of the sector is more efficient than a single monopoly.

Thus, any initial privatization and liberalization of the telecom sector in this day and age should not simply be to shift a public monopoly to a private one, which can become even more difficult to control, especially if it has a large foreign partner to back it up. The record of foreign participation in Africa has generally shown that even the strategy of a limited exclusivity period (usually 5 years) for basic services in urban areas is nowadays

in question, and it may ultimately be more efficient to transition directly from a public monopoly to a multi-player competitive environment, with small areas of exclusivity (perhaps down to the Warada level) for rural locations.

In preparation for this, the Government might look to develop a transitionary strategy that does not directly affect the monopoly in ETC's core business (voice provision and wholesaling of the national backbone), as well as laying the groundwork for the next phase of competition. An immediate transitionary step would be to amend the telecommunication law to allow for resale of ETC's services. Examples are needed to show that liberalization could have beneficial effects on the market, and to bring improvements to the customers and to ETC. The licensing of new mobile operators, ISPs, cybercafés and call centres would all help provide this impetus and take the burden off ETC in providing the wide range of value-added services that are needed.

This will also help ETC to begin shifting its operational culture into a competitive mode, bring additional traffic to ETC, and more generally help to 'decentralize' telecommunication services, separating wholesale from retail operations, and leaving part of the marketing and customer-care activities to private companies operating in different zones and regions. The expected results of this in demonstrating that competitive forces will ensure cost-based pricing and higher service levels without the need for strong regulation would also help to address any concerns that an open market will fail to deliver quality and affordable services.

One of the major difficulties experienced by the regulatory authority, ETA, is its lack of financial autonomy, increasing its dependency on government for decision-making, and low salary levels, making it difficult to attract and retain skilled staff. By giving the opportunity to many small private companies to apply for licences to resell services,

ETA could provide itself with new sources of revenue, enabling it to pay higher salaries that would allow it to retain skilled staff and to increase its participating in international initiatives for regulators.

Given the urgent need to improve service delivery for the majority of the population, new strategies need to be developed rapidly by policy-makers and Government, with a view to setting a deadline for the opening up of the market and the timely announcement of this date.

5.3 National strategies and policies to increase Internet diffusion

There is clearly a growing political momentum for improving the use of ICTs in Ethiopia, however this is largely focused on the provision of voice facilities in rural areas. Five years after the BITE report, a national information policy has yet to be finalized and awareness of the importance of improving the accessibility and use of the Internet is still at a low level. While an understanding of the importance of ICTs is growing amongst the general population, this awareness needs to be raised to the highest political levels.

Experience around the world has shown that the rapid diffusion of ICTs in a country is often closely associated with the level of government support. In the case of Ethiopia, the expansion of Internet infrastructure and services could be significantly accelerated by means of a national programme supported at the highest level of government. For instance, a national task force could be established to support ICTs, headed by the Prime Minister and composed of national experts. Such a task force could serve as the focal point for the high-level coordination of a number of national initiatives.

Seminars intended for policy-makers and regulators might also be a useful method to provide hands-on experience of the benefits of a high-quality Internet connection with appropriate applications and information resources. More immediately, it has also been suggested that case studies such as the present one should be translated into Amharic to facilitate circulation among policy-makers and publication in the press. Also, leading NGOs, the Prime Minister's Office and specific ministries with strong role in government (such as the Ministry of Capacity Building and the Ministry of Information) might be targeted with information and recommendations such as those mentioned in this case study.

Certainly, development and international bodies could usefully further help to promote Government awareness of how the Internet and ICTs can support of national development, encouraging it to make Internet diffusion a top item on the policy agenda. In this respect, the Government has a crucial role to play in order to create a critical mass of users, local entrepreneurs and skilled ICT technicians.

