

# Electronic Networking and Regional Development: the Eastern African Experience

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## Abstract

*Africa's problems are broad and diverse. They range from illiteracy to malnutrition, from poverty to malnourishment. To many, disease and underdevelopment are synonymous to Africa. Yet Africa has got some of the world's richest resources - natural or otherwise. Today, perhaps information is the most vital of them all. In this paper, we contend that electronic information networks can save the continent from this state of misery. Electronic communication as a vehicle for sustainable regional development holds unfolding opportunities for all key areas of an economy - from agriculture to mining, from health to education, from transport to regional cooperation. Experiences from the Eastern African region are presented.*

**Keywords:** *Networking, Regional Development, and Co-operation.*

## 1. Introduction

When Kwame Nkuruma and other patriots of the time talked of Pan-Africanism, the time was probably not ripe for it, despite the idea's nobility. Africa had all the basic problems - and still has - to contend with. Africa's vastness was compounded with difficulties in communications, which severely limited interaction between Africans, especially those in distant countries. Telephone systems are undependable and expensive, postal systems slow and unreliable, and airfares unaffordable to many an African worker or researcher. Yet cross-border communication is vital to the nourishment of regional research and development. It is now a widely accepted fact that research is a prerequisite to "development". Perhaps more importantly, significant R&D can only thrive if good, inexpensive communication systems exist. And so can industry.

Electronic communication offers unfolding opportunities as an inexpensive way to facilitate inter- (as well as intra-) country communication within Africa, and with the outside world. In particular, industrial development (and socio-economic development, in general) can significantly be boosted if electronic mail (email) was widely available and effectively used. In our own experiences, we can vividly recall at least three instances when email has achieved what could not have been achieved any other way. During the early days of HealthNet[1], a day came when a renal patient was in critical condition, but the renal team of doctors could only proceed with effective medication if further information, which could only be obtained from a journal, was available. No copy of the journal could be found locally (in Kenya), and the only speedy way to get one was to send an electronic SOS to the US. A brief was sent via email and within 6 hours, a copy of the article was with the doctors. A second experience involved a network of Kenyan expertise (KCI-NET, described later below); one of KCI-NET's activities is to offer "free" consultancy services to non-commercial organizations in the Eastern African region. Kenya Marine Fisheries Research Institute (KMFRI) wished to purchase networking equipment, and KCI-NET was approached to help prepare

a detailed proposal. Within three days, more than 300 technical messages had been exchanged, upon which a decision could be taken on what equipment to procure - without vendor bias, in short time, and at no cost.

A final example occurred during a networking workshop co-organized by the American Academy for the Advancement of Sciences (AAAS) and the African Academy of Sciences (AAS) to bring together key people involved in electronic networking initiatives in the region, and the donor community, government and telecom authority representatives. It came to light that Makerere University (Uganda) which had been successfully running email for a number of months would have to withdraw the service due to the exponentially increasing high cost of telephone bills caused as a result of a low-speed modem. The author put a challenge to those present from the donor community to come to Makerere's aid. The same evening, a plea was put on KCI-NET. The next morning on his way to the conference site, he found in his email box a message from Telebit Corporation, USA, reading in part "... give us the address for Makerere, the modem is on the way .....". All this while, the donor community representatives were still figuring out how to help. The power of email could not have been demonstrated any better!

In the next section, we highlight some of the specific ways in which email can significantly contribute to regional development. Section 3 outlines some of the requirements for email to be successfully introduced, and cites some of the impediments to its growth in Africa. In Section 4, we present the current status of email in Eastern Africa, and reflect on other regions of the continent and the developing world elsewhere. Section 5 discusses some efforts that have been largely responsible for network growth in Eastern Africa, and makes suggestions on how similar efforts could be emulated in order for email to become widely available in the continent. Some conclusions are drawn in Section 6.

## **2. Email as a Vehicle for Regional Development**

In this article, "development" is conceived to be an ameliorative change that entails maintaining and improving basic amenities such as:- infrastructure including communications (computer networks being part of it), healthcare, educational services, socio-cultural activities, financial services, business support services (eg. market information services and subcontractors' database), technological advancement, agriculture and agribusiness, environmental protection, and in general, a continually improving and sustainable standard of living. In the context of "regional" development, it is conceived that countries with common borders share so much that it is only through regional co-operation that meaningful development can be realized. In particular, networking helps to blur these artificial boundaries, and facilitate the exchange of information about commodities and services.

