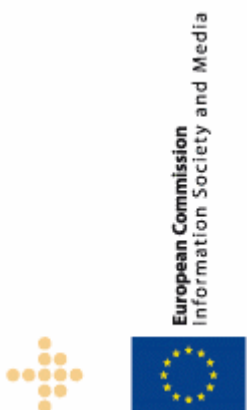# Guide to ICT Initiatives and Research Priorities in IST-Africa Partner Countries

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# 1.    INTRODUCTION

It is important that national ICT research priorities are aligned with national strategic priorities and available expertise. As a result the IST-Africa Consortium has undertaken an extensive consultation with the research communities in 13 African Countries across North Africa (Egypt), West Africa (Senegal), East Africa (Burundi, Kenya, Tanzania, Uganda), Central Africa (Cameroon) and Southern Africa (Botswana, Lesotho, Mauritius, Mozambique, Namibia, South Africa). This consultation has been undertaken as part of national IST-Africa Training workshops supplemented by direct one-on-one engagement with senior representatives of key stakeholders undertaking ICT-related research at a national level. All organisations have been encouraged to prepare an organisational profile to highlight their track record and expertise.

A survey has also been undertaken to provide an overview of the ICT Environment and ICT related initiatives currently ongoing at a national level based on consultation of all key research actors.

The findings outline the rich mix of ICT related activities being undertaken in different African countries and the depth of research institutions that exist.

The tables below provide an overview of the main institutions, research areas of interest and mapping to current Challenges under the FP7-ICT Work Programme for 2010 – 2012, based on consultations undertaken during 2010 - 2011.

As Table 1 illustrates, the partners have engaged with all relevant research organisations in each partner country. In each case, engagement was with the most senior representatives of each institution (including Chancellor, Dean, Head of Department or Professor in the case of universities). This exercise is to inform both national policy and provide insight to the European Commission and African Union Commission, to provide guidance when developing future international research calls.

Table 2 clarifies the strong clustering of interest across most IST-Africa Partner Countries in four key areas (1) Pervasive and Trusted Network and Service Infrastructures, (2) ICT for Learning and Access to Cultural Resources, followed by (3) ICT for Health, Ageing Well, Inclusion and Governance and (4) ICT for Mobility, Environmental Sustainability and Energy Efficiency.

Like the smaller clusters around Technologies for Digital Content and Languages (Burundi, Egypt, Namibia, Senegal and South Africa) and ICT for Agriculture (Kenya, Lesotho, Tanzania and Uganda), it is perhaps surprising that these clusters are not more pan-African in nature. It is certainly likely that these smaller clusters will continue to grow over the coming years.

*Table 1: Overview of National ICT Research Players and Research areas of Interest*

| Country | ICT Research Players | Research Areas of interest |
|---|---|---|
| Botswana | University of Botswana; BOTEC, National Technology Research Centre; Cable for Africa | Networks (Future Networks, Cloud Computing, Trustworthy ICT); Smart components; Networked Media; eHealth; Language Technologies; Technology Enhanced Learning; Digital Preservation |
| Burundi | Université du Burundi; Université Espoir d'Afrique; Université Lumière de Bujumbura; Université des Grands Lacs | Digital Libraries; Technology-Enhanced Learning; |
| Cameroon | University of Yaounde I; National Advanced School of Engineering, University of Yaounde I; Douala University; Dschang University; Ngaoundere University; University of Buea | Integrated services networks; Distance Learning Environments; GIS for Environmental Management; eHealth; Data mining and statistical modelling; |
| Egypt | Alexandria University; American University in Cairo; Arab Academy for Science, Technology & Maritime; Assiut University; Azhar University; Cairo University; Ein Shams University; Helwan University; Mansoura University; National Telecommunications Institute; Nile University; ITIDA; MCIT; CMIC (Cairo Microsoft Innovation Center); EngNet Company; Orange (France Telecom); IBM; Valeo | Environmental Management and Energy; Digital Libraries; Technology-Enhanced Learning; Language Technologies; eHealth; ICT for Transport; Intelligent Content & Semantics; Network of the Future; Embedded systems; Trustworthy ICT |
| Kenya | Strathmore University; Moi University; University of Nairobi; Mombasa Polytechnic University College; Jomo Kenyatta University of Agriculture and Technology; Kenya ICT Board; Kenya Agriculture Research Institute; Kenya Medical Research Institute; Multimedia University College; Presbyterian University of East Africa; Kenya Polytechnic University College; Kenya Methodist University; United States International University; Mt. Kenya University; Egerton University; Masinde Muliro University of Science and Technology; Inoorero University; Kenya Education Network Trust (KENET) | Network Design; Trustworthy ICT; Intelligent Information Management, Technology-Enhanced Learning, Wireless Technology; Digital Libraries; Open Source Technologies; eHealth; Remote Sensing and GIS; ICT for Agriculture; eTourism |
| Lesotho | National University of Lesotho; Lesotho College of Education; Department of Agricultural Research; Ministry of Health | Digital Libraries; Technology-Enhanced Learning; ICT for Agriculture; eHealth; Trustworthy ICT |
| Mauritius | University of Mauritius; University of Technology, Mauritius; Mauritius Research Council; National Information and Communication Technology Evaluation and Research Network (NICTERN) | Bioinformatics; Technology-enhanced Learning; IPv6; Context Awareness; Mobile and Ubiquitous Computing; Intelligent Systems; Data mining using agent technology; BPO; eCommerce; Trustworthy ICT |
| Mozambique | ARPAC - National Institute for Socio-Cultural Research; Mozambican ICT Institute; Eduardo Mondlane University; Pedagogical University; Higher Institute of International Relations; Catholic University; São Tomás University; Eduardo | Technology-Enhanced Learning; Digital Libraries; Mobile Applications; Trustworthy ICT; Environment sustainability; ICT for Agriculture |

| Country | Institutions | Research Priorities |
|---|---|---|
| | Mondlane University Informatics Centre; Centre of Medicine and Medical Equipment of the Ministry of Health; National Health Institute; Higher Polytechnic and University Institute; Mozambican Higher Institute of Science and Technology; Higher Institute of Transport and Communication; Higher Institute of Health Sciences; Higher Institute of Public Administration; National Institute of Education Development; and Agrarian Research Institute of Mozambique. | |
| Namibia | University of Namibia, Polytechnic of Namibia | Cloud Computing, Trustworthy ICT, eHealth, Digital Preservation, eGovernance, Water management, |
| Rwanda | National University of Rwanda, Kigali Institute of Technology and Management, Kigali Independent University, Byumba Polytechnic Institute, Kigali Institute of Education, Kigali Health Institute, Higher Agriculture and Veterinary Institute, Kibungo University of Agriculture, Technology and Education | Trustworthy ICT, Mobile Applications, Digital Libraries, Technology-Enhanced Learning, eHealth; Water Management |
| Senegal | Universite Cheikh Anta Diop; Universite Gaston Berger; Ecole Supérieure Polytechnique de Dakar; EPT; Centre de Suivi Ecologique; UGB St-Louis; SCA; L'Agence De l'Informatique de l'Etat (ADIE); Panos Institute | Future Networks; Research Networks; Bioinformatics; Sensors; Networked Media; Robotics; Language Technologies; eHealth; Water Management; Energy Efficiently design; Technology-Enhanced Learning |
| South Africa | CSIR/Meraka Institute; Medical Research Council; Cape Peninsula University of Tech; Central University of Technology; Durban University of Technology; Fort Hare University; Monash University; Nelson Mandela Metro University; North West University; Rhodes University; Stellenbosch University; Tshwane University of Technology; UNISA; University of Cape Town; University of Free State; University of Johannesburg; University of KwaZulu Natal; University of Limpopo; University of Pretoria; University of Venda; University of Zululand; Vaal University of Technology; Walter Sisulu University; University of the Western Cape; Wits University | Future Networks; Mobile Applications; Usability; Trustworthy ICT; eHealth; Digital Libraries; Technology-Enhanced Learning; Environmental Sustainability; Distributed Computing; ICT for Rural Communities |
| Tanzania | University of Dar es Salaam; Dar es Salaam Institute of Technology; Open University of Tanzania; University of Dodoma; Ardhi University; Sokoine University of Agriculture; Muhimbili University of Health Sciences; Tumaini University College, Dar es Salaam | Telemedicine; eHealth; High Performance Computing; Technology-Enhanced Learning; Digitial Libraries; eGovernment; ICT for Agriculture; eInfrastructures; Entrepreneurship |
| Uganda | Busoga University; Bugema University; Gulu University; Kampala International University; Kyambogo University; Makerere University; Mbarara University of Science & Technology; Ndejje University; The Inter-University Council for East Africa; Uganda Martyrs University | eHealth; Trustworthy ICT; Digital Libraries; Technology-Enhanced Learning; eInclusion; eAccessibility; ICT for Agriculture |

**Table 2: Mapping of ICT Research Interests with Challenges of FP7-ICT Work Programme 2010 – 2012 (Calls 7 – 9)**

| Country | Challenge 1: Pervasive and Trusted Network and Service Infrastructures | Challenge 4: Technologies for Digital Content and Languages | Challenge 5: ICT for Health, Ageing Well, Inclusion and Governance | Challenge 6: ICT for Mobility, Environmental Sustainability and Energy Efficiency | Challenge 8: ICT for Learning and Access to Cultural Resources | Challenge 3: Alternative Paths to Components & Systems | Other Priorities |
|---|---|---|---|---|---|---|---|
| Botswana | √ | | √ | | √ | | |
| Burundi | | √ | | | √ | | |
| Cameroon | √ | | √ | √ | √ | | |
| Egypt | √ | √ | √ | √ | √ | √ | |
| Kenya | √ | | √ | √ | √ | | ICT for Agriculture, eTourism |
| Lesotho | √ | | | | √ | | ICT for Agriculture |
| Mauritius | √ | | √ | | √ | | BPO |
| Mozambique | √ | | √ | √ | √ | | ICT for Agriculture |
| Namibia | √ | √ | √ | √ (Water Management) | √ | √ | |
| Rwanda | √ | | √ | √ (Water Management) | √ | | |
| Senegal | √ | √ | √ | √ | √ | | Robotics, Energy |
| South Africa | √ | √ | √ | √ | √ | √ | Rural Communities |
| Tanzania | √ | | √ | √ | √ | | ICT for Agriculture |
| Uganda | √ | | √ | √ | √ | | ICT for Agriculture |

## 2.    REPUBLIC OF BOTSWANA

### 2.1   Introduction

The Republic of Botswana is in Southern Africa. Botswana is bordered by Namibia on the west and north, Zambia at a narrow strip in the north, Zimbabwe on the east, and South Africa on the east and south. Botswana has an area of 581,730 sq km with an estimated population of about 2 million inhabitants (2011) and a literacy rate of 81%. 62% percent of the total population is between 16 and 64 years of age. The capital city is Gaborone has a population of about 196 000 (2009). The official language is English.

In relation to Communications, according to 2010 figures, there were 137,400 fixed phone lines in use compared with 2.363 million mobile phones.   There were 2,739 Internet hosts (2010) and 120,000 Internet users (2009).

Botswana has maintained one of the world's highest economic growth rates since independence in 1966. Her economic growth is largely attributed to mining of diamonds, which collectively make up one of the world's largest diamond reserves. The revenue earned from diamonds drive Botswana's economy. However, recent economic and political changes in the region present challenges to the government to explore other means of diversifying economy as dependence on mineral wealth forms a narrow economic base and are not sustainable.

As a consequence, Botswana established Science and Technology Policy in 1998 through which all ICT related developments could be coordinated. The development of a national ICT framework is perceived as a shift from factor endowments economy to an efficiency driven economy that will pave way to an innovative driven economy. It is in this context that Botswana's first National Information and Communications Technology Policy was approved by Parliament in 2007 [Maitlamo National Policy for ICT Development 2007].

In December 2010, following the recent Parliamentary election, an ICT Committee was constituted in the National Assembly. This is a promising development for Botswana, as it provides a framework for Parliamentary oversight of National Policy in this important domain. The current Ministry of Transport and Communications will report to the ICT Committee on implementation of Maitlamo.

The S&T Policy was reviewed during 2011 and a new Research Science Technology and Innovation Policy has been prepared and approved by Cabinet. It is billed to be presented before Parliament in the current Parliament session (Q1 2012).

## 2.2   ICT Background

The Government of Botswana has committed to developing a National Information and Communications Technology (ICT) Policy that will build on recent government initiatives and assist in achieving Vision 2016. In keeping with Vision 2016, it is envisioned that the National ICT Policy will position Botswana for sustained growth in the digital age by serving as a key catalyst in achieving social, economic, political and cultural transformation within the country.

The development of the National ICT Policy actively involved a wide range of participants from the public and private sectors, and civil society.

The development of National ICT Policy takes into account that relatively few people in Botswana own PCs or have access to the Internet at home. Many users rely on access to PCs and the Internet through employment or while receiving an education.

The overall objectives of the ICT Policy are to assist with three specific outcomes:

➢  Creation of an enabling environment for the growth of an ICT industry in the country;

➢  Provision of universal service and access to information and communication facilities in the country; and

➢  Making Botswana a Regional ICT Hub so as to make the country's ICT sector globally competitive.

To manage its complexity, the National ICT Policy is developed in the following key areas:

➢  Establishing the National ICT Vision, Goals and Objectives –to identify what the desired end-state looks like

➢  E-Readiness and Benchmarking – to establish the current level of ICT diffusion

➢  National ICT Policy – to identify and explain the key programmes and projects that are required to achieve the National ICT Vision, Goals and Objectives

➢  National ICT Master Plan – to define the various programmes and projects in greater detail, identifying the project deliverables, timelines, resources, programme dependencies and preliminary cost estimates

➢  An ICT Monitoring and Evaluation Programme – to measure progress and benefits achieved

### 2.2.1   ICT Infrastructure

Several projects aimed at positioning Botswana as a regional ICT hub have been undertaken over the past few years. Through the Pan African e-Network project 53 African countries will be connected as one network through satellite and fibre optic links for providing electronic and knowledge connectivity to the African nations. The network will primarily provide effective communication and connectivity among nations in the loop. It will also provide tele-education, tele-medicine and VVIP service. The project will inter-connect 11 Universities, 53 Learning Centers, 11 Super Specialty Hospitals and 53 Remote Hospitals in the membership of the e-Network project.

Botswana has identified 3 Very Small Aperture Terminals [Vsat] Sites comprising a Tele-Education Centre (learning Centre) at the University of Botswana, a Tele-medicine Centre (Patient-end-terminal) at the only referral hospital (Nyangabgwe Referral Hospital in the North part of the country and a VVIP Location at the Office of the President.

Within our neighborhood there are two diversified fibre links to South Africa. There are also radio links to Namibia, Zimbabwe and Zambia. Further afield there are direct Satellite links to UK [BT, Cable and Wireless], US [AT&T, Sprint] and Canada [Tele-globe]. There is also direct connectivity to London through SAT3 undersea cable.

Botswana has invested in fibre-optic networks locally and international in high capacity systems thereby making communication infrastructure one of the best in the continent. These include: NEPAD-Led Undersea Cable, East African Submarine System (EASSy), West African Festoon System and African West Coast Cable.

Botswana Telecommunications Authority (BTA) was established as an independent regulatory body to create and sustain an effective communications regulatory environment in Botswana. BTA has core mandate to create a transparent enabling regulatory environment through: managing the frequency spectrum; resolving industry disputes; setting industry standards; setting tariff principles and appropriate guidelines. BTA also ensures compliance with communications services regulatory framework through the management and monitoring of: service quality; customer satisfaction levels; broadcasting content; frequency spectrum; and terms and license conditions. BTA researches communications regulation, best practice communications services and industry performance so as to: advise government on policy formulation; establish communications regulatory policies; and inform industry and consumers.

The issuance of service neutral licenses to Botswana's three major telephone and mobile operators in the market (Botswana Telecommunications Corporation, Mascom, Orange and beMobile) is viewed as liberalization of Botswana's telecommunications industry. The license authorizes the three operators to provide national public telecommunication services over fixed or mobile, wire line or wireless, network links, using any available technology. However, BTC is the only fixed line operator in Botswana.