As indicated above, the policies concerning the liberalization of the Ethiopian telecommunication industry will have the most profound impacts on the prospects for broadening access to the Internet and to ICTs in general. In a competitive market there are likely to be a variety of innovative new ideas and opportunities for providing affordable Internet services and value-added services in Ethiopia, as well as encouraging local businesses to exploit the much larger information economies of the developed countries (as the case study has shown, a few enterprising businesses are already beginning to do this). Some of the possible new market arrangements that could occur in a liberalized environment include:

- Universal service/access obligations for licence applicants, including broadband connection of public access points (e.g. telecentres, schools, libraries, etc.) to high capacity networks and services;

- Joint ventures between cybercafés/telecentres, the fixed and mobile line operators, and other investors such as e-commerce entrepreneurs to offer full-service ICT access, content, and business venture options to rural communities, as well as to 'telework' for developed countries;

- Specialized start-up companies, such as public payphone providers, ISPs, etc, establishing new points of access, with ETA s support (and in some cases subsidy);

- Opportunities to link these with rural community radio licences, such as through UNESCOs Community Multipurpose Centre (CMC) programme.

ETA s liberalization policy could be structured to encourage these kinds of activities, tapping the potential of the under-served markets of Ethiopia to create the incentives for those with ingenuity and vision to bring both economic development and greater social equality to Ethiopians.

Aside from liberalizing the sector this will primarily require government investment in education and training, along with taking measures to cut input costs and consumer prices by supporting the development of local capital markets and other forms of finance, reducing import duties and speeding business registration, licensing and import clearance procedures.

While the kinds of activity mentioned above are necessary, policies also need to be developed that facilitate the increased use of the Internet in various sectors, such as education, health, e-commerce, etc. (see below).

A framework for the periodic measurement and evaluation of progress could also be developed in association with these initiatives.

5.4 Ensuring low Internet access tariffs

The low local call tariff in Ethiopia could do much to help promote the use of the Internet but its benefits have been obscured by the high subscription charges for EthioNet, which are amongst the highest in Africa. These are expected to be revised downwards, but this is unlikely to be a sufficiently large reduction to be affordable to a significant number of Ethiopians.

There are a number of other strategies that could be considered to lower Internet access prices. One is to create a business model in which ISPs and the telecom operator share the local telephone usage charge and eliminate the ISP charge. This also simplifies billing. A related strategy would be to investigate a very low flat-rate or even a free option for Internet access as is the practice in Peru and Chile. Clearly, if the ISP sector is liberalized, then ISP licence fees will need to be low in order to encourage small startup companies to enter the market and to avoid the high fees simply being passed on to the consumer in the form of higher usage charges.

Prices for leased-line Internet access also need review. Use of the Internet and e-mail has increased the demand by many businesses customers for permanent circuits. The availability, quality, and especially price of these data services, has a direct impact on an increasing number of regular customers, as opposed to the few large corporations that traditionally had large budgets for the use of private-line and data services.

In addition, if the ISP sector is to be opened up, they must be able purchase high capacity links between their PoPs and in effect resell leased lines provided by the telecom operator to their customers. The price that is paid for these data circuits will directly affect the price that end users must pay for Internet services. This fact, and the general importance of data

communication in today's international economy, underscores the importance of competitive pricing for private-line and data services.

Consideration also needs to be given to allowing ISPs and customers to self-provision their Internet infrastructure (as is becoming increasingly popular in other African countries), full liberalization of KU-band VSAT and wireless for data in the 2.4GHz and 5GHz wavebands. This will greatly encourage investment by government and development assistance partners in linking public institutions to the Internet and ultimately build much greater demand for broadband and trunking infrastructure from the telecom operator. This would not affect ETC's primary revenue base of voice calls and trunking. However, frequency monitoring equipment should be obtained to ensure that links adhere to power standards and to monitor congestion.

5.5 Universalizing access

The majority of Ethiopians are unlikely to be able to afford a telephone line, individual Internet access or a personal computer to access the Internet. Although there are a some cybercafés in the country, they operate in a grey area, are located in the largest cities and are relatively expensive. Clarifying current policy and liberalizing the sector will likely result in a reduction of prices and an explosion of facilities offered by the private sector, as evidenced in many other African countries. To ensure that these facilities also reach public institutions and the rural areas, a policy promoting shared Internet access from public locations should also be developed. This would also have the benefit of providing users with facilities to access training of many types.