### **2.1. Information versus Networks - General**

Being an invisible commodity, it is not usually easy to tag a

price to "information" in conventional economic terms. Yet it is becoming increasingly clearer (especially in the developed world) that information (like "knowledge") is power. Yet the most cost-effective way to acquire both is via electronic networking[2]. Apart from productivity improvement, there are instances when there is no other practical way to tackle a problem; a case in mind is the health-related SOS scenario reported in Section 1. Other ways in which networking can propel sustainable development include:

- Assisting people with specific problems to obtain help from experts on a network (much like the KCI-NET pool of expertise described below).
- Offering participating government planners direct access to people in the field and providing an effective mechanism to collect data from the field (eg. on small-scale enterprise management) and to disseminate policy, administrative and research information from government agencies to the grassroots.
- Providing a forum for Special Interest Groups to share ideas and formulate solutions to developmental problems.
- Facilitating on-line access to databases or data files on such areas as trade (buyers and sellers) and other specialised information which could be made available to urban-based industries as well as rural communities.
- Providing an avenue for distance learning with potential for continuing education for those in full-time employment, housewives, rural-based professionals such as teachers and generally all those with limited access to resources and time.

The list is non-exhaustive. Productive ways in which networks can be used can broadly be classified in terms of user-group: industry, government, and home user[3]. In what follows, specific applications are identified, and in each case an outstanding example is explored in some detail.

## **2.2. Networks in Business and Industry**

Networks can greatly increase efficiency and productivity in manufacturing and product development, business transaction and trade, research and development, and through office automation. Consider an ideal office or firm with each employee equipped with a powerful personal computer (PC) connected through a local server (and local area network, LAN) to other LANs and databases. Productivity and throughput is easily enhanced through efficient i) collection and sharing of data and information, ii) communication and messaging via electronic mail and other means, and iii) co-operative work through groupware. With the emergence of multimedia and video- conferencing facilities, productivity can be improved even further. In the case of a manufacturing process, information- on-demand or product inventories at any point can be availed on a real-time basis, facilitating decision making and production planning. For illustration purposes, two

business transaction scenarios are presented.

### Trade and Business Transaction

Scenario I: Suppose I want to export tea to Russia, who would I contact in Russia? What's the procedure for exporting tea? Who are potential competitors? Etc. In many cases, such information can take quite a while to find. Suppose there was an up-to-date database of tea agents maintained by an agency within the country reachable by e-mail. All one would need to do is consult the appropriate database, obtain phone/fax numbers and send out an inquiry and get responses possibly within hours. The kind of agency being referred to could be a commercial or an almost-free public service. The bottom line is that a useful repository of valuable information will have been compiled into searchable databases and that businessmen can post queries via e-mail. The advantage of e-mail is that it does not require people to answer telephones or entertain a constant stream of visitors. Indeed such an agency could be situated where rents are inexpensive because a central location is not essential; the electronic medium's ubiquity gives it centrality. The view at this point is that computers and networking require that we change some of our ways of doing things in order to maximize the benefits - speed and cost effectiveness.

Scenario II: I want to start a subcontracting business manufacturing furniture parts for a Japanese company. Can I have a list of Japanese firms that import furniture parts? This may be a request too specific for a general trade information agency's database to assist, but through a network it is easy to identify people who can get this information (for a fee, perhaps). It is assumed that we have a service (similar to CompuServe - a commercial global network) to which a majority of professionals and consultants subscribe. The net would serve as a medium to access this pool of expertise.

Of course the potential for a "buyers and sellers" database goes further. The database would, for instance, contain details about all participating sellers of any given product and all the prospective buyers. If a producer has a product, say avocados, s/he would consult the database and find out who wants avocados and accordingly make contact - possibly electronically. Indeed, this kind of arrangement is already in use. The International Trade Centre in Geneva, for example, operates one such global system for horticulture. Networks seem an attractive way to stimulate intra-African trade.