BTC has completed upgrading its national Management Data Network [MDN] and the Asymmetric Digital Subscriber Line [ADSL]. 2006/07 saw the successful launch of broadband services in most parts of the Botswana and it will be spread to support the Education, Healthcare, Libraries and other public sector needs [BTC Annual Report 2007]. Similarly in 2006/07 a network utilizing fibre-optic cables previously [Metropolitan Area Network] initially reserved for key business areas was rolled out. This was a deliberate move to create high capacity multi-Gigabit network to support existing services and launch new services such as Ethernet. This initiative becomes the first commercial Multi-Protocol Label Switching [MPSL] deployment in Botswana.

## 2.3   Current ICT Initiatives and projects

Over the past few years a number of ICT projects have been launched to provide more accessible services:

➢ Connecting Communities Programme

➢ Kitsong Centres

➢ Thuto Net

➢ Government On-Line

➢ Botswana Innovation Hub

### 2.3.1   Connecting Communities Programme

This Programme is focused on providing demand driven information relevant to the needs and conditions of the local people. With the purpose of connecting communities in rural, remote and urban communities with affordable and accessible computer and Internet services, 197 communities were identified for the program. The communities are serviced under the fast tracked telecommunication project **NTELETSA II**. The aim of the project is to supply, install, commission, and carry out operation and maintenance of network infrastructure in rural areas of Botswana.

The communities are grouped using 'Logical Zones' as a telecommunication deployment network. Logical zones were developed by grouping communities together based on geography and population. The logical zones have further been divided into regional networks or "underserved areas" to provide an economy of scale; the larger the area the greater the business that will allow operators to prosper and grow. This consolidation of logical zones resulted in the creation of 4 underserved areas. To this end, three mobile telephone service providers; Mascom, Orange and Botswana Telecommunications Cooperation [beMobile] have been awarded tenders in the four underserved areas (regional networks).

### 2.3.2   Kitsong Centers

The Rural Telecommunications Programme targets provision of essential infrastructure services in rural areas. This is part of government's obligation to integrate people into the economic and social development of the nation. The services include Internet lines, and telephones, and in 2006/7 Community Access Centers (CAC) were initiated. The CAC serve as a gate-way to the Internet and access to other services in the rural areas. The Community Access Centers (CAC) code-named Kitsong Centers are located in the following areas; Letlhakeng in the western part of the country to provide services to areas in the proximity of Central Kgalagadi Game Reserve and areas on the fringes of the rural Kweneng region. The CAC at Hukuntsi serves the areas within the Kgalagadi areas. Gumare in the north serves areas around the Okavango and the entire northern part of the country. At the moment 35 centers across the country are functional and an additional 25 centers are being set up.

In a nutshell all CAC will provide access to a range of on-line information including: local and community information, business information services, government information and services such as school registration, birth certificates, livestock tracking and passport applications.

While this may be ambitious, already several programs are 'hatching'. The Ministry of Communication, Science and Technology launched a project known as **í-Partnership.** This is a computer ownership project for government employees and unemployed youth to buy computers using government scheme. Employees are encouraged to buy computers at reduced cost to be able to take work home or 'work from home'. Several applications for the scheme have been processed. There is also a website which is operational for applicants to use to access the service.

### 2.3.3   Thuto Net

The Thuto Net program is an expansive project that incorporates the **Schools Connectivity Initiative,** to link all secondary schools to the Internet. At the moment 104 secondary schools through out the country have access to the Internet and the program is rolling out to other secondary schools.

All secondary schools in Botswana have computer laboratories comprising about 15-20 computers. This initiative is aimed at reducing literacy gaps between students in urban schools and rural schools. To fast track the program, the Department responsible for laying out the infrastructure is working together with the Department of Education to train teachers on using ICT as a classroom tool.

A similar initiative will be rolled out to primary schools through a program of refurbishing computers used in government departments with appropriate programs for primary schools.  This initiative is believed to provide opportunities for private sector to ensure support and maintenance of the equipment.

### 2.3.4   Government-On-Line

The Government of Botswana is undertaking major service delivery reform programmes aimed at improving service quality. A government web portal with information and e-services has been developed. The portal is customer focused making the organizational structure of government more transparent to citizens and business. E-Government represents a radically new way for government to interact with its constituents, clients and partners. The portal extends the "reach" of government and provides everyone with access to information and services, from virtually any location and at any time [NICT Policy 2007]. In addition, all government services that are appropriate for on-line delivery will be available over the Internet. Driver's licenses are accessible at all government Road Transport Offices and Depot across the country.

The e-Government program coordinated at the Ministry of Transport and Communication is launching a strategy of delivering electronic services to the nation. The main purpose of the strategy is to integrate government services to enable quick and uninterrupted services to customers.

Surveys conducted reveal that more than 400 services are offered by Government and once the services are offered electronically about 300 of the total could be offered on-line. The strategy outlined 5 channels through which government services will be launched.

Government ministries have Call Centres for customers to submit and enquire about services. Call centres provides basic information and services and information about the Ministry and use toll free phones. However the Call Centres are yet to be interconnected for ease of connecting and linking customers with services relevant to their needs.

Following a series of challenges and inadequacies resulting from the expansion of Government fleet regarding vehicles a fleet tracking, management and maintenance system is necessary. The system is expected to track and locate government vehicle wherever they will be. The system will reduce paperwork as currently management of the fleet is done manually. Other accessories provided for in the system include on-line booking for service, availability of unused vehicles in other government depots, up-date government records on total number of vehicles owned by government. The current system does not give up to date records of vehicles in the system thereby making it difficult to keep record of available and roadworthy vehicles and with the proposed system it will report all vehicles roadworthy, involved in accidents, boarded vehicles.

The Ministry of Agriculture has developed a Livestock Identification and Trace-back System to maintain a record of all the cattle in the country, and also track the exposure level of each animal to contagious diseases. The system uses data from other Government department like the National citizen identification system for identifying cattle owners. The Ministry of Agriculture is in the process of improving and modifying the current Livestock Identification and Tracking System (LITS) maximizing and optimizing services that were initially not exploited. These include ability to track and identify livestock that get lost or move between demarcated livestock zones.

Botswana Telecommunications Authority (BTA) 2010 annual report reveals that mobile tele-density in Botswana is at 131%. Though this growth in mobile telephony use is still limited to basic telephone and short message service (sms), significant expansion on mobile phone service is gaining momentum at the Ministry of Education and Skills Development where examination results could be accessed using mobile phone service. Similarly the Ministry of Labour and Home Affairs has expanded its service to inform applicants to collect their Identification Cards via short message service, and so will the Ministry of Lands and Housing in improving their services to clients.

### 2.3.5   Botswana Innovation Hub

The Botswana Innovation Hub comes at a time when Botswana's ICT infrastructure is fast developing. Botswana Innovation Hub is responsible for stimulating start-ups and providing enabling environment for investors. Technology driven and knowledge intensive industry, researchers, higher education and the ICT industry, are provided forum to interact together to foster innovation and new business. The success of these projects depends on good infrastructure.

BIH offers an ideal location and environment from which to run business operations with complete tax incentives, innovation fund, incubator with a specific aim of increasing ICT eco-system and move away from the current reliance on diamonds. BIH has partnered with Microsoft as part of a joint initiative to grow and stabilize ICT sectors in the region. This will result in the digital inclusion through skills acceleration activities, job creation, thought leadership and fostering of local innovation

The innovation hub has proposed sectors through which businesses, research and training could be explored. These areas include Information and Communications Technology (ICT), Bio-Technology, Energy and Mineral Technology. The BIH is located near the airport and offers services in the form of office space, land and state of the art telecommunications services.

## 2.4   National ICT Research Capacity and Priorities for Cooperation

The following universities and research centres in Botswana are undertaking ICT-related initiatives:

➢ University of Botswana, Dept of Computer Science[1]

➢ University of Botswana, Harry Oppenheimer Okavango Research Centre[2]

➢ University of Botswana, School of Medicine

➢ Botswana Technology Centre (BOTEC)[3]

➢ Cable for Africa

➢ Rural Industries Promotions Company (Botswana)[4]

During an IST-Africa FP7 Training Workshop held in Gaborone on 21 September 2010, the following priorities under FP7-ICT Call 8 and 9 were identified as being relevant to the research community in Botswana:

### Challenge 1: Pervasive and Trusted Network and Service Infrastructures (Call 8)

➢ ICT 2011.1.1 Future Networks - Cable for Africa

➢ ICT 20011.1.2 Cloud Computing, Internet of Services and Advanced Software Engineering - Cable for Africa

➢ ICT 20011.1.4 Trustworthy ICT - Cable for Africa

➢ ICT 20011.1.6 Future Internet Research and Experimentation (FIRE) (b), (c), (e) - National Technology Research centre

### Challenge 3: Alternative Paths to Components & Systems (Call 8)

➢ ICT 2011.3.2 Smart components and smart systems integration (b)  - BOTEC

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[1] http://www.ub.bw/learning_progs.cfm?pid=587
[2] http://www.orc.ub.bw/
[3] http://www.botec.bw/
[4] http://www.ripco.co.bw/default.aspx?pg=5563b836-ad64-4e90-a2d3-f0be82c90211

*Challenge 5: ICT for Health, Ageing Well, Inclusion and Governance (Call 9)*

➤ ICT 2011.5.2 Virtual Physiological Human (a), (b), (d)  - School of Medicine, University of Botswana

*Challenge 6: ICT for a Low Carbon Economy (Call 8)*

➤ ICT 2011.6.1 Smart energy grids – University of Botswana, Energy Dept

*Challenge 8: ICT for Learning and Access to Cultural Resources*

➤ ICT 2011.8.1 Technology-Enhanced Learning (Call 8) - University of Botswana, BOTEC, Teacher Training College

➤ ICT 2011.8.2 ICT for access to cultural resources (Call 9) - University of Botswana

The importance of research cannot be overemphasized; research plays a critical role in much of the decisions taken by any government. Botswana as a developing country requires a solid research infrastructure with the main objective of making informed decisions. However, there are other equally important research areas that Botswana can benefit from.

Under Challenge 6: **ICT for a Low Carbon Economy**, the country is faced with challenges ranging from high fuel prices, road accidents attributed to alcohol abuse and animals on the roads, uncoordinated roads maintenance to energy crisis that besieged the country. Deaths caused by road accidents in Botswana occupy 2nd position after HIV/AIDS related deaths.

With the country's commitment to reduce the prevalence of HIV/AIDS related deaths, a tendency to divert all resources to HIV/AIDS has created an imbalance of resources allocation to other life threatening occurrences. Reduction in road accidents deaths commits the country to invest more on Information and Communication Technologies, and the National ICT Strategy could not have come at any better time. Use of ICT infrastructure must aim at making roads safer.

Another potential research area is on energy. The current energy shortage has pressured governments in the region to look at alternative energy forms and this is an opportunity to involve and use ICT infrastructure to assure sustainability of natural resources. Botswana has huge coal reserves, which are currently not adequately exploited.

**Technologies for Digital Content and Languages** (Challenge 4) presents an opportune moment for potential researchers because libraries no longer exist as hard copies. The talk about mobile libraries in the form of trucks loaded with books moving between locations in the digital era becomes expensive and complex to manage. Though the concept of mobile libraries in Botswana still remains a viable option, other challenges are emerging. Government and non-government departments deal with huge volumes of information to be shared between and among the departments and this pose risks to the safety of the information. Projects that look at the use of ICT infrastructure to store and disseminate information must be considered.

**Challenge 5: ICT for Health, Ageing Well, Inclusion and Governance**

The advent of HIV/AIDS has given rise to the prevalence of opportunistic diseases that only a few privileged members of the society are privy to. The same members of the society resort to management of their health on an uncoordinated way. Medical practitioners depend largely on the assumption that patients or clients keep their medical records.  Of concern in this system is lack of proper management of clients' record on a longitudinal basis. Rather it is not a requirement for Medical practitioners to request full medical history in cases where clients fail to produce detailed health record. The current 'card' system is not adequate because new cards are issued when old ones are filled up and the client is expected to keep the records.

This scenario presents ample opportunities for researchers to use ICT infrastructure to develop mechanisms and systems that will avail clients' medical records at any medical facility that is linked to the national grid.

Another research area comes as a result of use of indigenous medicinal products by communities with limited access to modern medicine. The use of ICT infrastructure to keep data-banks of commonly used medicinal plants and their medicinal value would provide leads to further research.

**Challenge 1**: **Pervasive and Trusted Network and Service Infrastructure**;

Botswana like many other states experiences problems associated with cyber crime. There is therefore a need to build infrastructure to curb such activities. Already some efforts have been undertaken by government to curb cyber-crime. All mobile phones users are now requested to register their sim-cards with the Botswana Telecommunications Authority. This is hoped to ease and keep an inventory of mobile phone ownership and use in the country.

**National Participation in FP7**

Botswana is gradually increasing its participation in FP7 projects. The Department of Research Science and Technology initially hosted IST-Africa training workshops in Gaborone without funding during 2006 - 2007. Botswana through DRST formally joined the IST-Africa Initiative as a partner in 2008. DRST is now also involved as a partner in the extended phase of CAAST-Net. DRST is actively encouraging research institutions to build international partnerships and work to increasing the number of participations in the Framework Programme.

As a result of an IST-Africa Training Workshop on FP7-Africa 2010 hosted by DRST in Gaborone on 23 September 2009, the University of Botswana successfully participated in the submission of the HURAPRIM[5] proposal focused on Primary Health Care in Africa in cooperation with the University of Gent (BE), University of Oxford (UK), Medizinsche Universitaet Vienna (AT), Wits University (ZA), Mbarara University of Science and Technology (UG), Ahfad University for Women (SD) and Universtite de Bamako (ML), which commenced in March 2011.

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[5] http://www.huraprim.ugent.be/drupal/

There is now an appetite for participation in EU funded research, and the number of funded projects is expected to increase in future years. However, the significant gaps between calls, the high level of competition under specific thematic areas which are aligned with national implementation policy in Africa (e.g. TEL) and the long timeframe for projects to be evaluated and negotiated obviously has implications for participation.

Participation in other International programmes such as the Southern Africa Innovation Support Programme (SAIS) funded by Ministry of Foreign Affairs of Finland (2011 – 15) will also assist in building international partnerships.

**Level of Research Maturity**

Botswana is currently trying to diversify its economy, and attracting international research units and software companies to base themselves in the Botswana Innovation Hub is a signal of the strategic positioning the government is taking to increase the level of research maturity of the country.

One of the key challenges is the small number of research institutions. While the current primary focus is on technology adoption and developing applications, there is a strong policy focus on further strengthening the research capacity within the country, and especially in facilitating the continued development of post-graduate programmes and involvement in cross-border research.

## 3.   REPUBLIC OF BURUNDI

### 3.1   Introduction

The Republic of Burundi is situated in Central Africa, sharing boundaries with Democratic Republic of the Congo, Rwanda and Tanzania. It is a landlocked country and has a surface area of 27,830 sq km, made up of 17 provinces. The population in 2011 is estimated at 10.2 million inhabitants (15.5 million in 1999) with literacy rate of 59.3%. The official languages are Kirundi, French and Swahili. The capital city is Bujumbura.

In relation to Communications, according to 2010 figures, there were 32,600 fixed phone lines in use compared with 1.15 million mobile phones. There were 201 Internet hosts (2010), 157,800 Internet users (2009) and six Internet Service Providers.

Burundi joined the East African Community, which improves regional trade ties. The economy is predominantly agricultural with primary exports of coffee and tea. Burundi is currently dependent on bilateral and multilateral aid.

### 3.2   ICT Background

Burundi considers ICT to be an important enabler that can facilitate developments and job opportunities in the country. The Government of Burundi is committed to encouraging the integration of ICT in all spheres of society. The telecommunications sector is liberalised but Internet access is predominantly restricted to public points of access in cyber cafes in the capital, Bujumbura.

The National Policy in Burundi was formulated jointly by the Government and UNDP in October 2000 and adopted in 2004. Subsequently the Government approached UNECA to work with them to develop and fund an ICT action plan for the period 2007 – 2011. The Government of Burundi has led several activities in relation to the use of ICT in the service of the socioeconomic development and the Good Governance under the responsibility of the National Committee.