As a first step towards promoting shared access in rural areas and in the public sector, service providers could be required to provide services at cost for community access points such as schools and libraries. Another option would be to establish a universal service fund, using a small percentage of the licensed operators' turnover (or tax contributions) to fund unprofitable services in rural areas. In addition, it could be possible to encourage organizations with a large network of public offices such as banks or the post office to work together to provide Internet access.

5.6 Sectoral support strategies

5.6.1 E-commerce

With the global moves toward the use of e-commerce it is important that Ethiopia develop adequate e-commerce enabling policies which are synchronized with global trends and standards. Government leadership is needed to impart the use of e-commerce with authority, confidence and awareness. In particular it should:

• Accelerate the development of e-commerce relevant legislation. In particular, digital signatures and contracts, intellectual property, taxation, encryption, privacy, network security and computer crime, liability, and consumer protection;

• Support government-to-business projects such as electronic payment of taxes, customs duties, public procurement, etc.;

• Develop government-to-consumer applications such as in agricultural trading markets that are relevant to a significant part of Ethiopian society;

• Legitimize and consolidate the business and trade directories that currently exist for the country.

Coordination is needed to unify e-commerce initiatives taking place nationwide through establishment of a task force comprising government, development agencies, the private sector and civil society.

Awareness raising and education is needed for the public and the business

community of the potential of e-commerce and ICTs in general. The diffusion of successful e-business models, development of pilot projects, and a toolkit on how to set up an e-business will help to improve the prospects for e-commerce development in the country.

Support for electronic transactions in general needs to be urgently accelerated in Ethiopia before the benefits of e-commerce can be seen. This could be in through the introduction of GSM transactions, credit cards and prepaid/smart cards. This would include making the necessary legislative and institutional reforms to enable credit card payments over websites and could be developed through an alliance of private and public sector interests the use of e-commerce prepaid cards (a concept similar to the successful model used in cellular mobile services).

Small-scale services and products can often more adequately meet local needs, but are unable to attract capital because of the small sums required. Given the scarcity of venture capital available in Ethiopia for local small and medium size enterprises (SME) with e-commerce initiatives, the Government and local financial institutions should consider the possibility of establishing a fund for specific e-commerce initiatives.

Inefficient shipping/clearing and delivery of goods will undermine the competitiveness of many e-commerce initiatives (as it does for normal businesses). Given it is a landlocked territory with a very undeveloped transport infrastructure, Ethiopia probably suffers more than many other low-income nations from the transport barrier. One action to improve the situation could be to promote cooperation among e-commerce companies to achieve economies of scale in the delivery of their products. Furthermore, it is important to seek lower costs and increased efficiency among customs clearance, shipping and transport companies.

Local content development could benefit from support, through special tax and credit incentives for the development of local websites in economic sectors in which Ethiopia has competitive advantages, such as agriculture, tourism, etc. The production of local content and a national e-commerce sector could be enhanced by establishing incubators in different geographical areas with the adequate conditions and with the cooperation of research and development units of private sector, universities, and public institutions.

5.6.2 E-government

Government should lead by example through its use of ICTs to carry out its public service functions. Government as an active ICT user would simultaneously increase its own efficiency and demonstrate the gains that can be realized through new information and communication technology.

An e-government initiative could include establishing a well-developed government site. This would build on existing sites developed by various ministries by providing appropriate links and more consistency. The 'electronic parliament' project could also be part of this programme.

Some other areas in which the Ethiopian Government can pursue this leadership function are through:

a) The establishment of a transparent electronic procurement system available to all interested parties on the Internet;

b) The deployment of intranets and networked team practices aiming at the assimilation of modern work practices typical of networked learning organizations;

c) The use of the Internet in public services that depend heavily on information for policy making such as employment, transportation, and energy.