It is noteworthy that apart from being a vehicle for economic development, telematics is itself big business. In Japan, for example, the two major industries - Automobiles and Finance & Insurance contributed 4.6% and 3.6% of the market share respectively in 1990; in 2000, information and communication is expected to be the largest with a market share of 5-6% of the 61-70 trillion Yen (US\$ 700 billion[3]). Today, the global telematics industry alone (excluding information and traditional data processing services) is already a US\$300 billion biz[4]. Although Africa's share is currently marginal, it cannot afford to lie by.

### 2.3. Networks and the Public Service

Apart from essential services provided to society by governments, the government tends to be itself a major consumer of information and the technology (IT). In countries like Britain and Turkey, the public service is believed to be the single most major consumer of IT. Promotion of networks in the public sector will contribute directly and significantly to improvement in efficiency, effectiveness, transparency and accountability. Among the sectors to benefit most from a networked public sector are medical and social services, education, agriculture and mining, tourism, transport, research and development, public administration, and libraries and other information services. In parts of the world where networks are fast becoming a common feature, remarkable improvements are already being felt. And such developments have not spared the developing world either, except perhaps for Africa. Indeed, it is amazing that in a national draft Policy Document[3], in an effort to strengthen justification for introduction of advanced networks in Japan, the seriousness already shown in the Americas, Europe and South East Asia are cited; yet there is no mention whatsoever about Africa, as if the continent never existed.

Being so critical to humanity, we discuss the use of networking in healthcare further.

#### Networking and Healthcare

As "health networks" evolve and welfare services at home using networks become widely available, a vibrant social structure will emerge, allowing participation (directly or otherwise) of rural folk as well as their urban counterparts[5] in policy formulation and decision-making. In terms of health care, it is a fact that timely processing and transportation of information is crucial for the provision and management of the health service - a feature reminiscent of a "good" health system. Today's health care requirements in the developed world, for example, cannot be met any other way except through "health networks".

Practical examples of such information include: epidemiological survey results and health statistics; distribution of health facilities and drugs; availability of medical personnel, their numbers, categories, qualifications, where deployed, etc; health-related literature - health informatics scientific papers, local and international journals, article titles or abstracts, conference and symposia proceedings, survey reports, etc; inventory of research activities, results and funding sources and levels; and so on. The nature and type of communication methods used for the synthesis, publication and dissemination of such information will directly reflect on the overall quality of service provided. A simple, inexpensive electronic network can greatly facilitate exchange of health information among health managers, planners, policy and decision makers, researchers and other health workers.

The potential uses of a network like the proposed "AfyaNet"[6] ("Afya" in Swahili means "Health", and "Good Health" in Arabic) include:

- Disease and/or epidemic outbreak notification
- Routine reporting by hospitals and other health facilities
- Timely dispatch of patient records to referral hospitals
- Electronic broadcast of SoS, eg. during blood or drugs appeal
- Wide dissemination and publication of research findings, especially among decision and policy makers, planners, managers, and scientists
- Delivery of memos, holding of on-line conferences, and participation on bulletin-boards (BBSs), augmenting and helping to reduce the number of physical meetings
- Facilitation of easy forwarding of data to Headquarters for critical analysis, thereby ensuring quality control
- Source of technology transfer (eg. by "broadcasting" technical questions to subscribers in the more technologically developed parts of the world)
- Elicitation of regional and local collaborative research initiatives.

The potential benefits of such a network will include:

- timely publication and dissemination of accurate and current data and information,
- increased communication and informational exchange at a significantly reduced cost,
- increased options of data transmission,
- facilitation of interconnected, distributed databases permitting on-line querying (to authorized users),
- permitting controlled access to external users, and
- permitting sharing of resources like printers, storage, expertise, etc.

What is encouraging is that such benefits are already being accrued in areas where networks have been introduced, including certain parts of Africa. With advances in multi-media technologies, it is only a matter of time before "tele-medicine" (ie. intricate surgical operation electronically executed from a remote site) becomes a reality in the developed world. And yet in several parts of Africa, even a humble beginning is yet to trigger off!

## 2.4. Networks at Home

With PCs becoming a common feature in most homes in the developed world, home-based computing and teleworking is expected to tremendously increase over the next few years. Some of the major uses of home-based networks are: home shopping, ticketing and security, entertainment, distance education, popular participation in decision making, ready access to personalized "yellow pages" and teleworking.