The World Bank supported the National Backbone system to link the provinces and the design phase commenced in early 2008. UNESCO undertook a survey of Higher Education institutions in 2008.

The Government of Burundi has led several activities in relation to the use of ICT in the service of the socio-economic development and the Good Governance under the responsibility of the National Committee. These activities include development of the National Policy in ICT, launch of a optical fibre project, plans to provide computers in the Higher Education system, a policy for free changes

when importing ICT equipment and the development of partners in ICT Networking (such as participation in the IST-Africa Initiative).

Despite the liberalisation of ICT, Burundi still faces a number of challenges in relation to the ICT adoption. Investment in ICT for Higher Education is planned during 2012 – 2013 to include development of a common telecommunications infrastructure, interconnection of workstations and development of software to manage Bachelor and Master Programmes.

## 3.3 National ICT Research Capacity and Priorities

The Universities undertaking ICT related activities in Burundi include:

➢ Université du Burundi - Faculté des Sciences

➢ Université Espoir d'Afrique[6] - Faculté des Lettres et des Sciences (Département d'informatique, option Informatique et système de gestion de l'information & Département de la Communication); Faculté d'ingénierie et de Technologie (Département d'Ingénierie en génie et gestion des télécommunications);

➢ Université Lumière de Bujumbura[7] - Faculté de Communication & Faculté d'Informatique de gestion;

➢ Université des Grands Lacs[8] - Faculté d'Informatique

There are approximately 30,000 students in Higher Education in Burundi, 11,000 of which attend the University of Burundi.

During an IST-Africa FP7 Training workshop in Bujumbura in October 2009, the following research areas were identified:

***Challenge 4: Technologies for Digital Content and Languages***

➢ ICT 2011.4.3 Digital Preservation (Call 9)

***Challenge 5: ICT for Health, Ageing Well, Inclusion and Governance***

➢ ICT 2011.5.1 Personal Health Systems (Call 7)

***Challenge 6: ICT for a Low Carbon Economy***

➢ ICT 2011.6.3 ICT for efficient water resources management (Call 8)

***Challenge 8: ICT for Learning and Access to Cultural Resources***

➢ ICT 2011.8.1 Technology-Enhanced Learning (Call 8)

Other research priorities include ICT for Agriculture, telecommunications, good governance and security.

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[6] http://www.hopeafricauniversity.org/
[7] http://ulbu.bi/
[8] http://www.ulpgl.net/

**National Participation in FP7**

IST-Africa is the first FP7 project in which Burundi is involved, but it has in recent years also been represented in a small number of unsuccessful proposals. There is now an appetite for participation in EU funded research, and the number of funded projects is expected to increase in future years. However, the significant gaps between calls, the high level of competition under specific thematic areas which are aligned with national implementation policy in Africa (e.g. TEL) and the long timeframe for projects to be evaluated and negotiated obviously has implications for participation.

Participation in IST-Africa is complimented by partnerships between the Ministry and the Kingdom of Belgium, University Agency of Francophonie, World Bank, UNESCO and USAID.

eLearning, eHealth, eAgriculture and Living Labs have been identified as having the most potential for sustainable socio-economic impact to date. A national Living Labs Working Group (with participation from government, industry and research as well as Belgium as a donor country) has now been established to identify priorities and other stakeholders to establish the first Living Labs.

**Level of Research Maturity**

The general level of research maturity in Burundi is limited, primarily due to lack of international exposure, developing infrastructure and limited donor engagement. IST-Africa has assisted greatly in this regard, by providing necessary resources, facilitating exchange of experiences with both Europe and Africa, focusing international attention on Information Society and ICT related challenges and opportunities in Burundi and providing opportunities to engage with research stakeholders internationally.

There is now a greater sense of urgency in the government and in the research community to not fall any further behind and leverage the opportunity that IST-Africa presents. This is reflected in the greater numbers registered for the ministries mailing list, and the enthusiasm to get involved in the development of Living Labs, following the very successful Living Labs Training Workshop in Bujumbura, attracting involvement from industry and the Belgian Government (the sole European donor in Burundi) as well as governmental, educational and research institutions.

Complimentary activities include the launch of an optical fibre project, plans to invest in infrastructure and computers in the Higher Education system, a policy for free changes when importing ICT equipment and the development of partners in ICT Networking (such as participation in the IST-Africa Initiative).

One of the key challenges is the small number of research institutions. While the current primary focus is on technology adoption and developing applications, there is a strong policy focus on strengthening research capacity within the country, and especially in facilitating the continued development of post-graduate programmes and involvement in cross-border research.

There is now a much higher level of awareness of pan-African and international ideas of what level of research maturity is required and a greater focus on the development of research results with the potential to achieve sustainable socio-economic impact.

# 4.    REPUBLIC OF CAMEROON

## 4.1    Introduction

The Republic of Cameroon is situated in Central Africa, sharing boundaries with Nigeria to the west, Chad to the northeast, Central African Republic to the east, Congo, Gabon and Equatorial Guinea to the south with direct access to the Atlantic Ocean to the southwest. It is a unitary state, with a surface area of 475,442 square km, made up of ten regions subdivided in to fifty-eight (58) divisions and further subdivided into 375 districts currently in the process of decentralisation. The population in 2011 was estimated at 19.7 million inhabitants (15.5 million in 1999) with literacy rate of 67.9%. The official languages are English and French.

Cameroon is called Africa in miniature due to its strategic geographical location, diversified culture (over 240 tribes composed of Bantus, Semi-Bantus, Soudanians, Hamites and Semites), two main religions: Christianity and Islam, climate (tropical and humid in the south and dry in the north with two seasons), vast equatorial forest found in most African countries. Its natural resources include: Petroleum, Bauxite, iron ore, timber and hydropower.

In relation to Communications, according to 2010 figures, there were 496,500 fixed phone lines in use compared with 8.156 million mobile phones.  There were 90 Internet hosts (2010) and 749,600 Internet users (2009).

## 4.2    ICT Background

The Republic of Cameroon has recognized that ICTs must be integrated in realising projects in various sectors (education, health, agriculture, economy, energy etc.)

In September 2005, a sectoral strategy of Posts, Telecommunications and ICT together with the sector policy statement relating thereto was finalized in a bid to influence the trends towards reducing the proportion of poverty by half by 2015 with the following objectives:

➢  increase the fixed (of 0.7% in 2005) and mobile (of 15% in 2005 ) teledensities to 30% and 50% in 2015;

➢  provide 20,000 villages with modern telecommunications facilities by 2015;

➢  multiply by 50, the number of direct and indirect jobs in the field of telecommunications and ICT by 2015.

The implementation of this strategy was underpinned by the following three pillars:

➢  Adapting and updating the legal, regulatory and institutional framework;

➢ Improving service delivery in quantity, quality, and affordable;

➢ Increasing the use of ICT and densify the industrial fabric of ICT companies

The ICT sector is undergoing a process of liberalization since the promulgation of Law No. 98/014 of 14 July 1998 governing telecommunications in Cameroon.

While individual ministries are responsible for different aspects of development, deployment and exploitation of ICTs (e.g. Ministry of Communications, Ministry of Trade, National Agency for Information and Communication Technologies – NAICT, Ministry of Posts and Telecommunications and Telecommunications Regulatory Board, National Centre for the Development of Computer Services), the Presidency of the Republic defines and sets guidelines for National ICT policy (NAICT reports to President), the Prime Ministers' Office is responsible for monitoring implementation of the ICT policy and the National Assembly has a legislative responsibility, responsible for voting ICT related laws. A committee was set up in August 2009 by a Prime Ministerial decree creating a pilot Committee for monitoring the putting in place of the National Strategy for the Development of ICT headed by the Minister of Post and Telecommunications.

Established in 2002 (Decree No 2002/92 8 April 2002) and according to Law No. 2010/013 (21 December 2010) governing electronic communications and Law No. 2010/012 (21 December 2010) related to cyber security and cyber criminality in Cameroon, the National Agency for Information and Communication Technologies (ANTIC) has the role to promote and monitor government activities in the area of ICT. Its responsibilities include: developing and monitoring the implementation of the ICT national development strategy; ensuring the harmonization of technical standards; proposing technical references in order to facilitate interoperability among information systems and regulating the sector; providing expertise to government services for design and development of their technical projects; coordinating the establishment and monitoring of Internet, Intranet and Extranet sites for the state and public institutions; contributing to the technical training of trainers for universities, high schools, colleges, teacher training colleges and primary schools; and participating in the training of the state personnel in ICTs by making recommendations on the content of the technical training and on the programmes of professional and competitive examinations. It is also responsible for the regulation, control and monitoring of activities related to the security of electronic communication networks, information systems and electronic certification on behalf of the Government of Cameroon.

Due to insufficient consultation and coordination amongst stakeholders involved in these sectoral and ministry initiatives, ANTIC was tasked with formulating a National Policy for the Development of ICT, which implements "some provisions of the Constitution, the Investment Code, education sector laws, major guidelines of the Poverty Reduction Strategy Paper (which has been reviewed and resulting in the Growth and Employment Strategy Paper) and honor commitments made by Cameroon with regards to global poverty reduction efforts (Millennium Development Goals, Education for All, Tunis Agenda for the Information Society, etc.)". It was validated by the Head of State, His Excellency President Paul Biya in January 2007 and it aims to provide:

➢ A comprehensive framework for ICT development in line with national objectives;

➢ A consultation and action framework for collaboration by the public sector (government) with the private sector, civil society and development partners;

➢ A framework for coordinating government action and external support, notably from the Digital Solidarity Fund.

A further review of this document in September 2009, with the main objective to operationalise the strategic priorities identified new emphases on the consistency between programs and ICT projects and the government strategy outlined in the National Objectives Framework (NOC). The review exercise identified twelve (12) prioritized programs based on the following seven (07) strategic pillars retained from the National Strategy for ICT Development: (i) Building Human capacities, (ii) Improving the legal, regulatory and institutional framework, (iii) Strengthening the rule of law and sovereignty, (iv) Infrastructure development, (v) Development of social sectors through the use of ICT, (vi) Modernizing the public service and (vii) Development of an ICT industrial sector.

According to the Ministry of Post and Telecommunication, after the liberalization of the Telecommunications sector, Cameroon presently has three major telephone network operators offering several services (MTN, Orange, CAMTEL), which influenced the increase of the number of active mobile phone subscribers from 1.2 million in 2003 to nearly 4 million in early 2008. Between 2000 and 2006, the number of telephone lines and telephone subscribers per 100 people increased dramatically from 1.26 per 100 to 18.56 per 100, corresponding to an exponential growth of 1373%. The number of micro-computers increased from 0.22% in 1997 to 1% in 2005, an increase of approximately 354%. Internet subscribers are now close to 750,000, 3.9% of population. According to 2010 figures, there were 496,500 fixed phone lines in use compared with 8.156 million mobile phones.  There were 90 Internet hosts (2010) and 749,600 Internet users (2009).

## 4.3 Current ICT Initiatives and projects

Over the past few of years, there have been a number of national initiatives focused on stimulating the use of ICT as a development tool to alleviate poverty and other challenges. They include:

➢ Government action plan for an information and knowledge-based society by Ministry of Scientific Research and Innovation;

➢ Implementation of ICT development programme by Ministry of Higher Education;

➢ Creation of multimedia resource centres at secondary and high schools by Ministry of Secondary Education;

➢ Liberalisation of the audiovisual sector by the Ministry of Communication;

➢ Implementation of National Governance Programme by the Prime Ministers' Office;

➢ Use of ICTs to manage State Personnel by Ministry of Public Service and Administrative Reform (SIGIPES);

➢ Computerisation of National Identity Card by the Delegation of National Security;

➢ Computerisation of Electoral Process by Ministry of Territorial Administration and Decentralisation.

External initiatives include:

➢ Definition of National Information and Communication Plan (NICI Plan) by UNECA;

➢ UNDP Initiative on ICT Policy in Cameroon within the framework of the Second Tokyo International Conference for African Development (TICAD II);

➢ ITU Support for formulation of MINPOSTEL Sector Strategy;

➢ UNESCO Support to development of community and rural radios

### 4.3.1   The National Electrification Project

The electricity supply in Cameroon is below consumer's satisfaction as there are power shortages even in some parts of the major towns hence hindering access to information and communication Technologies. Despite the efforts made by the electricity corporation (AES SONEL), some towns can be without electricity for several hours or days.

In this regard, a joint project to extend the road network and distribution of electricity in 400 localities in 8 regions to serve an additional 332,000 new subscribers (covering 1,5 million inhabitants) will soon commence.

**Organization(s)/funding sources:**  Loan agreement worth 22Billion FCFA was recently signed between the group ADB and Cameroon Represented by the Minister of the Economy, Planning and Regional Management in Tunis.

**Geographic scope and time frame**: National, ongoing to end by 2035.


In line with the National Strategy for ICT Development, certain programs or projects were identified in September 2009. Most of the projects listed below are funded through the Public Investment Fund. Some of these projects will receive funds from international donors including the African Development Bank, World Bank and the European Union.

### 4.3.2   Building Human Capacities

With limited qualitative and quantitative human resources in the managerial and technical field in general, and the ICT field in particular, the government aims to put in place a training program to build the capacity of state personnel in ICT. Related projects include: Training staff and multimedia resource center attendants on the use of ICT and creation of a training center for state personnel.

**Geographic scope cost and time frame**: National, 2 440 000 000 francs CFA from 2010 to beyond 2012.

### 4.3.3   Improving the Legal, Regulatory and Institutional Framework

The development and implementation of a legal, regulatory and institutional framework is likely to facilitate the development of an economic sector through Information and Communication Technologies, to create a competitive environment for the development and the provision of electronic communications services, stimulate innovation, create a framework for reducing costs and diversify the choices of consumers.

The Government recognizes the need to periodically revisit the legal system, regulatory and institutional framework to take account of rapid technological change.

In this regard, in order to create a conducive environment for development and delivery of electronic services related to e-government and e-commerce, the following laws were enacted in December 2010:

➢ Law No. 2010/012 of 21 December 2010 related to cyber security and cyber crime

➢ Law No. 2010/013 of 21 December 2010 governing electronic communications

➢ Law No. 2010/021 of 21 December 2010 governing electronic commerce

These laws reinforce Law No. 98/014 of 14 July 1998 governing telecommunications in Cameroon. The overall objective is to create a normative and institutional environment to facilitate and promote the integration of Cameroon in the global information and knowledge society.

**Geographic scope, cost and time frame**: National, ongoing, 340 000 000 francs CFA, from 2010 to 2012.

### 4.3.4   Strengthening the rule of Law and Sovereignty

Information and Communication Technologies will be used as a powerful tool in safeguarding the sovereignty and territorial surveillance to improve population management, the fight against antisocial behavior and behavior that may jeopardize the rule of law. The judiciary will be computerised while the process of computerising identification cards in Cameroon continues. Projects for territorial security include: Data center deployment, putting in place of a Public Key Infrastructure and a certification authority.

**Geographic scope, cost and time frame**: National, 22 336 259 000 francs CFA, before 2010 to beyond 2012

### 4.3.5   ICT Infrastructure Development

The national ICT infrastructure is almost obsolete. However, access to ICT services in general and the Internet in particular is based on the deployment of a reliable telecommunications infrastructure.

The Government is committed to develop and densify the telecommunications network and Internet development through the implementation of the electronic communications infrastructure development program. The following project to develop communications infrastructure were

identified: National backbone infrastructure (more than 5000 km of Optical Fibre cable has been laid over the national territory with an additional 50km of Fibre Optic forming a mesh in the economic capital, Douala), extension of government intranet, feasibility studies for an Internet Exchange Point (IXP), Wimax telecommunications infrastructure network and equiped multimedia centers.

**Geographic scope; cost and time frame**: National, 98 018 320 000 francs CFA, before 2010 to 2012.

### 4.3.6   Development of Social Sectors through the use of ICT

General observation shows that the use of ICT is low in both public and private sectors and within the general population. In this era of information society, ICT is an indispensible tool for human development.

To this end, the Government undertakes to ensure ownership of ICT in the sectors of health, education, agriculture or rural development.