5.6.3 E-education

Education is a critical component for successful Internet adaptation and use. Ethiopia might want to consider some of the following strategies to enhance the performance of the country's education sector, and prepare its population for using the Internet:

a) Experience around the world has shown that progress in the area of ICTs will be limited if teachers are unaware of, or reluctant to accept, information technology as an educational tool. In Ethiopia, there is not yet a national programme to train teachers in the use of ICTs for education. Public and private institutions could establish a national programme to familiarize teachers at all educational levels with basic knowledge about the use and potential of ICTs.

b) Distance education has great potential for countries with limited resources and significant rural areas such as Ethiopia. There is a need to provide further support to projects like AAUnet, ESTC's distance education programmes and other national initiatives aimed at building knowledge and experience in the provision of education over the Internet.

c) Given the central role that technology plays in the generation of wealth today, ICT training and applications should ultimately be integrated into every stage of the educational process, at the levels of primary and secondary school, higher education, and vocational training, and become part of the national curriculum. While the provision of more basic resources for the educational system will need to take place first in a country like Ethiopia, the establishment of shared access centres for surrounding schools could be considered before allocating scarce

resources to connecting them directly to the Internet. The emergence of low cost WiFi and KU-band VSAT (USD 2'000 per terminal) for Internet access now makes providing connections in rural areas a more affordable possibility and strategies to capitalize on this should be developed. In addition, the planned introduction of GPRS on the GSM service could aid in the provision of access for mobile users and others in remote communities covered by the signal, provided that tariffs remain low for this service.

d) The cost of communication services is high for most school and university budgets. There is no formal requirement to provide low-cost communication access for the educational sector. The Government might usefully introduce mechanisms to promote the delivery of communication services at low cost to educational institutions nationwide. These could include special tax consideration for the operators, direct subsidies to schools in the startup period, and other schemes such as adopt-a-school programmes that could be promoted among international organizations and the Ethiopian diaspora.

e) Government, local private sector, and civil society organizations could seek the support of the international business community to fund programmes to provide technology tools (such as new and recycled computers, software applications, books and other instructional materials, etc) and state-of-the-art knowledge on technologies and applications.

f) Instilling a culture of information sharing should be an overarching part of many of these initiatives to address what many call the "highland culture" which is rather closed and not conducive to open information exchange.

5.6.4 E-health

The health sector in Ethiopia as in most other parts of the world lags behind other sectors in the country in adopting ICTs. Much of this slow pace is associated with a lack of awareness among the medical community of the cost/benefit that underlies the adoption of new technologies like the Internet. An existing proposed telemedicine project supported by ETC and ITU has not yet got off the ground, but measures such as this will clearly help to approve the awareness in this sector. This delay should be addressed, and other measures that could be considered include:

a) Develop an awareness campaign to highlight with precise data to the health sector, the cost and benefit relation if technologies like the Internet are adopted.

b) Support an annual conference on telemedicine in Ethiopia where experiences are presented and opportunities offered by new communication technologies are discussed.

c) Identify, at the international level, the institutions that are currently providing support (through soft, long-term loans, and philanthropic projects) for the advancement of e-health and telemedicine in developing nations and solicit their support for the implementation of specific pilot projects in the country.

d) Incorporate health-related functions, applications, and links to the Internet-connected telecentres that are being created throughout the country. Promote such opportunities among the local health community.

5.7 General operational strategies for ETC and ETA

On a financial basis, ETC only pays corporate tax to the Government but is still limited in its ability to increase expenditures on infrastructure deployment because it operates largely on the basis of cash-flow from revenue generation. ETC has not exploited the local (or international) capital markets for loans, which could be a ready source of finance for increasing the pace of rollout of the network. Fortunately access to hard currency appears not to be a problem, as it is in many other African countries.

Adopting regional type-approval of telecom equipment would reduce delays in adoption of new technologies and decrease the demands on limited resources within ETA.

To provide temporary access for visitors to Ethiopia and for EthioNet customers travelling abroad it is suggested that ETC consider joining one of the two major roaming service providers, IPASS (www.ipass.com) or GRIC (www.gric.com). These services operate by using the Radius protocols to authenticate users remotely and charging a small additional fee (usually about USD 6 per hour) which is billed back to the user's home system, allowing the providers of the roaming service to earn extra income from roving users. As there are many temporary diplomatic and international agency users visiting Ethiopia, EthioNet should be able to derive significant income from the service.