## Teleworking and Participatory Development

In this section, we have looked at instances in which electronic networks can be used to boost development. In public administration, for example, it can help in decentralized planning and administration, paving way for popular participation in planning and decision making. Indeed, at governmental level, networks can be more so particularly useful in participatory

decision making insofar as donor and international agencies too (many of which are accessible electronically) can readily contribute. Apart from allowing participatory development, networks create ready access to technologies (including networking), and in business terms, access to new (global) markets. Access to information resources may include on-demand access to worldwide databases on agriculture, industry, education, etc - as well as "live", interactive access to pools of expertise. Telematics can greatly help improve access and productivity of information processing and distribution, to an extent that is only limited to a user's creativity and imagination. Perhaps less visible is the immense reduction of paperwork (and an alternative to physical transportation), thus cutting down on costs.

Having seen that networking itself can be big business, it is to be remembered that in introducing networks in a large-scale, tremendous employment opportunities will emerge. However, it may be argued that computers and phones (and by extension, networks) are limited to the minority urban elites who will use them simply to widen the gap between them and their rural counterparts. The truth, however, is that progress amidst the urban folk is easily - directly or otherwise - trickled down to the grassroots. In direct terms, gains can be in terms of repatriation from "sons and daughters" in gainful employment, who in many cases happen to be the bread winners. Indirect benefits are accruable when one considers that the technology itself can be used by administration to better the lives of the rural folk. Planning and administration of villages, towns (including water, sewerage, lighting, etc) is greatly facilitated via IT and networks. Think of a case, for example, where a local health dispensary uses immunization teams or drugs databases in planning and administration, thereby minimizing waste and increasing productivity.

A real-life experience may help to demonstrate. The cost to immunize a child in India is estimated at US\$ 15 per child. The high drop-out rate due to poor follow-up and lack of facilities to track the target population in a study led to an estimated increase to \$54. Using the same manpower, but now supported by an integrated information system reduced the cost to \$32 per child immunized in a very remote area of Rajasthan (India) [7]. The bottom line is the fact that information helps to plan and work better, and access to such information is greatly enhanced through networks. Is it any wonder that much of the information reported in this article was obtained through a network?

It is a fact that developing countries tend to spend scarce resources with least planning and control; what does that result in? If Information helps us to plan and work better - then the investment must be made. Caution must be borne, however, that a tool is only as good as we make of it. An enabling environment must evolve. Competent manpower must be produced. But above all else, our attitudes to information and its dissemination and use must first change.

### 3. Email Requirements and Drawbacks

In [5], the key requirements for email are summarized in their order of priority as: infrastructure, championship and motivation, management support, enabling governmental policy, availability of expertise, good planning and management, maintainability and sustainability, equipment and software (preferably mainstream), and existence of a critical mass of users. We re-emphasize that non-availability of funds which is usually claimed as the main drawback to most projects in Africa is only secondary here. Indeed, many African countries have reasonable telecommunication infrastructures, and custom-tailored software exist for such poor lines, anyway. Apart from telephone or similar links, a low-end personal computer and an inexpensive modem (US\$20-800) are the only other facilities normally required. Nevertheless, the real key requirement for email to take off in any place is motivation and championship. There must be a group or individual who fully comprehends the opportunities of email, and has unparalleled commitment to making email work. All other requirements will in most cases follow naturally.

Email itself has its drawbacks, like any other technology. People get enclaved to their machines, for example. Yet others see this characteristic as a strength! Everybody wants to communicate, and sometimes with intimate friends. Email is an effective way to promote computer literacy, especially in Africa where much of other computer-related work is easily delegated to subordinates. Other drawbacks to email have been summarized in [5] as: abuse, difficulty to assure security, confidentiality and anonymity, and a lack of "physical" inter-personal contact. Despite its ubiquity, a number of factors continue to impede email development and growth in Africa. These include: little sensitization, limited resources and lack of adequate funding, and failure to plan for sustainability. Our own experience shows that although many people (particularly from the developed world) may find these two reasons unusual, over-sensitivity and opportunism [8] are equally significant factors hindering email growth in the continent.