Within the framework of the Pan-African online services project with the government of India, three projects at pilot stages have been realized. They include:

**eHealth:** The University Teaching Hospital (CHU) in Yaoundé is linked to the hub in Congo Brazzaville for tele-medicine activities

**Tele-education**: The University of Yaoundé I (National Advanced School of Engineering) has been equipped for online courses in the Central African sub-region.

**Tele-diplomacy:** The Ministry of External relation has been equipped with communication devices for high-level communication between Heads of States.

**Geographic scope, cost and time frame at national level**: 4 570 000 000 francs CFA, 2010 to beyond 2012.

### 4.3.7   Modernising the Public Service

A major focus of Government policy is to modernize the management of the state with an efficient public administration, decentralization of government, and public participation in decision-making. The capabilities of Information and Communication Technologies to enhance the modernization of public services will ensure the improvement of government's relations with citizens, public and private companies or increase the effectiveness of their internal functioning.

In this light, the Government is committed to develop online services (extension of the pan-African online service project with the Indian government, web site development, electronic management of documents and dematerialized procedures, setting up of treasury ATM payments, governmental and national ICT web portals), modernize working tools (extending the government intranet to regions, creating multimedia centers, dematerialization of public contract procedures, electronic archiving of public contract files, computerizing toll gates), scanning the national heritage and develop planning tools for strategic management (integrated fiscal management and financial

management & accounting system, accountability of government expenditure, research on socio-economic impact of ICT, developing a strategy and program for e-governance, elaboration of the '.CM' domain name policy, creating a multidimensional statistical database, spatial data infrastructure, computerizing the electoral system, feasibility studies to develop local content e.g digitizing of national cultural, scientific and touristic heritage). ICT master plans are in the process of elaboration in public administrative units, ministries websites are being developed most of which are still in the emerging (limited web presence) stage and a government intranet will be developed.

In order to have a concrete programme in the modernization of the public sector, ANTIC in partnership with UNU-IIST has elaborated the draft of the electronic governance strategy in Cameroon, the document development is based on consideration of the following perspectives:

➢ Information and Service Delivery;

➢ Internal Government Operations;

➢ Enablers;

➢ Impact on Growth and Development

**Geographic scope, cost and time frame**: National, 30 076 640 000 francs CFA, before 2010 to beyond 2012

### 4.3.8   Development of an ICT Industrial Sector

Vision 2035, plans to make Cameroon an emerging country. To achieve this, its dominant role as a consumer of technology, needs to be changed to that of a producer. In this context, the Government is committed to supporting indigenous development of service industries and ICT products through programs to promote ICT companies and support Research and Development in the area. Partnerships will be developed between the research world and the professional world in Cameroon. Major projects include: organizing a national forum on Internet and ICT governance, feasibility studies to put in place an ICT technopole in Cameroon, creation of a platform for R&D.

**Geographic scope, cost and time frame**: National, 1 525 000 000 francs CFA, 2010 to beyond 2012.

### 4.4 National ICT Research Capacity and Priorities for Cooperation

The following universities and research centres in Cameroon are undertaking ICT-related initiatives:

➢ University of Yaounde I[9]

➢ National Advanced School of Engineering, University of Yaounde I

➢ Douala University[10]

➢ Dschang University[11]

➢ Ngaoundere University

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[9] http://www.uy1.uninet.cm/
[10] http://www.univ-douala.com/
[11] http://www.univ-dschang.org/1.8/index.php

> ➢ University of Buea[12]

Based on a consultation process, each University has identified their areas of research expertise and track record and has developed an organisational profile. Existing relationships with European research institutions have also been identified. A summary of these findings are provided below:

➢ ***Department of Computer Engineering, National Advanced School of Engineering, University of Yaounde I***

- ▪ Research Expertise

  - • Simulation of flows in porous media; E-learning concepts and tools; Software testing concepts and tools; Network protocols; Health statistics; Remote system administration based on GSM protocol

- ▪ Existing relationship in place with INRIA, France; IRISA (Rennes-France) & GDAC (Canada)

➢ ***Laboratoire d'Imagerie Spatiale et d'Informatique (LISI) & Department of Mathematics and Informatics, Université de Douala***

- ▪ Research Expertise

  - • Distance learning environments (Optimal design of interfaces, traffic characterization and modelling, coding and compression of data for optimal transmission, synchronization and authentication of learners)

  - • Traffic engineering for integrated services networks (Development of new traffic models that capture the self-similar property of network traffic; performance impact of self-similarity; QoS characterization and provisioning in the presence of self-similar traffic; Application to network intrusion detection (anomaly detection))

  - • Geographic Information Systems for environmental management (Remote sensing, processing of remote sensing images)

  - • Mathematical modelling for epidemiology

- ▪ Existing relationships in place with Université Paris-Est (Marne-La-Vallée), France in relation to Geographic Information Systems for environmental management & University of Siegen and the University of Technology of Ilmenau, Germany in relation to Traffic engineering for integrated services networks.

➢ ***Department of Mathematics and Informatics, Université de Dschang***

- ▪ Data mining, Distributed systems and services, Scientific calculations, Multi-agent systems, research on sensors; Parallel Processing; Digital signal processing; Technology-enhanced Learning

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[12] http://ubuea.net/

- Existing relationships in place with AUF: Agence Universitaire de la Francophonie; Université de Paris 13; Cisco Systems

➢ *Department of Computer Science, University of Buea*

- System Modelling: Organisational Change Management; Agent Modelling and the Dynamics and Transmission of Malaria, Semantic issues in systems); Programming Language Technology (Formal Methods, Transformation Systems, Tools and Semantics);

This in turn is mapped to the Challenges of the ICT-FP7 Work Programme with the following findings:

| Challenges | Universities with expertise |
|---|---|
| Challenge 1: Pervasive and Trusted Network and Service Infrastructures | National Advanced School of Engineering (Network protocols); Department of Mathematics and Informatics, Université de Douala (Mathematical modelling for epidemiology) Department of Mathematics and Informatics, Université de Dschang; Department of Computer Science, University of Buea; Department of Mathematics and Informatics, Université de Dschang (Digital signal processing & distributed systems) |
| Challenge 5: ICT for Health, Ageing Well, Inclusion and Governance | Department of Mathematics and Informatics, Université de Douala (Mathematical modelling for epidemiology); Department of Computer Science, University of Buea (Modelling); |
| Challenge 6: ICT for Mobility, Environmental Sustainability and Energy Efficiency | National Advanced School of Engineering (Flows modelisation and simulation); Laboratoire d'Imagerie Spatiale et d'Informatique (LISI), Université de Douala; Department of Mathematics and Informatics |
| Challenge 8: ICT for Learning and Access to Cultural Resources | National Advanced School of Engineering (E-learning concepts and tools); Laboratoire d'Imagerie Spatiale et d'Informatique (LISI), Université de Douala; Department of Computer Science, University of Buea; Department of Mathematics and Informatics, Université de Dschang (Technology-enhanced Learning) |
| Research Infrastructures (Capacities Programme) | Department of Computer Science, University of Buea |

Based on Cameroon's development program (growth and employment) for the period 2010 to 2020, most of the researches are focused on the following areas:

**(i) Infrastructure development**: energy, building construction and public works, transport, water and sanitation, land management

**(ii) Modernisation of the production mechanism**: rural sector, mining, social economy and handicraft, industry and services, human development, health, education and training, gender, social protection, national solidarity

**(iii) Regional integration and diversification of trade**: regional integration

**(iv) Financing the economy**: fiscal policies, banking system, micro finance.

In line with these priorities, ICT research is also incorporated in the stated areas in order to develop electronic services including e-health, e-agriculture, e-banking, e-commerce, e-learning, electronic surveyance on transport highways.

**National Participation in FP7**

Cameroon has been successful in a number of projects within Environment, Health and Social Sciences. Under the ICT theme, the Universite De Yaounde I was a beneficiary in the Integrated Risk Management for Africa (IRMA) project. Cameroon successfully participated in proposals submitted under the FP7-Africa 2010 Call (Africa Build[13] and WaterBiotech[14] projects). It was also represented in a number of unsuccessful proposals.

Agence Nationale des Technologies de l'Information et de la Communication, Cameroon (ANTIC) through the IST-Africa Initiative, wishes to support a wider take-up of opportunities under the ICT theme. There is considerable interest in participation in EU funded research, and the number of proposals and hopefully funded projects involving Cameroon is expected to increase in future years. However, the significant gaps between calls, the high level of competition under specific thematic areas which are aligned with national implementation policy in Africa (e.g. TEL) and the long timeframe for projects to be evaluated and negotiated obviously has implications for participation. Being a Francophone country is also a barrier in a country where not everyone speaks English, which is defacto the international language of science, particularly in an EU research context.

**Level of Research Maturity**

While Cameroon has more research institutions that some other IST-Africa Partner Countries, this is clearly a key challenge. While the current primary focus is on technology adoption and developing applications, there is a strong aspiration at government level to further strengthening research capacity within the country, and facilitate the continued development of post-graduate programmes.

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[13] http://africabuild.eu/

[14] http://waterbiotech.eu/en/project.html

After the IST-Africa FP7 Training workshop held in Yaounde, Cameroon on March 21, 2010, which mainly focused on ICT-Call 7 – 9, an electronic forum of Cameroonian ICT related researchers was established. The forum is currently having over 30 active members with the aim of exchanging research views and opportunities. With these achievements, ANTIC has initiated a project that entails reinforcing the network of ICT researchers and building partnership among academia, businesses and the government in Cameroon. This has great promise for the future.

## 5.    EGYPT

### 5.1    Introduction

Egypt is situated in Northern Africa, bordering the Mediterranean Sea and sharing boundaries with Libya and the Gaza Strip. It has a surface area of 1,001,450 square km, made up of twenty-seven administrative divisions. The population is estimated at close to 82 million inhabitants (July 2011) with literacy rate of 71.4%[15]. The official languages are Arabic, English and French.

The Government of Egypt recognizes the ICT sector as a critical component of the national economy, not only due to its substantial contribution to employment, exports and diversification of the economy, but for its dynamic and innovative potential, and its broader role in providing enabling technologies, products and services that underpin the development of Egypt as a knowledge-based economy in the global market.

In relation to Communications, according to 2010 figures, there were 9.6 million fixed phone lines in use compared with 70.6 million mobile phones. There were 187,197 Internet hosts (2010) and 20.1 million Internet users (2009).

### 5.2    ICT Background

Emphasis is placed on continuing research and development in the application of ICT in industries to allow Egypt to become and remain a world-class competitor. Progress is seen as no longer dependent on natural resources but rather on creativity and innovation. To boost this concept, the Ministry of Communications & Information Technology (MCIT) has launched an initiative with a specified set of strategic objectives to emphasize the importance of, and promote, R&D in ICT industry and the applications of ICT R&D in other sectors. The MCIT R&D initiative materialized in the form of Research and Development Centres of Excellence.  The R&D Centres of Excellence are created in the form of consortia, each consisting of leading local and multinational industrial organizations operating in Egypt from both the private and public sectors, as well as Egyptian universities and research institutions. Creating mechanisms for the collaboration between academic and industrial institutions on the local and international levels is a key feature and goal of MCIT's R&D Centres of Excellence.

The first of those centres the R&D Centre of Excellence in Data Mining and Computer Modelling (DMCM), which started in 2005. R&D programs currently running in the DMCM are: (1) Data Mining

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[15] CIA World Factbook

and Computer Modelling for Oil and Gas industry, Data Mining and Computer Modelling for the Tourism industry, (3) Arabic Text and E-content Mining including Arabic Natural Language Processing, and (4) Basic Research supporting Data Mining and Computer Modelling.

Egypt's ICT sector is open to the world and international cooperation has been an integral part of the activities of the ICT sector. For Egypt, with world-class ICT infrastructure in place, a geographic location at the crossroads of major global submarine cables, a policy and regulatory environment that nurtures competition, and sizeable local and regional markets, the focus of international cooperation in the ICT sector has matured to a new level. Egypt is actively engaged in global policy dialogues to shape the priorities of the knowledge society and address issues of common concern.

Looking ahead, the vision of the Ministry of Communications and Information Technology (MCIT) for international cooperation has three main components: to enhance the political positioning of Egypt's ICT sector globally in recognition of its role in bridging the digital divide; to increase opportunities of knowledge sharing and exchange of technical expertise, especially in the areas of ICT for development and innovation; and to maintain channels for policy – level dialogue in the widest sense possible.

Egypt's ICT Policy (2007 – 2011) has been implemented. A new strategy for the ICT sector in Egypt has been under preparation during 2011 for agreement with the new Government.

## 5.3 Current ICT Initiatives and projects

### 5.3.1   ICT for Learning

The projects and programs under the ICT for Learning initiative collectively reflect MCIT's vision to use information and its underlying technologies to further sustainable human development in Egypt and to build an information society capable of absorbing and capitalizing upon the emerging knowledge revolution.

The main components/ projects of this initiative are:
➢   Education Development via Information and Communication Technology (ICT)
➢   Illiteracy Eradication Initiative
➢   E-Learning Competence Center (ELCC)
➢   ICT for Micro, Small and Medium Enterprises

### 5.3.2   ICT for Health

The Government of Egypt and its Ministry of Health have established several e-Health programs to bring better diagnostic and health services to a wider segment of the Egyptian society. MCIT has facilitated the integration of ICT in health services and the provision of medical education to remote or underserved areas of Egypt. The e-health initiative is inspired by pursuing equal opportunities for health services anywhere in Egypt, and expanding medical insurance to all citizens.

The principle objectives of the e-Health initiative are as follows:

➢ **Extend** better medical diagnostic services to rural areas

➢ **Provide** a training facility for the medical community

➢ **Acquire** international consultations for special cases

➢ **Reduce** the cost of health care through better patient management

➢ **Optimize utilization** of expertise and resources

➢ **Provide** an advanced medical services in emergencies

➢ **Create** an electronic databases for medical records

The main components/ projects of this initiative are:

➢ Emergency Medical Call Center and Ambulance Service

➢ National Network for Citizen Health Treatment

➢ Information System Units in Governmental Hospitals

➢ National Healthcare Capacity Building Project

➢ Pilot Project for Hospital Automation

➢ Women's Mobile Health Unit Project

➢ National Cancer Registry Program

➢ The Suzanne Mubarak Center for Women's Health in Alexandria

➢ IT Health Master Plan

➢ National PACS Project

➢ Integrated National Health Record System

### 5.3.3   ICT for Government

MCIT was instrumental in introducing e-government in Egypt and extending ICT into public services. As a general mandate, MCIT supports other ministries in facilitating e-Government programs and services as part of the Egyptian Information Society Initiative (EISI). One of the core objectives of the initiative is to modernize the way citizens interact with their government by introducing ICTs to the internal operations of government departments and to their interface with the public.

The main components/ projects of this initiative are:

➢ National Land Registration System

➢ Automation of Notarization Offices

➢ Prohibited from Transaction System Network

➢ Automation of Chambers of Commerce Project

➢ Egyptian Geography Network (EGN)

➢ Sheikh Zayed Geographic Information Systems Unit

➢ e-Commerce Map for Alexandria Chamber of Commerce

➢ General Organization for International Exhibitions and Fairs (GOIEF)

➢ Infrastructure Development of the City of Luxor

➢ National Organization for Potable Water and Sanitary Drainage

➢ Upgrade of the Central Agency for Organization and Administration (CAOA)

➢ National Council for Childhood and Motherhood

➢ e-Government Applications

➢ Enterprise Resource Planning (ERP) Systems

➢ Ministry of Finance

➢ Central Agency for Public Mobilization and Statistics (CAPMAS)

➢ MFTI Economic Databases and Decision Support Services

### 5.3.4  E-Content

The digital content industry encompasses the creation, design, management and distribution of digital products and services and the technologies that underpin these activities. Egypt places high regard in developing and distributing Arabic e-Content that forms the basis of intellectual and cultural inspiration for future generations. Accordingly, MCIT has led the way to the establishment of an e-content industry in Egypt through its Arabic e-content initiative. This initiative aims to enhance the competitiveness of the Egyptian e-content industry by supporting the production, use and distribution of Arabic digital content on global networks.