A web-based version of the public telephone directory should be required by the Telecom operator's licence and requested to ETC for the 2002 update.

5.8 Other observations

The extremely low tariff of the mobile service (up to 5 times lower than many other African GSM providers) would be worth further study and promotion as a case study. The advantages of not having to pay a high licence fee and excessive interconnect charges is clearly benefiting the consumer considerably, but this does not entirely explain why GSM operators in much more competitive environments in other countries are charging such high tariffs

Annex 1
Framework dimensions

Table 1: Pervasiveness of the Internet	
Level 0	*Non-existent*: The Internet does not exist in a viable form in this country. No computers with international IP connections are located within the country. There may be some Internet users in the country; however, they obtain a connection via an international telephone call to a foreign ISP.
Level 1	*Embryonic*: The ratio of users per capita is on the order of magnitude of less than one in a thousand (less than 0.1%).
Level 2	*Established*: The ratio of Internet users per capita is on the order of magnitude of at least one in a thousand (0.1% or greater).
Level 3	*Common*: The ratio of Internet users per capita is on the order of magnitude of at least one in a hundred (1% or greater).
Level 4	*Pervasive*: The Internet is pervasive. The ratio of Internet users per capita is on the order of magnitude of at least one in 10 (10% or greater).

Table 2: Geographic Dispersion of the Internet	
Level 0	*Non-existent*. The Internet does not exist in a viable form in this country. No computers with international IP connections are located within the country. A country may be using UUCP connections for email and USEnet.
Level 1	*Single location*: Internet points-of-presence are confined to one major population centre.
Level 2	*Moderately dispersed*: Internet points-of-presence are located in at least half of the first-tier political subdivisions of the country.
Level 3	*Highly dispersed*: Internet points-of-presence are located in at least three-quarters of the first-tier political subdivisions of the country.
Level 4	*Nationwide*: Internet points-of-presence are located in all first-tier political sub-divisions of the country. Rural dial-up access is publicly and commonly available and leased line connectivity is available.

Table 3a: Sectoral Use of the Internet			
Sector	**Rare**	**Moderate**	**Common**
Academic - primary and secondary schools, universities	>0-10% have leased-line Internet connectivity	10-90% have leased-line Internet connectivity	>90% have leased-line Internet connectivity
Commercial-businesses with > 100 employees	>0-10% have Internet servers	10-90% have Internet servers	>90% have Internet servers
Health-hospitals and clinics	>0-10% have leased-line Internet connectivity	10-90% have leased-line Internet connectivity	>90% have leased-line Internet connectivity
Public-top and second tier government entities	>0-10% have Internet servers	10-90% have Internet servers	>90% have Internet servers

Table 3b: The Sectoral Absorption of the Internet

Sectoral point total	Absorption dimension rating	
0	Level 0	*Non-existent*
1-4	Level 1	*Rare*
5-7	Level 2	*Moderate*
8-9	Level 3	*Common*
10-12	Level 4	*Widely used*

Table 4: Connectivity Infrastructure of the Internet

		Domestic backbone	International Links	Internet Exchanges	Access Methods
Level 0	*Non-existent*	None	None	None	None
Level 1	*Thin*	≤ 2 Mbps	≤ 128 Kbps	None	Modem
Level 2	*Expanded*	>2 – 200 Mbps	> 128 kbps -- 45 Mbps	1	Modem 64 Kbps leased lines
Level 3	*Broad*	>200 Mbps -- 100 Gbps	>45 Mbps -- 10 Gbps	More than 1; Bilateral or Open	Modem > 64 Kbps leased lines
Level 4	*Immense*	> 100 Gbps	> 10 Gbps	Many; Both Bilateral and Open	< 90% modem > 64 Kbps leased lines