### 4. Status of Electronic Networking in Eastern Africa

For purposes of this article, we shall assume Eastern Africa spans the following countries: Burundi, Comoros, Djibouti, Ethiopia, Kenya, Mauritius, Mozambique, Rwanda, Seychelles, Somalia, Sudan, Tanzania and Uganda. In this Section, we give an overview of the current status of email in the region, highlighting supported protocols and emerging trends. A summary of the general telecommunication status is also given.

#### 4.1. Status of Email

By African standards, the Eastern African region is reasonably well endowed with email systems, and the future of email services in the region looks bright. A number of initiatives that have largely been responsible for the email development in the region are summarized in Table 1. Some of them have been operational for a number of years; others are still in their planning stages. By and large, email is still in its infancy, and no clear policies



a number of years; others are still in their planning stages. By and large, email is still in its infancy, and no clear policies seem to have evolved in any country regarding the large-scale development and utilization of email. At present, Kenya seems to be at the forefront of email activity in the region - and perhaps within the entire Sub-Saharan Africa - boasting at least 5 independent and diverse service providers, about 500 email users/user organizations, and a daily (non-commercial) volume traffic of about 1 MB.

Project Country	RINAF	RECO SCIX	Health Net	KCI-NET	NGONET	ESANET	PADIS Net	AFRI NET	RIO
Burundi	*								
Comoros	*								
Djibouti	X		X						
Ethiopia	*	X		X			X		
Kenya	X	X	X	X	X	X	X	X	X
Mauritius	*	X							X
Mozamb.	X	X	X		X				
Rwanda	*								
Seychelles	X	X							X
Somalia	*	X		X					
Sudan	*		X	X					
Tanzania	X	X	X	X	X	X		*	
Uganda	X		X	X	X	X		*	
# Countries	13	7	6	6	4	3	3	3	3

LEGEND X Existing \* Proposed

**Table 1: A Summary of Networking Initiatives in the Eastern Africa Region (Adapted from [12])**

There is also much email activity in Uganda and Ethiopia (each already with about 100-200 users [9]), the latter perhaps because of the UN's Economic Community for Africa (ECA's) PADIS initiative. Interestingly, much of the email growth in Kenya and Uganda (and elsewhere in the region) is squarely attributable to individual hobbyists and enthusiasts. There is also some email activity in Tanzania and, more recently, Mozambique, Djibouti, Mauritius, and Seychelles. Being probably the world's poorest country, that email can thrive in Mozambique is not only surprising, but is also a positive sign. Despite being poverty-stricken, Africa can still have some hope in low-cost networking, as has been demonstrated in Mozambique. It is unfortunate, then, that some countries in Eastern Africa still do not have email service.

A project that seems pitted to introduce and popularize email in the region widely is RINAF[10,11], funded by UNESCO, and with the objective to promote networking between academic and research institutions in Africa. RINAF, despite being in infancy, has already embarked on a number of training and sensitization programmes, and is in the process of activating nodes in seven countries in the region. Two twin projects that have been responsible for much of the on-the-ground networks are ESANET and HealthNet[1]. ESANET is funded by IDRC, while HealthNet is funded by SatelLife, with partial support from IDRC, among others. The three main East African universities - Nairobi, Makerere and Dar-es-Salaam - are participants in the ESANET project. There is a tendency that a HealthNet groundstation is found next to an ESANET node. Perhaps of all other networking efforts described in this article, HealthNet is unique in the technology it adopts - of low-orbit satellite communication. The rest rely on terrestrial telephony.

A unique initiative that has also been instrumental in promoting networking in the region is KCI-NET, presented in more detail below. KCI-NET is unique in that it operates with little or no budget, and reflects an emerging tradition of extensive human resource volunteers on the global electronic network. Apart from providing voluntary technical support, KCI-NET has also been actively involved in soliciting for donations of new and refurbished computing and communications equipment for use in non-commercial institutions in Eastern Africa. KCI-NET has worked closely with the other projects aforementioned, and also with NGONET and RECOSCIX. The former is a network of NGO's working on environment and development, while the latter is a network of marine scientists in the West Indian Ocean region. Both are discussed in [12,13].