The main components/ projects of this initiative are:

➢ Online Journalism

➢ CULTNAT

➢ National Archives of Egypt

➢ Fekr Rama Portal

➢ Luxor Portal

➢ Egynews Portal

➢ Science and Technology Portal

➢ Community Development Portals

➢ Telecentre Network

➢ The Egyptian Sign Language Dictionary CD

### 5.3.5  Access for All

MCIT seeks to guarantee universal, easy, affordable and rapid access for all Egyptian citizens to ICT, and stimulating awareness of the potential uses and benefits of ICT. In this respect, MCIT has implemented a number of programs with the chief aim of providing benefits to users, promoting computer literacy, and encouraging increased use of ICT by the public.

The main components/ projects of this initiative are:

> IT Clubs

> Mobile Internet Unit

> Egyptian Olympiad in Informatics

> Egypt PC 2010 – Nation Online

### 5.3.6   Green ICT

Greening ICT, or applying user-friendly policies, has become a dire need. Environment protection is an important issue for human safety, for sustaining social and economic development, and for preserving natural gifts for next generations. ICT tools, widely spread currently, constitute very important potential for protecting environment, creating solutions for decreasing toxic emissions by other sectors.

## 5.4   National ICT Research Capacity and Priorities for Cooperation
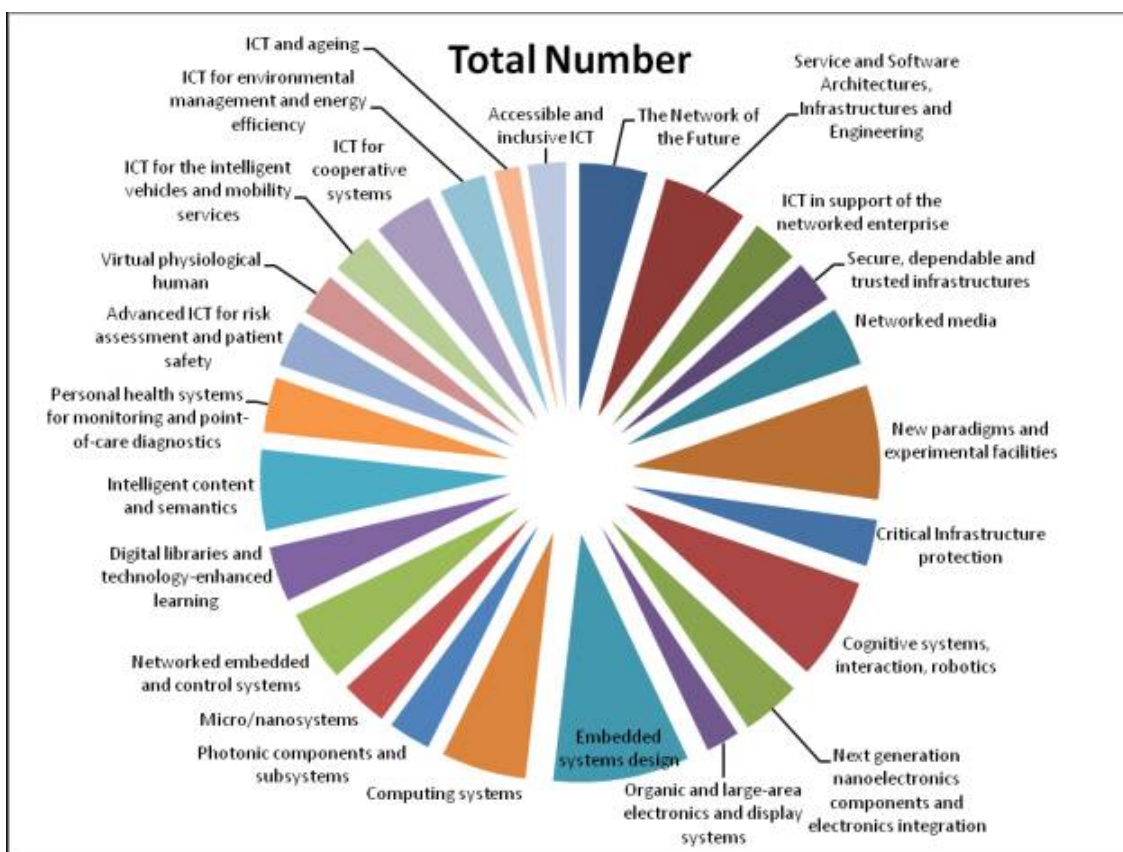


Figure 1: Research areas relevant for Egypt

Within the context of the Med-IST FP6 project[16], the Ministry of Communications and IT undertook an open consultation process with Egypt experts and researchers in academia and industry to review current research policies and to map these against the challenges available for funding under FP7-ICT. A questionnaire was circulated followed by several consultations meetings with

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[16] http://www.med-ist.eu/

stakeholders in Government, ICT Research Policy Advisory, Academic/Higher Education, Industry and Citizens. As a result of this consultation process, the stakeholder groups identified 25 research areas relevant for Egypt.

This was then narrowed down to a smaller number of focus areas: Network of the Future; Embedded systems design; Networked embedded and control systems; New paradigms and experimental facilities; Cognitive systems; Service and software architectures; Computing systems; Digital Libraries; Intelligent content and semantics.

The eight top priorities for future ICT research were identified as being

| 6.2 | ICT for Environmental Management and Energy Efficiency |
|-----|--------------------------------------------------------|
| 8.1 | Technology-Enhanced Learning |
| 5.1 | Personal Health Systems |
| 6.6 | Low-carbon multi-modal mobility and freight transport |
| 4.2 | Language Technologies |
| 1.1 | Future Networks |
| 3.3 | New paradigms for embedded systems |
| 1.4 | Trustworthy ICT |

The stakeholder group outlined future research drivers are outlined below:

| Future Research Drivers | Implications for ICT Research |
|-------------------------|-------------------------------|
| Education | 1. Research of improving the media of education<br>2. ICT Training<br>3. E-learning<br>4. Research of improving the media of education<br>5. Mobile Computing<br>6. More Arabic NLP research<br>7. Service and Software Architectures, Infrastructures and Engineering<br>8. Digital libraries and technology-enhanced learning<br>9. Intelligent content and semantics<br>10. ICT for cooperative systems |
| Health | 1. E-learning<br>2. Research on health & Medicine<br>3. E-Health<br>4. Researches on health and medicines<br>5. Bioinformatics<br>6. Visualization tools |
| Energy & Environment | 1. ICT for mobility, environmental sustainability & energy efficiency<br>2. Researches of how to benefit from renewable energies<br>3. Traffic Control Systems<br>4. Technology Transfer |
| Transportation | 1. E-learning<br>2. Mobile Computing<br>3. Traffic Control Systems |
| Food | 1. Decrease of the Devoted R&D Budget<br>2. Research on the desert cultivation and food industry<br>3. Using Biotechnology<br>4. Water usage<br>5. Traffic Control Systems |

Figure 2: Egypt's Top 5 Research Drivers

**5.4.1    Priorities in relation to the research drivers**

**ICT for Education**

The reforming of education is a national priority in Egypt. In this context, the Government of Egypt launched the Egypt Education Initiative (EEI) under Presidential auspices and monitoring. The use of ICT in education and the reform of ICT education are major components of the policies of EEI. The four pillars of EEI are: (1) Pre-university Education, (2) Higher Education, (3) Lifelong Learning, and (4) ICT Industry Development. This is a clear indication of the recognition of the significance of ICT industry development in Education reform. EEI, combined with MCIT e-Content and ICT for All Initiatives, ensure that governmental drive is guaranteed as national priority in support of ICT for Education.

Moreover, EEI, like most recent governmental programs, projects, and policies, is based on Public-Private-Partnership (PPP). This PPP forms cooperative venture by which the public needs are fulfilled while innovative private sector is flourishing. This mutual benefit ensures maximum social and economic impact.

Egypt has a well-developed ICT industry, which is focused on Education. Several Egyptian companies work on e-learning, online education, e-content, e-culture, NLP and other related field. Multinational companies such as IBM also work on R&D in areas related to ICT for Education. The Egyptian Center for the Documentation of Cultural and Natural Heritage is key player in this area with a concentration of Egyptian patents holding awards winning brains working on innovative major projects including the Archaeological Map of Egypt, the Architectural Heritage of Cairo, the Arabic Music Heritage, the Folkloric Heritage, the Natural Heritage, the Photographic Heritage, and the Manuscripts Documentation, in addition to several other international collaborative projects with the European Commission, IBM, and UNESCO. Figure 4 below outlines the FP7 objectives and challenges selected by the stakeholders as priority areas relevant to ICT for Education.

| Priority: ICT for Education | |
|---|---|
| **Research objectives** | **Relevant research areas** |
| Objective 8.1 Technology enhanced learning & Objective 8.2 ICT for Access to Cultural Resources | - Arabic archiving<br>- Text mining<br>- Multimedia data<br>- Virtual classrooms<br>- Semantic search<br>- Large-scale digital libraries in robust and scalable environment<br>- E-content<br>- Digital preservation<br>- Responsive environments for technology-enhanced learning<br>- Intelligent and adaptive learning systems |
| Objective 4.2 Language Technologies Objective 4.4 Intelligent Information Management | - e-publishing<br>- Knowledge exchange<br>- Semantic search<br>- Advanced authoring environments<br>- Technologies for personalised distribution and self-aware, |

| | | |
|---|---|---|
| | - | adaptive content |
| | - | Semantic foundations |
| | - | knowledge management systems |
| Objective 1.1 Future Networks | - | All areas of Challenge 1 can have direct applications to online and technology-enhanced learning and teaching |
| Objective 3.3 Embedded Systems Design | - | Mobile systems for educational applications |

**ICT for Health**

Egypt has also identified health as a priority for national development. MCIT signed protocols with the Ministry of Health (MoH) to modernize and computerize the health sector in Egypt. Databases and knowledge-bases are being built to facilitate the use of data and related ICT applications for R&D in health. MCIT also signed protocols with the MoH and Ministry of Higher Education and the Ministry of State for Scientific Research to start the implementation of nation-wide level cancer registry and form joint teams for the planning of scientific research on the drivers of certain diseases. Evidently, the government is providing strong support for the ICT for Health.

From the academic and R&D institutions perspective, Egypt has Colleges of Medicine, Dentistry, and Pharmacology in most of its universities and a number of medical research institutes all of which are currently concentrating on the use of ICT technology in medicine. Moreover, colleges of engineering include departments of Biomedical Engineering in addition to the health and medical related research in other engineering departments and the departments of Computer Science, Information Technology, Information Systems, and Decision Support in the colleges of computing. There have been a large number of students R&D projects for students in the above mentioned colleges and departments in the past years, a sign of growing interest and build up of human capacity and expertise in the field.

Following an increased interest, private sector developmental is focusing on ICT for health. MCIT/ITIDA have incubated a number of entrepreneurial companies undertaking ICT R&D for medical and health application who are now successful with growing market share in North America and Europe. However, ICT for Health is still a growing trend in Egypt. Capacity exists and is strong in certain areas but still being built in other areas. This explains why only one health related area was listed in the top 10 priorities nominated by the stakeholders, Objective 5.1. Strong potential is building up in other areas especially the area of Virtual Physiological Human, Objective 5.2, Bio-ICT convergence, Objective 8.3, and Medical Information and Knowledge-base Systems.

| Priority: ICT for Health | |
|---|---|
| **Research objectives** | **Relevant research areas** |
| Objective 5.1 Personal Health Systems | Wearable / portable / mobile ICT systems for the personalised monitoring for people at risk or with chronic health conditions Portable or handheld devices for point-of-care diagnostics for pre-disposition to diseases, early diagnosis |
| Objective 5.2 Virtual Physiological Human | Patient-specific computational modelling and simulation Medical data integration and knowledge extraction Intelligent and haptic medical simulation environments |

**ICT for Energy & Environment**

Egypt is facing an energy problem as Egypt's yearly oil production and consumption rates are getting closer and it is expected that consumption will exceed production in the near future. This will result in Egypt importing oil at 100[+] dollars per barrel resulting in a heavy economic burden. Transportation and electricity strongly depends on oil usage.

Some FP7 objectives indirectly contribute to the increasing energy efficiency; Objective 3.3, Embedded Systems Design, is an example. Embedded systems for control and efficient energy consumption is an approach that has been used world-wide with still strong potential. Egypt has a strong force both the institutional and human levels in both local and expatriate expertise. However, the area directly concerned with Energy and Environment is Objective 6.3 ICT for environmental management and energy efficiency. This objective ranked 19th in the existing capabilities with estimated 11 projects in Egypt. It ranked 25th though as a strong area with governmental drive and support being the key strength. This is an indication that although Egypt has some capabilities in this area but it still needs to strengthen these capabilities. But it is important to note that some projects and teams with varying degrees of success are working on ICT and data related energy production and efficiency optimization in several universities as well as private sector R&D companies.

| Priority: ICT for Energy & Environment | |
| --- | --- |
| **Research objectives** | **Relevant research areas** |
| Objective 3.3 Embedded systems design | - software architecture<br>- software design |
| Objective 3.1 Very advanced nanoelectronic components: design, engineering, technology and manufacturability | - Photo cell<br>- Semiconductor<br>- MEMS |
| Objective 6.2 ICT systems for energy efficiency | - data forecast<br>- computational modelling<br>- Collaborative systems for environmental management<br>- ICT for intelligent monitoring of energy production, distribution<br>- models and platforms for energy efficient services |

*ICT for Transportation*

Egypt recognizes the importance and criticality of having efficient and effective transportation systems. Traffic is a major problem in major Egyptian cities such as Cairo and Alexandria. Egypt started relying heavily on ICT technology to solve this problem. A new traffic law planned to be in effect in August 2008 is relying on new design for license plate with RFIDs associated with RFID tracking system. Research is also running in several universities on the development of intelligent image and video analysis and recognition for traffic control and law enforcement by means of networks of smart cameras, radars, and other ICT-based systems. Transportation development is not limited to traffic systems and tools. Ports of different types and media are also being developed and new ones are being built with the supporting ICT systems. Several areas of Challenges 1 and 3

are well developed in Egypt with tailored solutions for transportation application. Objectives 6.1 and 6.2 are the most directly relevant to transportation. Several academic projects and even ICT industries develop solutions for Location-aware Personalised Services and ICT-based Freight Transport Solutions, which map to Objective 6.1 and Real-time Traffic Management and Control and Vehicle-to-vehicle or Vehicle-Infrastructure Communication Systems, which map to Objective 6.2.

| Priority: ICT for Transportation | |
|---|---|
| Research objectives | Relevant research areas |
| Objective 6.6 Low carbon multi-modal mobility and freight transport | Location-aware Personalised Services based Freight Transport Solutions |
| Objective 6.7 Cooperative Systems for energy efficient and sustainable mobility | Real-time Traffic Management and Control<br>Vehicle-to-vehicle or Vehicle-Infrastructure Communication Systems |

In conclusion the stakeholders agreed that Egypt needs to undertaken more R&D activities in order to respond to the challenges and threats posed by each of the above issues. Egypt has capacity, institutions and personnel, and has been working to develop solutions to the challenging problems. Expanding international cooperation with the EU through the FP7 will have a profound impact on the national development as well as the exchange and integration of ideas, solutions, and expertise for issues and challenges of mutual interest between Egypt, the MEDA region, and the EU.

### 5.4.2   Priorities in relation to FP7-ICT Challenges

The stakeholder group identified the following priorities in relation to FP7-ICT challenges:

#### 5.4.2.1 Challenge 1 - Objective 1.1 Future Networks

Challenge 1, Pervasive and Trusted Network and Service Infrastructures, in general and Objective 1.1, Future Networks was considered to be highly relevant in terms of available human capacity, competitive industry, academic programs, government drive, and international experience. Egypt has invested heavily in the build up of networks infrastructure, resulting in a well-developed communication systems infrastructure and a growing industry focused on innovative, rather than just a developmental level. Egyptian companies are competing internationally for both developmental and R&D projects in this area. The following institutions are carrying out R&D projects in this area:

➢ Ein Shams University

➢ Cairo University

➢ Azhar University

➢ Alexandria University

➢ Helwan University

➢ Mansoura University

➢ Assiut University

➢ National Telecommunications Institute

- ➢ Nile University
- ➢ Arab Academy for Science, Technology & Maritime
- ➢ Atomic Energy Institute
- ➢ Orange (France Telecom)
- ➢ Several entrepreneurial companies
- ➢ All Engineering and Computer Science colleges in most Egyptian Universities.