Table 5: The Organizational Infrastructure of the Internet

Level 0	*None*: The Internet is not present in this country.
Level 1	*Single*: A single ISP has a monopoly in the Internet service provision market. This ISP is generally owned or significantly controlled by the government.
Level 2	*Controlled*: There are only a few ISPs because the market is closely controlled through high barriers to entry. All ISPs connect to the international Internet through a monopoly telecommunications service provider. The provision of domestic infrastructure is also a monopoly.
Level 3	*Competitive*: The Internet market is competitive and there are many ISPs due to low barriers to market entry. The provision of international links is a monopoly, but the provision of domestic infrastructure is open to competition, or vice versa.
Level 4	*Robust*: There is a rich service provision infrastructure. There are many ISPs and low barriers to market entry. International links and domestic infrastructure are open to competition. There are collaborative organizations and arrangements such as public exchanges, industry associations, and emergency response teams.

Table 6: The Sophistication of Use of the Internet	
Level 0	*None*: The Internet is not used, except by a very small fraction of the population that logs into foreign services.
Level 1	*Minimal*: The small user community struggles to employ the Internet in conventional, mainstream applications.
Level 2	*Conventional*: The user community changes established practices somewhat in response to or in order to accommodate the technology, but few established processes are changed dramatically. The Internet is used as a substitute or straight-forward enhancement for an existing process (e.g. e-mail vs. post). This is the first level at which we can say that the Internet has "taken hold" in a country.
Level 3	*Transforming*: The user community's use of the Internet results in new applications, or significant changes in existing processes and practices, although these innovations may not necessarily stretch the boundaries of the technology's capabilities. One strong indicator of business process re-engineeering to take advantage of the Internet, is that a significant number (over 5%) of Web sites, both government and business, are interactive.
Level 4	*Innovating*: The user community is discriminating and highly demanding. The user community is regularly applying, or seeking to apply the Internet in innovative ways that push the capabilities of the technology. The user community plays a significant role in driving the state-of-the-art and has a mutually beneficial and synergistic relationship with developers.

Annex 2
Meeting Schedule
11-15 March 2002

Monday 11 March	
Morning	Mr Seife Mulugeta, Head, Standard and Quality Control department, Ethiopian Telecommunication Agency (ETC) Ms Rosemary Arnott, British Council
Afternoon	Mr Mulat Agumas, General Manager, Ethiopian Telecommunication Agency (ETA) Mr Wossenyeleh Tigu, Head of Legal Services, ETA Mr Tilahun Kebede and Mr Ibrahim Sanou, ITU Regional office for Eastern Africa.
Tuesday 12 March	
Morning	Mr Fanta Adane, Internet Services Division Manager, ETC Mr Moges Teferra, Deputy General Manager, Telecom Services Department, ETC Mr Adaga, ex-Deputy division Manager for Telemedicine and Manager IT and New Services, ETC
Afternoon	Mr Asmare Abate, Telecommunication General Manager, ETC Mr Abdul Semed, Marketing Division Manager (Tariffs), ETC
Wednesday 13 March	
Morning	Ministry of Infrastructures Mr Amre Almayehu, Director Mobile Services Department, ETC Prof. Habtamu, Head of African Virtual University, and Dean of continuing and distance Education division, University of Addis Abeba.
Afternoon	Mr Eshetu Fantaye, Practice Director, Africa, and Mr Jon Jones, Practice Director, Transnational Computer Technology (TCT) Mr Robel Dressa, Multimedia division, ETC
Thursday 14 March	
Morning	Mr Eshetu Alemu, Director National computer and information center, Ethiopian Science and technology commission (ESTC) Mr Haileyesus Mezgebu, Head IT Department, Commercial Bank of Ethiopia
Afternoon	Mr Dawit Bekele, Professor, Addis Abeba University, Director Manager of Ethiolink Mr Berhanu Seboka, Manager, Global Development Learning Network Center, Ethiopian Civil Service College. Visit to the college's Global Distance Learning Center
Friday 15 March	
Morning	Mr Abi Woldemeskel, General Manager, Ethiopian Investment Authority Mr Solomon Mammo, Manager, IT Department, Dashen Bank Mr Sirak Yohannes, Information and Communication Technology Manager, UNDP
Afternoon	Debriefing