There are also a host of other existing or proposed initiatives. Although the French-supported RIO-ORSTOM project has in the past concentrated on West Africa, it has recently moved into Eastern Africa as well, initially having sites in Kenya, Mauritius, and Seychelles. Besides, the proposed Commonwealth funded GOVERNET, and the Africa Regional Centre for Computing (ARCC's) African Academic and Research Network Foundation (AARNEF) seem poised to have a major impact on networking in the region. At present, however, the state of email in Eastern Africa (and Africa) is still marginal, even by developing countries standards. Latin America and South East Asia, in contrast, seem to have adopted the electronic culture, and electronic networks are mushrooming at an enviable pace. This seems to already have had a very positive impact on the overall development of the two regions, as recent events reveal. It is probably time that a leaf was borrowed.

#### **4.2. Email Protocols found in Eastern Africa**

Like elsewhere in the developing world, only low-cost networking options can be sustained in Eastern Africa. Such options take cognizance of the poor quality, yet expensive telephone infrastructures found in the continent. Fido[14] and UUCP[15] are the two most widely used entry-level technologies. Apart from Mozambique and Kenya (and more recently, Mauritius and

Seychelles), the other countries in the region seem to have adopted a purely DOS-based Fido path. Even in Kenya, although UUCP is operated by a few organizations, Fido is the mainstream technology. Mozambique, by contrast, adopted UUCP from the very start and is not known to operate any Fido nodes. Apart from the telephone-based protocols, the low-orbit satellite run by HealthNet are also becoming common. However, the "last-mile" problem must still be resolved through a telephone-based interface. Experimental interfaces between the ground stations and Fido have been reported. The cost of a station and governmental control cannot allow each institution to run its own ground station. Hence what is found more often is a ground station, which also supports Fido, centrally placed and linked by phone to sub-nodes (hubs) or end points. In many cases, two alternative outlets from a country exist - one via the satellite and another through the normal public telephones. Such a feature is usually desirable for reliable communication.

Whether to adopt UUCP or Fido is an issue as old as networking itself. Each has its pros and cons. Fido, for example, being DOS-based is readily supported with existing expertise. UUCP, which is Unix-based, may require specialized Unix skills that may not be readily available in the region. However, Unix is fast gaining ground, and seems set to be the operating environment of the future, especially for the academic and research communities. But the fact that to run Unix requires a reasonably powerful computer may be a handicap. PC-based UUCP versions (eg. uuPC) are appearing, but their capabilities are still way below those of Fido. They, for example, may not have optimal performance on poor lines, may have limited features (eg. no bulletin-board facilities), etc. Nevertheless, UUCP offers a straightforward Internet migration path. Given services offered by the Internet (including on-line library search, real-time "chat", large file transfers, and remote login), it is the "ultimate" network. It is unfortunate that there is no direct Internet access from Eastern Africa - indeed none in Africa apart from Egypt, Tunisia and South Africa. Fortunately, gateways exist to allow communication across different platforms, eg. between FidoNet and Internet, and FidoNet and UUCP. Given the experience already gained and the user communities already created in certain countries, it is time that an Internet node was developed in the region. With the somewhat favourable telephone charging structures (especially within the Preferential Trade Area, PTA), other countries can use normal dial-up to access the regional Internet node.

#### **4.3. Status of Telecommunication Services**

The general quality of the telephone service in the region is dismal. Firstly, phones are not widely available. Secondly, the lines are unreliable, and traffic charges (especially international traffic) quite high. Thirdly, international direct dialing (IDD) is available only in a few countries. Fourthly, dedicated packet data switching networks are almost non-existent, except in 2-3 countries. Finally, regulations on connection of private circuits on the public networks tend to be harsh. In general, the local Telecom Authority (PTT) will insist on type approval for modems, and charge quite exorbitantly for so doing.

The unwritten policy is one of discouraging communication and data transfer. It is high time that factual figures of benefits accruable from free informational flow, in particular scientific and technological data, were made available to PTTs and policy makers.