### 5.4.2.2 Challenge 3 - Objective: 3.3 New paradigms for embedded systems, monitoring and control towards complex systems engineering

Embedded systems are relevant to almost all industries from automotive to home appliances and medical systems and even hand-held devices. Embedded systems enable intelligent control, optimized performance, efficient energy consumption, enhanced safety and many other functions in every industry and every-day life. Key strengths in relation to this area are: strong human capacity quality of research, infrastructure, and industry. Several Egyptian companies are providing Embedded Systems Design services for the local and international markets. The following institutions are carrying out R&D projects in this area:

***Academia***

- ➢ Ein Shams University (Faculties of Engineering & Computer Science)
- ➢ Cairo University
- ➢ Alexandria University
- ➢ Mansoura University
- ➢ Assiut University
- ➢ Helwan University (college of Engineering and College of Computer Science)
- ➢ All colleges of Engineering in Egyptian universities.

**Industry**

- ➢ *Emad Hegazy*: System on chip of RF/PHY/MAC layers, embedded software for telecom applications.
- ➢ IBM
- ➢ Valeo

### 5.4.2.3 Challenge 8 - Objective 8.1 Technology Enhanced Learning

With an increase in the number of Egyptians using the Internet and making use of the vast information available in Arabic, it is important to leverage digital libraries for learning. Content creation, preservation, and assurance of users to acquire information are all important aspects to advance learning and knowledge-bases, There is a strong push in Egypt in making use of the digital technology in the learning system through the creation of the first completely e-learning university, encouraging faculties to make their courses available online. All this in addition to the EEI

highlighted earlier and the e-content initiative aiming at the digitization of the entire written repertoire of Egypt, and other initiatives in the Ministries of Education and Higher Education and State for Scientific Research are actualized governmental programs guaranteeing the strong drive, continued momentum, and the developed know-how with regard to Objective 4.1. Moreover, the Egyptian expertise in eCulture with large Digital Libraries of integrated multimedia contents for E-Culture and E-Heritage through the Bibliotica Alexandrina and CultNat represent a history of achievements and substantial know-how in this field. The emerging Web 2.0 necessitates further development of Digital Libraries and the surrounding ICT solutions for storage, retrieval, and knowledge extraction from such libraries, with emphasis on the characteristic features of Arabic language, art, and heritage. Realizing the importance of this issue, the UN-ESCWA hosted an experts meeting on the promotion of Arabic e-content that resulted in the launching of the Promotion of Arabic E-content Initiative by Incubation initiative. While some countries in the region are in need for such incubation to build an Arabic content industry, Egyptian industry in this area is strong, not only in relation to the governmental programs and initiatives, but primarily on the Egyptian private sector industry. Several Egyptian R&D companies specialize in this area with some of which having international award-winning products and complete portfolios of relevant projects and solutions. RDI, Coltec, and Alkhawarizmi, and Sakhr are just examples to name a few. Egypt has the relevant human capacity, existence of academic programs, governmental drive and support, industry, experience, infrastructure, market, and publications to undertake R&D activities in this domain. Research collaboration with the EU community in this field is of great interest and benefit for both regions. The following institutions are working on Digital Libraries and Technology-enhanced Learning:

➢ Helwan University (College of Engineering, College of Computer Science, and College of Arts)

➢ *Arabia Inc.:* Issues of the International Fiqh Academy Magazine (66,000 pages - 561 Researches), Islamic Research Magazine (76 Issues) containing 1300 Researches and Articles, Zakah Seminars and Conferences Project (13 Seminars+ 4 Conferences), Anti-Smoking Series (20 Books), NLP Series (10 Books), Verified Heritage Books (7 Books), *Hadîth* Books Encyclopedia (Mastering Hadîth through Perfecting At-Tuhfah (Hadîth Collection)    (96 Volumes), Collection of Sunnah Encyclopedia (700 Books), Inheritance Calculation Encyclopedia (8 books), The Glorious Qur'ân Encyclopedia (25 Books + 300 Volumes + 256 Audio Records), Recitations Encyclopedia (50 Books + 9120 Audio Records), Morphologiacal Analyzer, Semantic Analyzer & Search Engine, Development of Architecture Systems Software, Development of DMS Systems Software, Development of Library Management   Systems Software, and Development of 5 WEBSITES & PORTALS with Intensive Digital Content.

➢ *Maher Harras:* Developing an Arabic Automatic classifier, Developing an Arabic Automatic summarizer, Developing a Morphological Analyzer that handles peculliarities of  Arabic Language, Developing an Automatic Information gathering and Processing System.

➢ *Maged Hegazy:* Bredge™ Learning Management System, Bredge™  Learning Management System – Corporate edition, Bredge™  School Management System, Bredge™  Online Testing

System, Bredge™ Competency Management System, Bregde™ Sales Academy, Bredge™ CAT Academy, Abtal Shotar™.

- *CMIC (Cairo Micorsoft Innovation Center).*
- Bibliotheca Alexandrina
- Ministry of Higher Education
- IBM Egypt
- EngNet Company
- Ain Shams University
- Cairo University (College of Computer Science)
- Faculty of Arts, Cairo University
- ITIDA sponsored projects in collaboration between Egyptian universities and industry
- Data Minind & Computer Modelling Centre of Excellence
- MCIT
- CultNat
- TAIA-IT
- Several entrepreneurial companies

### 5.4.2.4 Challenge 4 - Objective 4.4 Intelligent Information Management & Objective 4.2 Language Technologies

Egyptians are becoming more involved in content creation through daily web activities and online communities. Content personalisation and distribution, and community building are essential for further development of collaborative learning. Arabic Natural Language Processing and Intelligent content management is of paramount importance in the region not only in Education but also in other areas. Egypt has significant strength and competence in this area in terms of University and Industrial research as well as SME's working in this field. Arabic content creation and management is an area that is receiving national interest and one of the components of Egypt ICT Export Strategy. The following institutions are undertaking activities relevant to Objective 4.4 and Objective 4.2 Language Technologies:

- Helwan University (College of Computer Science)
- Maher Harras: Developing a digitization system for implementing and managing the e-publishing process of Arabic resources, An Arabic search engine, has been developed especially to perform semantic based search in Arabic text. It could be customized to be multilingual
- Ein Shams University
- Cairo University
- CMIC (Cairo Microsoft Innovation Center)
- RDI Company - After building their own novel Arabic Lexicon and a line of products, some of which are international award winning, they have built semantic tagging system for semantic

web and semantic-based search engines and tools. Their research output is in use by the Text and E-content Mining group of the R&D CoE in Data Mining and Computer Modelling.

➢ Specified Systems Laboratory in Ministry of Agriculture

➢ All Computer Science & Engineering Faculties in all Universities

### 5.4.2.5 Challenge 5 - Objective: 5.1 Personal Health Systems

Personal Health Systems addresses the development of wearable, portable, and mobile ICT systems for the personalised monitoring for people at risk or with chronic health conditions. It also addresses the development of portable or handheld devices for point-of-care diagnostics for pre-disposition to diseases, early diagnosis. Both those areas are well developed in the departments of Systems and Biomedical Engineering at Egyptian Universities with presence of a large pool of talented, well educated and well-trained students. Now several projects, some of which are entrepreneurial, started developing devices of those categories for industry and market use. The following institutions are undertaking activities relevant to this challenge:

**Academia**

➢ College of Medicine – Cairo University (Kasr El-Einy Hospital)

➢ Nile University

➢ Medical Engineering Dept. in Cairo University

➢ Research in Systems & Bio-medical Engineering Dept. in Cairo University

➢ Colleges of Engineering and Computer Science in most Egyptian universities

**Industry**

➢ CMIC

➢ Pulse for Integrated Solutions

➢ Several entrepreneurial companies

### 5.4.2.6 Challenge 6 - Objective 6.6 Low carbon multi-modal mobility and freight transport

The following institutions are undertaking activities in this domain:

➢ All Engineering & Computer Science Faculties in all Universities.

➢ American University in Cairo

➢ Nile University

### 5.4.2.7 Challenge 6 - Objective 6.7 Cooperative Systems for energy efficient and sustainable mobility

In August 2007, the Egyptian government has removed energy subsidies for high-energy intensive industries that includes steal, fertilizers, aluminium, and cement. This is part of a larger plan for energy management in Egypt. Energy management and efficient usage became an important factor for industries to monitor and implement. Research in these areas is important to maintain high competitive industries and successful economic growth. The high Egyptian vulnerability of

sustainable energy supply in the very near future makes research in this domain an integral part of the larger Egyptian policy for energy management. ICT will play an important role in the future to ensure useful energy usage, and implementing state-of-the-art research in this area will assure the best result possible in this domain. This justifies the need for extensive collaborative R&D in this area. The justification for the competency in the area was given above under ICT for Energy and ICT for Transportation. The following institutions have a history of achievements in this area:

➢ ePower dept. of Engineering Faculty in the Ain Shams University.

➢ Ministry of Electricity & Energy.

**National Participation in FP7**

Egypt is currently involved in 77 FP7 projects across the ICT, Environment, Health, Space and Social Sciences themes. Project involvement under the ICT Theme includes IST-Africa[17] 2010 – 2011, IST-Africa 2012 – 2013, JOIN-MED, EuroAfrica-P8[18] project (2012 - 2013), Virtual Museum Transnational Network (V-MUST.NET)[19] Network of Excellence (2011 – 2015) and Tools and expertise for 3D Collection Formation (3D-COFORM)[20] Integrated Project (2008 - 2012). Egypt is also involved in BRAGMA, CAAST-Net, IDEAL-IST, MIRA, EumedConnect: NReNs interconnection to GEANT and NATP: Support to Regulatory Reforms and Harmonization in the Mediterranean Region. Egypt has also been represented in unsuccessful proposals.

There is a strong appetite for continued participation in EU funded research, and the number of funded projects is expected to increase in future years. However, the significant gaps between calls, the high level of competition under specific thematic areas which are aligned with national implementation policy in Africa (e.g. TEL) and the long timeframe for projects to be evaluated and negotiated obviously has implications for participation.

**Level of Research Maturity**

Egypt has a vibrant research community and this is boosted by the critical mass of research institutions compared to most of the IST-Africa Partner Countries. A great deal of work has been carried out in areas including Incubators to build links between universities and entrepreneurial commercialisation of research. Quite a few international technology companies have operations in Egypt, which clearly provides an additional emphasis to innovation already driven by Egypt's increasingly important software industry.

While there is a clear focus on technology adoption and developing applications, there is a strong research tradition in many of the Egyptian universities. The new government has ambitious goals to further strengthen national research capacity, and facilitating continued development of post-graduate programmes and involvement in cross-border research.

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[17] http://www.ist-africa.org
[18] http://euroafrica-ict.org/
[19] http://www.v-must.net/
[20] http://www.3d-coform.eu/

# 6.   REPUBLIC OF KENYA

## 6.1   Introduction

Kenya is situated in East Africa, bordering the Indian Ocean and sharing boundaries with Tanzania, Uganda, South Sudan, Ethiopia and Somalia. It has a surface area of 580,367 square km, made up of Nairobi and seven provinces. The population is estimated at close to 41 million inhabitants (July 2011) with literacy rate of 85%. The official languages are English and Kiswahili.

In relation to Communications, according to 2010 figures, there were 460,100 fixed phone lines in use compared with 24.969 million mobile phones. There were 47,676 Internet hosts (2010) and 3.9 million Internet users (2009).

The Government of Kenya through the Vision 2030 Development Blue Print recognizes the importance of ICT in economic development and has therefore initiated major steps to promote its use. One of the major initiatives that the Government is pursuing is to improve ICT infrastructure in order to bridge the digital divide and lower the cost of communications. The Government is also levelling the ground through the development and implementation of policy and regulations aimed at attracting investment within the sector. The Government recognizes information to be a resource that must be generated, collected, organized, leveraged, secured and preserved to enhance national prosperity.

Kenya aspires to achieve the status of a knowledge and information-based society by 2030. This aspiration is linked to the growth in the global business outsourcing industry that has opened a new window for developing countries to exploit a new growth area for ICT enabled Services (ITES) and BPOs. ICT has become a key driver of Kenya's economic growth over the last decade accounting to 13 per cent of growth in GDP.

## 6.2   Current ICT Initiatives and projects

Kenya, through Vision 2030 recognises ICT as a foundation for a knowledge economy. Developing affordable information and communication network infrastructure and applications is central to building the information economy. Accordingly, the Government's objective is to ensure that the country has a competitive telecommunications industry that delivers reliable and affordable services and products for the economic and social benefit of citizens. The development of ICT Parks and Digital Villages will gradually lead to low-cost provision of ICT goods and services. This is also expected to facilitate the growth and establishment of BPOs.

The laying of the undersea Fibre Optic Cable from Mombasa to Fujairah in UAE linking Kenya to the global fibre optic submarine system was completed in 2009. This project has provided Kenya with a

reliable and affordable high capacity bandwidth. The laying of 5,500 km of terrestrial fibre optic cables covering most parts of the country has also been completed and linked to the undersea fibre optic network resulting in considerable efficiency and reduction in ICT costs. For instance, a 5-fold reduction has been achieved in the cost of transmission of a megabyte of data between 2008/09 and 2009/2010.

### 6.2.1   Kenya Transparency Communication Infrastructure Programme (KTCIP)

The   KTCIP programme aims to ensure equity in the provision of ICT services. The programme has two components, namely:

➢  Establishment of Digital Villages

The Government is currently supporting the development of digital villages at the constituency level. These centres will provide avenues for the full utilization of the fibre cable infrastructure for BPO related initiatives. This will also facilitate online delivery of Government services and capturing statistical data right from the constituency level.

➢  Bandwidth subsidy

This component aims at providing bandwidth subsidy for universities and colleges, business processing outsourcing, e-government and content development and digitization. This will accelerate the usage of ICT in learning, social and government institutions.

### 6.2.2   Data Centre/Data Recovery Centre

The Government Data Centre (GDC) will be established to provide storage for all government databases. In addition, the Neutral Data Centre (NDC) will provide world-class services to government ministries, departments and agencies, private sector operators and businesses.

### 6.2.3   Integrated Management Information Systems (IMIS)

This project aims to improve on governance. The following systems will be developed: Pensions Management Information System (PMIS); a Company Registry and e-voting; digitized court recording; Geographic Information System (GIS); digitization of archival resources at the Kenya National Archives; Land Registry System; Electronic Banking Systems and Integrated Population Registration System (IPRS).

### 6.2.4   Information and Content Development

The Government has embarked on initiatives aimed at leveraging on digital content to unlock new opportunities to conduct business.  The scope of information and content activities within the ICT sector include digital content strategy, creating and protecting content and delivering and accessing content.

### 6.2.5   Public-Private Partnership (PPP) Projects

#### 6.2.5.1   Rural ICT Enterprises (RIEs)

The Government is facilitating the marketing of locally assembled ICTs such as the PCs and related ICT products on behalf of SACs. It will also encourage rural ICT SMEs or "digital villages" with the necessary minimum ICT platform for electronic communications to take place. These RIEs will be based at the constituency level in an effort to offer business solutions suitable to rural settings, taking into consideration the specific business and commercial needs of Kenya's rural economy. In addition, the RIEs will have the capacity to provide affordable access to basic and a diversity of ICT services to the surrounding population.

#### 6.2.5.2   Madaraka PC Project

In collaboration with ICT incubators at Jomo Kenyatta University of Agriculture and Technology (JKUAT), University of Nairobi (UoN), Kenya College of Communications Technology (KCCT), and Strathmore University (SU), the government is implementing a project to assemble a low cost PCs for the local market. The project is intended to provide an incubation environment for students in local universities. In addition, it will give Kenyans access to affordable, robust PCs and create a market which will not only provide hardware and software products, but also create an environment where these products can be developed and manufactured. It will also facilitate the provision of after-sale and maintenance services.