Service Country	Overall Quality	Overall Cost	Call to Nairobi	Call to Addis	Ave. Call Overseas	IDD	PSDN	Mod- em Rest- riction
Comoros	Fair	Fair	10	10	8	NO	NO	N/A
Ethiopia	Fair	Fair	1.5	-	4.5	NO	NO	YES
Kenya	Good	Fair	-	3	4.5	YES	YES	YES
Mauritius	Good	Low	1.2	1.2	2	YES	YES	YES
Seychelles	Fair	Fair	2.5	3	4.5	NO	SEMI	MINI- MAL
Sudan	Fair	Fair	3.5	3.5	5	YES	N/A	YES
Tanzania	Fair	Fair	Local	6.5	8.5	EXPE- CTED	NO	YES
Uganda	Fair	Fair	Local	2	4.5	EXPE- CTED	NO	YES

**LEGEND**

N/A - Information not available  
Rates in US\$

**Table 2: A Summary of Telecom Services in the Eastern African Region (Adapted from [17])**

Table 2 summarizes some of the attributes of the telecommunication service provided in certain countries of the region. Data for other countries was unavailable, but it is suspected that the trend would be very much the same. It must be emphasized that this information is dated (1991-2), and could have much changed. But again, the general picture can still be reliably inferred. Broadly speaking, Ethiopia, Kenya and Mauritius seem to have reasonably good infrastructures. The latter two even boasts public data switching networks (PSDNs). Besides, for some reason phone tariffs between various capital cities and Nairobi (or Addis Ababa) tend to be low. Moreover, for those countries without automatic international dialing capability, calls could be initiated from the "regional node". Given the already existing email infrastructures and expertise, and that most of the networking initiatives cited earlier have selected Nairobi to be the regional (and continental, in some cases) focal point, it would make sense that means be explored to start an Internet node in Nairobi. A regenerative method can then be used to introduce and popularize the service in other countries as well. In the next Section, we discuss an initiative by Eastern African researchers - based locally or abroad - to promote networking in the region. KCI-NET seems to hold much hope.

Nevertheless, volunteer groups like KCI-NET can only address provision of value-added services over existing infrastructures. Africa lags far behind any other region of the world in telecommunications development by any standards. It has, for example, only 2% of the world's main telephone lines despite 12% of the world's population living in Africa. Over the past decade, Africa had the lowest annual growth in teledensity (ie. main telephone lines per 100 inhabitants) of any developing region, partly due to rapid population growth. Indeed, 35 of the world's 49 least telecommunication-developed countries are in Africa [16], and indications are that this proportion can only get worse. It is therefore imperative that overall improvement of telecommunications services be embarked upon, especially in areas where barely any infrastructure exists.

#### **4. KCI-NET: A Network of East African Scientists**

A group that has played a lead role in the development of email in Eastern (and other parts of) Africa is KCI-International, capitalizing on expertise found on its network, KCI-NET. Comprising over 100 East Africans world-wide, this is the largest and fastest growing network of African scientists - and a unique society in its true and wholesome electronic nature. KCI-NET has experts (including professors, system managers/operators, etc) in a diversity of fields, especially on networking. It offers a unique pool of African-own expertise that can be "volunteered" for the regional development of informatics at any time within short-notice. And since its experts are available on-line, queries posed to KCI-NET can be processed and answered in minutes, at little or no cost, and without vendor-bias. Perhaps most importantly, KCI-NET has got experience with leading-edge and mainstream (and affordable) networking technologies, including TCP/IP, the Internet protocol. It has also experience with some of the lower-end technologies that have now proliferated the Third World, especially Fido and UUCP.

KCI-NET interconnects all its members, distributed in places as far afield as USA, Canada, UK, Italy, Finland, Netherlands, Sweden, Turkey, Australia, New Zealand, Singapore, Ethiopia, Tanzania, Uganda, and Kenya. Established in June 1991 initially as the international chapter of the Kenya Computer Institute, KCI-International is a clear manifestation of what email can achieve, and how it "squashes the world".

The main objective of KCI-International is to promote the use and development of information technology (IT) in Africa, and Eastern Africa in particular. To this end, various technical sub-committees have been constituted to look into aspects as diverse as:

- procurement of new and refurbished computing facilities and literature
- local resource redistribution and/or sharing
- maintenance of a resource database and a computerized national bibliography
- institution of a regional centre of excellence in computing
- research and development (with an initial emphasis on software)
- evolution of a national IT policy (in collaboration with

- other interest groups)
- consultancy services (on equipment, software, and training)
- general IT awareness and evolution of appropriate technical standards
- promotion of electronic and human networking\* (footnote)
- organization of IT conferences, symposia and seminars
- safety, health informatics, hazards and ergonomics
- legal aspects of computing and data security (copyright, data protection/encryptology, viruses, etc)
- applications (library service, legal/health/land information systems, CAD, scanners, ...)
- social implications of IT, and environmental issues
- publication of a suitable technical journal and newsletters etc.

Perhaps of particular interest is the proposal for an African Centre of Excellence for Computing (ARCC), with "campuses" scattered all over the continent. Amongst the key objectives of ARCC are to:

- i. serve as a base for high-level computing training and research.
- ii. promote development and usage of computing and communications technologies in Africa.
- iii. facilitate co-ordination of collaborative computing research and teaching in Africa's higher institutions of learning.
- iv. foster closer co-operation and linkages between computing industry and academia.

In particular, the Centre proposes to maintain a pool of volunteer computing experts, and to start an African Academic and Research Network Foundation (AARNEF) to facilitate a speedy growth of networking technologies in Africa. AARNEF will be subscriber-based. On contribution of a token fee by an African government or institution, a team of networking experts will be availed to create networks within those countries/institutions. In fact, although the Centre is yet to be formally launched, a number of organizations have already benefitted from the support of the Centre's volunteers. When fully operational, the Foundation will be expected to additionally play the role of co-ordinating networking initiatives in Africa, and to serve as an advisory (non-executive) body to external groups interested in promoting scientific and technological networks in Africa.

## 5. Conclusions

Given that reasonable telecommunication infrastructures already exist in many parts of Africa, and that several of the other email pre-requisites cited earlier can be easily acquired, we are more than convinced that Africa is ripe for a revolution - a telematics revolution. If anybody needs computer networks, it is Africa. Traditional communication methods are either too unreliable, too poor or too inexpensive - or (in some cases) outright absent. The continent is vast and sparse, with a very small fraction in the science and technology fraternity. Yet even these few must communicate, if they are to contribute towards eradication of Africa's numerous ills. Aggravated with meagre budgets (East Africa hosts some of the world's poorest, hunger

stricken and war-torn nations), inexpensive yet effective technologies must be explored. And these need not be limited to email: other forms of electronic communication - notably fax, telex and phone - are just equally vital for a region's socio-economic growth. Enabling environments must evolve that will facilitate information, knowledge and resource sharing between individuals, institutions and countries.

Hard facts will be required to convince beyond any doubt that electronic networking is indeed an engine for development. Experiences from other parts of the world must be augmented with results from empirical studies done locally, particularly from already existing networks. Apart from development, closer regional co-operation would be significantly boosted with viable electronic networks. It is not interesting that it may be easier and cheaper to call Kigali from Nairobi via Paris or London than to call directly? Given that email works well even with poor phone lines, South-South communication will greatly be improved. Development of such networks will go along away at fulfilling some of the endeavours of institutions like PAN-AFTEL. It is time Africa realised that outside friends can only help to an extent; the real initiatives to deliver the continent must come from within. Email offers an exemplary opportunity for those ideas to be easily and widely deliberated and tested. That some donor agencies now attach an email component as a requirement for the projects supported must be lauded. Real empowerment comes with information and communication.

It is for these reasons that we must also laud initiatives like KCI-NET; and there are several of them. Other known country- or regional-based initiatives include NAIJANET (for Nigerians), CAMNET (for Cameroonians), GHANANET (for Ghanaians), KENYANET (for Kenyans), IVORIAN (for Ivorians), TUNISIANET (for Tunisians), and MAGHREBNET (for Northern Africans). It is not surprising that by and large, it is those citizens resident abroad that are the main players. You never know what you miss until you have it! More of similar efforts must be initiated, and a common front sought. In fact, to have a coherent approach to network promotion in Africa, the isolated networking initiatives themselves require to be "networked"; the successes of networking efforts in North America and Europe cannot tell the story more. Yet as developed as their networks already are - with the fewer hustles with alternative transport systems - they are still apportioning even larger parts of their budgets to networks development. Is it time that Africa borrowed a leaf?

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#### FOOTNOTE

\* Members of KCI-NET have, for example, collectively contributed to meet a substantial part of the telephone cost for regular email traffic between Kenya and the Internet.