#### 6.2.5.3   Multimedia Technology Parks (MTPs)

The Government has identified the Export Processing Zones (EPZ) in Athi River as the location site for the proposed Multimedia Technology Parks. Plans are therefore underway to establish more ICT enterprises.

#### 6.2.5.4   Konza Technology Park

The Government has proposed to set up a technology park at Konza, which is part of the Vision 2030 Flagship Programmes. The Government through the Ministry of Information and Communication is set to break ground for the construction of Konza Technology City, the first smart City of its kind in Kenya and Africa. The Tech city will host BPO park, Science park, Convention centre, mega mall, hotels, international schools, world class hospitals, Championships Golf Course, Financial District, High Speed Mass Transportation and Integrated Infrastructure.

The main objective of developing an ICT park is to serve as an enabler to wealth and job creation as well as being an avenue to provide the necessary environment to attract investment. The park will also facilitate business activity within and outside the country, reinforce efficient linkages between the private and public sector, promote the acquisition and usage of ICT in the country and promote good ICT governance.

The Smart City will open up a world of opportunities and facilitate success through a thoughtful environment and intelligent infrastructure with advanced support systems. It is part of a wider

scheme to position Kenya as the region's technology hub, using development to entice more companies to set up base in the country.

### 6.2.5.5  ICT Hardware

ICT hardware is a very important component of ICT infrastructure and a pre-requisite to any meaningful deployment of ICT services to the population.  Unfortunately, they have to be imported and until recently, imported hardware parts were not subject to any fiscal concessions. Currently, the taxes on ICT hardware are largely zero-rated.  Zero-rated taxes on ICTs are integral to the stated government policy objective of universal access to affordable ICT services. The Government will set up National ICT Centres of Excellence to develop a critical mass of human resource required to support capacity for the industry.

### 6.2.5.6  ICT Software

The Government is currently holding negotiations with various ICT software providers with a view to securing bargains that will make ICTs affordable and universally accessible.  In addition to providing fiscal concessions on software, the Government will also promote local software development by encouraging a scheme to ensure that at least 50 percent of Government software procurement is sourced from local software developers. The Government will also encourage software multinationals like *Microsoft* and *Oracle* to offer special incentives such as free development tools, training, certification and marketing support to local software developers.

### 6.2.5.7  E-Government

The achievement of e-Government in Kenya has been one of the main priorities of the Government of Kenya towards the realization of national development goals and objectives for Wealth and Employment Creation, as stipulated in the Kenya Vision 2030. The Government of Kenya established the e-Government Programme in June 2004. It has since then committed itself towards achieving an effective and operational e-Government to facilitate better and efficient delivery of information and services to the citizens, promote productivity among public servants, encourage participation of citizens in Government and empower all Kenyans.

Some of the key online services available through the e-government initiative include:

➢  Application of public service jobs online

➢  Tacking statutes of ID and passports

➢  Exam results and candidate selection

➢  Submission of tax returns

➢  Custom services

➢  Reporting of Corruption

➢  Business licensing e-registry

Other ongoing e-government projects include:

➢  Government shared services

➢ Government Data Centre

➢ Community Learning Information Centres

➢ County connectivity project

➢ Interactive Voice Response System

➢ Government unified messaging system

➢ Capacity building

### 6.2.5.8  *Mobile based services*

There are currently four mobile service providers operating in Kenya with over 63.5% of the Kenya population with mobile phones. This widespread mobile coverage has also been accompanied by rapid ICT entrepreneurship in service delivery. Notable of them all is mobile banking and money transfer services where most Kenyans even those in rural areas can pay for services and transfer money using any of the four mobile service providers in the country.

## 6.3  National ICT Research Capacity and Priorities for Cooperation

To address the macroeconomic and social challenges and achieve the transformation to a knowledge-based economy, priority sectors in which ICT will be integrated to solve societal challenges have been identified.

The national sectors significant to achievement of national growth and development targets are:

➢ Agriculture, Rural Development and related industries

➢ Health and Life Sciences

➢ Trade and Industry

➢ Human Resource Development

➢ Physical Infrastructure

➢ Energy

➢ Environment and Natural Resource Management

➢ Information Communication Technology (ICT)

The following universities and research centres are currently involved in ICT research in Kenya

➢ Strathmore University[21]

➢ Moi University[22]

➢ University of Nairobi[23]

➢ Mombasa Polytechnic University College[24]

➢ Multimedia University College[25]

➢ Presbyterian University of East Africa[26]

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[21] http://www.strathmore.edu/
[22] http://www.muk.ac.ke/
[23] http://www.uonbi.ac.ke/
[24] http://www.mombasapoly.ac.ke/
[25] http://www.mmu.ac.ke/
[26] http://www.puea.ac.ke/

➢ Kenya Polytechnic University College[27]

➢ Kenya Methodist University[28]

➢ United States International University[29]

➢ Mt. Kenya University[30]

➢ Egerton University[31]

➢ Jomo Kenyatta University of Agriculture and Technology[32]

➢ Kenya ICT Board[33]

➢ Kenya Agriculture Research Institute[34]

➢ Kenya Medical Research Institute[35]

➢ Masinde Muliro University of Science and Technology[36]

➢ Inoorero University[37]

➢ Kenya Education Network Trust (KENET)[38]

## 6.4    Research Priorities in relation to FP7 ICT Challenges

Following the IST-Africa FP7 Training Workshop held in March 2010 in Nairobi, the Ministry of Higher Education, Science and Technology (MOHEST) together with the national ICT stakeholders conducted a mapping exercise to identify research priorities in relation to FP7 ICT Challenges. The results of this exercise are outlined in the tables below:

**Research Priorities in relation to FP7 Call 8**

| Challenge | Objective | Institutions involved in R&D activities under the objective |
|---|---|---|
| **Challenge 1: Pervasive and Trusted Network and Service Infrastructure** | ICT 2011.1.1 Future Networks | • Egerton University<br>• Moi University<br>• Masinde Muliro University of Science and Technology<br>• Kenya Polytechnic University College<br>• Strathmore University<br>• United States International University<br>• Kenya Methodist University<br>• Inoorero University<br>• Kenya Education Network Trust (KENET) |
| | ICT 20011.1.2 Cloud Computing, Internet of Services and Advanced Software Engineering | • Moi University<br>• Strathmore University<br>• United States International University<br>• Kenya Methodist University |

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[27] http://www.kenyapolytechnic.ac.ke/
[28] http://www.kemu.ac.ke/
[29] http://www.usiu.ac.ke/
[30] http://www.mku.ac.ke/
[31] http://www.egerton.ac.ke/
[32] http://www.jkuat.ac.ke/
[33] http://www.ict.go.ke/
[34] http://www.kari.org/
[35] http://www.kemri.org/
[36] http://www.mmust.ac.ke/
[37] http://www.iu.ac.ke
[38] http://www.kenet.or.ke/

| | ICT 20011.1.4 Trustworthy ICT | • Moi University<br>• Kenya Methodist University<br>• Inoorero University<br>• Kenya Education Network Trust (KENET) |
|---|---|---|
| **Challenge 4: Technologies for Digital Content and Language** | ICT 2011.4.4 Intelligent Information Management | • Moi University<br>• Strathmore University<br>• Inoorero University<br>• National Council for Science and Technology |
| **Challenge 6: ICT for a Low Carbon Economy** | ICT 2011.6.3 ICT for efficient water resources management | JKUAT |
| **Challenge 8: ICT for Learning and Access to Cultural Resources** | ICT 2011.8.1 Technology-Enhanced Learning | • University of Nairobi<br>• Egerton University<br>• Moi University<br>• Masinde Muliro University of Science and Technology<br>• Kenya Polytechnic University College<br>• United States International University<br>• Kenya Methodist University<br>• Mt. Kenya University<br>• Inoorero University<br>• Kenya Education Network Trust (KENET) |

**Research Priorities in relation to FP7 ICT Call 9**

| Challenge | Objectives | Interested Institution |
|---|---|---|
| **Challenge 2: Cognitive systems, interaction, robotics** | ICT 2011.2.1 Cognitive Systems and Robotics (b), (c), (e) | Jomo Kenyatta University of Agriculture and Technology |

**National Participation in FP7**

Kenya is gradually building up success in proposals submitted under ICT and STI themes, with current participations in CAAST-Net[39] (2008 – 2012), IST-Africa[40] 2010 – 2011, IST-Africa 2012 – 2013, ERA-Net Africa[41], PAERIP [42], BRAGMA, EuroAfrica-P8[43] project (2012 - 2013) and Crop Monitoring as an E-agriculture tool in developing countries (E-AGRI)[44] (2011 - 2014).

Kenya is currently involved in four FP7 projects – BRAGMA, CAAST-Net, ERA-Net Africa and IST-Africa, but has also been represented in a number of unsuccessful proposals. There is an appetite for participation in EU funded research, and the number of proposals involving Kenyan institutions expected to increase in future years. However, the significant gaps between calls, the high level of competition under specific thematic areas which are aligned with national implementation policy in Africa (e.g. TEL), the limited funding specifically focused on SICA international cooperation projects and long timeframe for projects to be evaluated and negotiated has implications for participation.

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[39] www.caast-net.org/
[40] http://www.ist-africa.org
[41] http://www.erafrica.eu/en/159.php
[42] http://www.paerip.org/
[43] http://euroafrica-ict.org/
[44] http://www.e-agri.info/index.html

**Level of Research Maturity**

Kenya has quite a strong research tradition, and a relatively large number of research institutions compared to some other IST-Africa Partner Countries. This can only be beneficial. Kenya – like a number of other IST-Africa Partner Countries is actively trying to develop a national software sector and attract Foreign Direct Investment, reinforcing the drive for innovation. The country is positioning itself as a regional hub for East Africa, which is facilitated by Nairobi's importance as an airline hub.

One of the key challenges is the small number of research institutions. While the current primary focus is on technology adoption and developing applications, there is a strong policy focus on further strengthening the research capacity within the country, and especially in facilitating the continued development of post-graduate programmes and involvement in cross-border research.

# 7.    KINGDOM OF LESOTHO

## 7.1   Introduction

The Kingdom of Lesotho is located in Southern Africa, an enclave of South Africa. Lesotho has an area of 30,355 km. Sixty one percent of the population of 1.9 million[45] is between 15 and 64 years of age (median 22 years). English and Sesotho are the official languages, with 85% literacy.

Key sectors in Lesotho are agricultural, followed by industry and services. Lesotho produces about 90% of its own electrical power needs. Export partners include US, Belgium and Canada.

The ICT Policy was approved and adopted as a working document in March 2005. The main driver of the ICT policy is the Ministry of Communications, Science and Technology.

In relation to Communications, according to 2010 figures, there were 38,800 fixed phone lines in use compared with 698,800 mobile phones.  There were 632 Internet hosts (2010) and 76,800 Internet users (2009).

## 7.2 ICT Background

Lesotho's ICT Policy identifies nine critical areas for the development of the country, namely;
  ➢ ICT and supporting infrastructure
  ➢ Education and human resource development
  ➢ Enabling legal and regulatory framework
  ➢ Rapid delivery of ICT services to society
  ➢ E-Government
  ➢ E-Commerce
  ➢ Health
  ➢ Agriculture and Food Security
  ➢ Tourism, Environment and Natural Resources
  ➢ Gender and Youth

Access to telecommunications services in Lesotho is approximately 3% of the population for fixed line and just over 20% of the population for mobile. Internet access is still nascent, with only 2% of residents subscribing to Internet services, with additional access at Internet cafes, primarily in

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[45]  CIA Factbook

Maseru. Efforts to expand the network further are at an advanced stage through the utilisation of the proposed Universal Access Fund (UAF). It is believed that utilisation of the UAF will assist the sector to overcome challenges that include difficult terrain.

The proposed regulatory framework encourages the deployment of converged technologies, which can be offered over existing networks using IP technology.

In relation to overall infrastructure, the country intends to adopt a technology neutral approach in selecting appropriate, scalable technology needed to build robust communications networks. Secondly, the policy seeks to encourage the expansion of the national electricity grid in order to support the deployment of ICT infrastructure.

## 7.3 Current ICT Initiatives and projects

The following section provides an overview of current ICT initiatives ongoing in Lesotho in the areas of eLearning, eHealth and eGovernment.

### 7.3.1 eLearning / Technology-Enhanced Learning

Despite its poor ICT infrastructure and high levels of poverty, Lesotho has begun to take the necessary steps to promote higher levels of ICT access and usage in its communities and education institutions. The Government of Lesotho has adopted a National ICT Policy that makes references the education sector. Over the past few years, the NEPAD eSchools Demo Project in Lesotho has been a catalyst in focusing attention on the potential that ICTs hold to enhance education in the country.

Two key projects in the school sector are the NEPAD eSchools Demo Project and SchoolNet Lesotho. There are also reportedly a few private sector companies engaged independently in making some technology accessible to schools at a price on the basis of leasing PCs to schools.

#### 7.3.1.1   NEPAD eSchools Demo Project

The New Partnership for Africa's Development (NEPAD) eSchools Initiative is a multicountry, multi-stakeholder, continental initiative that aims to impart ICT skills to young Africans in primary and secondary schools and improve the provision of education in schools through ICT applications and the use of the Internet.

The first phase of the initiative is a demonstration (demo) project that is being implemented by the private sector partners. The objectives of the Demo Project are to:

➢  Determine typical e-school scenarios and requirements in various circumstances in Africa

➢  Highlight the challenges inherent in a large-scale implementation of e-school programmes

➢  Monitor the effectiveness of multi-country, multi-stakeholder partnerships

➢  Determine best practice and exemplary working models for the large-scale implementation of the initiative, which aims to equip more than 550,000 African schools with ICTs and connect them to the Internet

> ➤ Demonstrate the costs, benefits, appropriateness, and challenges of a satellite-based network

> ➤ Demonstrate the costs, benefits, and challenges of ICT use in African schools

Lesotho is one of the 16 countries where the Demo Project was co-ordinated by a dedicated country liaison person based at the Ministry of Education and Training. Oracle and Microsoft are two companies that formed consortia to support the Demo Project in six Lesotho high schools where the typical model involved fitting each school with a lab comprising approximately 20 PCs, a server and printer, and a media lab which in some instances included a PC-based kiosk containing health information and satellite television access to education channels. Teachers at the six schools received training and learners have subsequently used the PC labs in the classroom.

**Funding sources:** Private sector partners

**Geographic scope and time frame:** National; ongoing

### 7.3.1.2   *SchoolNet Lesotho*

SchoolsNet Lesotho's role is to promote learning and teaching through ICTs to schools in Lesotho. SchoolNet Lesotho held launch workshop in 2005 with the support of the Open Society Initiative for Southern Africa (OSISA). It is run largely as an organization of volunteers and is dependent on donor funds.

**Geographic scope and time frame:** National; ongoing.

### 7.3.1.3   *Pan African eNetwork – Tele-Education*

This project aims at providing tele-education services to 10,000 African students to undertake Post-Graduate, Under-Graduate, PG Diploma and Diploma and skill enabling certification courses in subjects such as Business Administration, IT, International Business, Tourism and Finance over a 5-year period in Indian Universities/Educational Institutions.

The National University of Lesotho through its outreach programme Institute of Extra-Mural Studies (IEMS) is connected to Universities in India where students in Lesotho have access to lectures in Indian universities. There have already been regular tele-education services.

### 7.3.1.4  *CECS ICT Literacy Programmes*

The Community Education Computer Society (CECS) is a South African-based NGO, which focuses on the development of ICT skills in the form of literacy programmes across southern Africa. Lesotho is one of six countries where CECS has a dedicated ICT literacy programme that was established with the support of the Open Society Initiative for Southern Africa (OSISA).

The 80-hour programme on ICT literacy enables participants to use word processing, spreadsheet and presentation software, design a basic Web page using HTML, and perform basic computer troubleshooting and maintenance.

**Geographic scope:** National

### 7.3.2   eHealth

#### 7.3.2.1 ICT village in Mahobong

This project is intended to provide training on the use of ultrasound technology to the health personnel of the Holy Trinity Clinic in Mahobong to prevent deaths of mothers and children in the area surrounding the clinic.

A training period was initially undertaken in early 2011 and trained 20 people. OCCAM, WINFOCUS and Hospital of Lodi invited representatives from surrounding clinics to attend. There is now a satellite connectivity, which facilitates personnel in Mahobong to refer to dedicated staff at the Hospital in Lodi for second opinion and any other support needed. Apart from the ultrasound machine, the project intends to support the creation of a delivery room at the Clinic.

The project has also been extended to the National University of Lesotho in the Health Department where the trainee nurses are being also trained on the use of the ultrasound scanner.

The project will soon be extended to St. Josephs hospital which is in the same area as the University.

**Funding source**:  The Ministry of Health of Regione Lombardia – Italy

**Geographic scope**: Mahobong, Leribe District

#### 7.3.2.2 Electronic Medical Record

Electronic Medical Record (EMR), which is a computerized medical record, is created in a few hospitals in Lesotho and as of 2011 none of them have a fully integrated system. Subsequently EMR will be created in all hospitals in Lesotho.

EMR systems will assist health care professionals to store and share patient information across disciplines and across facilities. It will also provide timely and efficient access to medical records without compromising patient privacy, and allows patients to engage in their own health care

**Funding source**: Millennium Challenge Account (MCA)

**Geographic scope and time frame**: National and ongoing

#### 7.3.2.3 Development of a web-based Social Welfare Routine Information System (SWRIS)

The Ministry of Health and Social Welfare of Lesotho (MOHSW) and specifically the Department of Social Welfare (DSW) developed a routine information system for Social Welfare as part of setting up a functional Monitoring and Evaluation system for the Orphans and Vulnerable Children (OVC) response in Lesotho. The system consists of a data procedure manual for data collection and reporting tools on services provided to OVCs at all levels. The frequency of data collection and reporting varies from monthly, quarterly and annually depending on the indicators for which data is collected and reported for purposes of Monitoring and Evaluation of the National OVC Program.

Currently there are an estimated 220,000 OVCs and scores of other vulnerable children. Some require basic services to enable them have basic essentials met to enable them lead near normal

lives. In order to plan appropriately for these numbers of disadvantaged children, there is need to know those that are receiving services and those that are not. This can be best facilitated by developing a database on individuals receiving services and the type of services they receive. In addition, there are destitute adults and elderly people being provided with services and these too need to be captured.

DSW is in the process of designing, developing and adequately testing a web-based database application that will enable it to collect and report relevant information for decision making and service provision at all levels of its structure in responding to HIV and AIDS pandemic as per the MOHSW and DSW strategic plans.

**Funding source:** The Global Fund Coordinating Unit  - Lesotho

**Geographical scope and timeframe**: National and ongoing

### 7.3.2.4 Laboratory Information System

The Association of Public Health Laboratories (APHL) through a cooperative agreement with the U.S. Centers for Disease Control and Prevention (CDC), Global AIDS Program (GAP) supported the U.S. President's Emergency Plan for AIDS Relief (PEPFAR) by implementing Laboratory Information System (LIS). The goal of this class of software, which handles receiving, processing and storing information generated by medical laboratory processes is to strengthen health system capacity and services for HIV/AIDS.

Lesotho piloted its current LIS in four laboratories (Central, Mafeteng, Makoanyane and Scott) after having assessed five of them. The LIS will be extended to additional sites potentially including all District Hospitals in the Lesotho National Public Health Laboratory System (NPHLS)

**Funding Source**: PEPFAR

**Geographic scope and timeframe**: National and ongoing

### 7.3.2.5 Rx Solution

From 2008 Strengthening Pharmaceutical Systems (SPS) has been providing technical support to the Ministry of Health and Social Welfare (MOHSW) by supporting the implementation of the Rx Solution, an electronic information management program. SPS is assisting the country to move towards a comprehensive, integrated patient management information system at hospital level. As at January 2012, Berea hospital has fully implemented the system, and now patient information can be tracked right from when the patient registers up until the dispensing point. This is a great milestone as it will assist the GOL in its endeavour to appropriately manage patient information, particularly of patients on ART, thus creating an enabling environment for improved management of patients on ART.

**Funding Source**: USAID

**Geographic scope and timeframe**: National and ongoing

### 7.3.2.6 Pan African Network - Telemedicine

The tele-medicine facility will connect the Ministry of Health with health facilities around the world, while another system will be connected to the State House to enable the Prime Minister to communicate with other Heads of State. To date (January 2012) the infrastructure has been installed in Teyateyaneng (T.Y.) Hospital.

**Funding source**: Government of India and African Union

**Geographic scope and timeframe**: National and ongoing

### 7.3.4    eGovernment

### 7.3.4.1 Digital Broadcasting Migration

The process is focused on migrating television broadcasting from analogue to a more spectrum-efficient and high quality digital platform by 2015. The Ministry of Communications, Science and Technology has invested M400 million into the project and it is in the first stage of implementation.

The adoption of digital broadcasting will enable consumers to benefit from improved reception quality, additional programme channels and more efficient use of spectrum in the country

**Funding source**: Government of Lesotho

**Geographic scope and timeframe**: National and ongoing.

### 7.3.4.2 Lesotho Government Data Network (LGND)

This project is an expansion of the Lesotho Government Data Network to district capitals. LGDN aims to connect all government offices in Maseru and in the other nine (9) districts to one network and data centre housed at Moposo House, the Ministry's headquarters. This will help to significantly reduce communications and data-sharing costs within government.

The main objectives are to:

➢ Ensure a connected government and support for rolling out IFMIS and related applications at the district level.

➢ Provide a reliable and secure backbone infrastructure that will cater for current and future IT needs of the government

➢ Eliminate duplication, facilitate interoperability of systems and reduce cost by sharing common network components across systems

➢ Create a stable communications platform for all ministries/departments to utilize in the execution of their citizen-centric operations

➢ Strengthen collaboration between various tiers of government

➢ Improved government service delivery to its citizens regardless of location by having access to similar services and applications throughout the Kingdom

**Source of funding:** Lesotho Government

**Geographic scope and timeframe**: National and ongoing

### *7.3.4.3 Support for the Establishment of IXP*

The Lesotho Communications Authority (LCA) has decided to initiate and support the establishment of the Internet Exchange Point (IXP) in Lesotho in order to improve access speeds for Internet users, reduce cost since a good proportion of traffic would be exchanged utilising local rather than international bandwidth. In addition, the IXP would create revenue through new business opportunities by allowing easier hosting of local domains and improved access speeds. To this end, the UAFC set aside about M1.8 million towards the establishment of the IX. Initial groundwork has been started with stakeholders of the Lesotho Internet community to enlist their buy-in into the project.

**Source of funding**: Universal Access Fund

**Geographic scope and timeframe**: National and ongoing

## 7.4   National ICT Research Capacity and Priorities for Cooperation

The Government of Lesotho through the Ministry of Communications, Science and Technology in conjunction with relevant stakeholders for the ICT sector and the private sector is committed to embark on the following e-applications: ICTs for Government and e-Government; ICTs for Health & eHealth; ICTs for Learning & eLearning; ICTs for Enterprises & e-Commerce; Network Technologies; Digital Content and Digital Libraries; Geographic Information Systems; and Internet Technologies.

In line with its National Science and Technology Policy, Lesotho realises the role of research and development as a major activity that defines the critical agenda in the national system of innovation and in the industrial and commercial transformation. As a result, R&D is critical in the production of new stock of knowledge, new materials, publications and new services. It is seen as a critical tool towards promotion and development of ICT in the Information Society by identifying needs and challenges that face the ICT sector hence inform policies, programmes and projects.

In this context the following research priorities have been identified for Lesotho:

**Research Priority**: ICTs for Government and e-Government

| Research Objectives | Research Areas |
|---|---|
| Facilitate the broadest possible access to public domain information (2.1.4) | ▪ Speech Recognition and Text-to-Speech for information access.<br>▪ Access Networks using available e-infrastructure such as GSM and PSTN networks.<br>▪ Web applications using indigenous languages. |

| | • Free/libre and open source software (FLOSS) utilization for e-government solutions. |
|---|---|
| Promote the production of local ICT products and services that reflect the needs, interests and culture of the country. (cf. 2.2.4) | • Web applications and information systems for marketing and advertising the government tourist attractions |
| Establish ICT public access points in places such as post offices, schools, libraries and rural health care clinics among others. (2.2.6) | • Developing mesh networks for rural areas<br>• Convergence of analogue and data networks |
| Paying attention to the special needs of marginalized groups of society, including women, youth, the disabled, disenfranchised and the elderly. (2.2.6) | • Speech recognition and text-to-speech for the visually impaired and the elderly for government services access.<br><br>• Development of training methodologies for people with special needs and the marginalized.<br><br>• Development of electronic and mechanical devices for the people with disabilities. |
| Ensure that ICT infrastructure is widely available at an affordable price to support the delivery of telecommunications, broadcasting, postal and multimedia services  (2.2.7) | • Software development cost reduction through use of FLOSS |
| Improve internet access for tourists throughout the country | • Appropriate access points developed throughout the country for tourists to have internet access with the aim of attracting more tourists into Lesotho |

**Research Priority**:  ICT's for Health & e-Health

| Research Objectives | Research Areas |
|---|---|
| Ensuring that all local clinics and hospitals are connected to the ICT infrastructure (2.2.7) | • Convergence technology development for interconnecting the PSTN, GSM and Radio broadcast communication systems.<br>• Developing web services and access channels for remote patient diagnosis<br>• Visibility studies on low cost ICT infrastructure in the mountainous areas of Lesotho. |
| Online HIV/AIDS information access for rural | • Web services for HIV/AIDS information in |

| communities | Sesotho |
| | ▪ Development of HIV/AIDS interactive information stations at local government offices using FLOSS |
| Online/Mobile Access to medical practitioners and institutions | ▪ Development of mobile- and e-commerce applications for service access |

**Research Priority**:  ICTs for Learning & e-Learning

| Research Objectives | Research Areas |
|---|---|
| One lecturer – multiple classrooms throughout the country  (IEMS can benefit from this objective) | ▪ Optimization of Communication networks for enabling distance e-learning |
| Use of mobile devices for teaching | ▪ Software development for mobile devices<br>▪ Cost effective methodologies of implementation |

**Research Priority**:  ICTs for Enterprises & e-Commerce

| Research Objectives | Research Areas |
|---|---|
| Private sector service access using both the internet and mobile devices (e.g. banking) | ▪ Development of interactive web services and WAP services |
| Online payments for electricity, water and gas | ▪ Development of interactive web services and WAP services |
| Promote the development and dissemination of local ICT products and services (2.1.5) | ▪ Qualitative and quantitative studies for assessing the research efforts and innovation in the ICT sector throughout the country.<br>▪ Marketing strategies for local ICT products and innovations |
| Online shopping (e.g. ordering pizza) | ▪ Development of Mobile Commerce Applications |

**Research Priority**:  Network Technologies

| Research Objectives | Research Areas |
|---|---|
| Develop network technologies suitable for government service delivery in Lesotho | ▪ Study of existing infrastructure and development of network protocols suitable |

| government service delivery in Lesotho | for ensuring access to government information. <br>• Mesh network development for rural areas <br>• Wireless networks (WiMAX) capabilities for enhancing the ICT infrastructure in Lesotho. |
|---|---|
| Improvement of bandwidth for local information and services access | • Study of data and voice traffic and the quality of service required for such traffic in order to effectively manage the bandwidth |

The following national organisations are currently undertaking ICT-related activities in Lesotho:

➢ National University of Lesotho[46]
➢ Lesotho College of Education
➢ Department of Agricultural Research[47]
➢ Ministry of Health and Social Welfare[48]
➢ Ministry of Education and Training[49]
➢ Ministry of Communications, Science and Technology[50] (ICT Department)

The Department of Mathematics and Computer Science in the National University of Lesotho has a Computer Unit (CS Unit), which is responsible for research in ICT. The whole CS Unit functions as a research group. Main research areas that the CS Unit explores are meant to improve government services and also to bridge the digital divide in Lesotho. The three main areas of research in the CS Unit are: (a) Communication Networks and Applications (CNA), (b) Artificial Intelligence and Human Language Technologies (AI & HLT) and (c) Information Systems (IS). The university research grant is the major source of funding for most projects.

**(a) Communication Networks and Applications**

Research in this area includes:

- Network Management and Services

- Next Generation Networks & Services Development
    - SIP-enabled instant messaging systems on IMS
    - WiMax QoS on IMS

- Mobile Commerce Applications

- Mobile Advertising

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[46] http://www.nul.ls/
[47] http://www.dar.gov.bw/
[48] http://www.gov.ls/health
[49] http://www.gov.ls/education/
[50] http://www.gov.ls/comms

- Intelligent Networks for e-government

- VoIP-based Computer Telephony Integration with Asterisk

## (b) Artificial Intelligence and Human Language Technologies

Research in Artificial Intelligence in is the following areas:
- Machine Translation (at early stages)
- Speaker Recognition systems.
- Sesotho Speech recognition for bridging the digital divide.
- Text-to-speech in Sesotho for accessing government information and services.
- Development of Voice Browsers (VoiceXML interpreters)

It is worth noting that the projects above are currently research projects and laboratory work by individual researchers and have a very good potential depending on wider funding.

## National Participation in FP7

IST-Africa is the first FP7 project in which Lesotho is participating. IST-Africa and MCST supported a number of Lesotho organisations in identifying partners and submitting proposals under FP7-Africa 2010 Call. Unfortunately these proposals were not short listed for funding. IST-Africa with the support of MCST secured the participation of the National Assembly of Lesotho in the Africa4All Parliamentary Initiative co-funded under the @CP-ICT Call. This resulted in parliamentarians and staff members being trained to use an information system and learning how the Information Society can positively impact on their working life.

There is an appetite for participation in EU funded research, and the number of proposals involving institutions from Lesotho expected to increase in future years. The Ministry and IST-Africa continue to encourage the research community to explore opportunities for international research projects and build links to secure direct research funding. However, the significant gaps between calls, the high level of competition under specific thematic areas which are aligned with national implementation policy in Africa (e.g. TEL), the limited funding specifically focused on SICA international cooperation projects and long timeframe for projects to be evaluated and negotiated has implications for participation.

## Level of Research Maturity

Lesotho does not have a strong research tradition, reflecting perhaps the relatively small number of research institutions compared to some other IST-Africa Partner Countries. Lesotho – like a number of other IST-Africa Partner Countries is actively trying to develop a diversified economy. This is reflected on the government's emphasis on innovation and technology adoption and the development of applications and local content to service national requirements.

Being entirely surrounded by another country – and to a considerable degree economically reliant on that country (with many people from Lesotho working and earning their living across the border brings its own challenges. This requires an increased policy focus on further strengthening the

research capacity within the country, and especially in developing post-graduate programmes. As a result of IST-Africa training workshops in Lesotho, there is now a much higher level of awareness of the necessity for research activities to have a clear socio-economic purpose, and the requirement to focus on potential impact, and the potential benefits of multi-stakeholder research projects.

## 8.    MAURITIUS

### 8.1    Introduction

Mauritius is situated in the South West Indian Ocean, slightly over the tropic of Capricorn, in latitude 20° south and longitude 57° east of Greenwich. It is 2,000 km off the east coast of Africa and some 855 km east of Madagascar. An island of volcanic origin with an area of 1,864 km2, it is almost entirely surrounded by coral reefs.

A melting pot of the world's oldest civilisations, Mauritius is a rare example of social peace and unity in a multi-cultural society. The population boasts origins from the European and African continents, as well as India and China. Such a cosmopolitan legacy makes for legendary hospitality. Mauritius is a safe place to live, Mauritians being naturally well-inclined and of peaceful nature. All Mauritians enjoy freedom of expression and religion.

The population is estimated at 1.3 million inhabitants (2011) with a literacy rate of 84.4%. The languages are Creole, Bhojpuri, French and English.

In relation to Communications, according to 2010 figures, there were 387,700 fixed phone lines in use compared with 1.191 million mobile phones. There were 36,653 Internet hosts (2010) and 290,000 Internet users (2009).

Mauritius has the highest adult literacy rate for the whole of Africa as a result of free education at primary and secondary school level. This highly disciplined and educated workforce is also equally fluent in English and French, while many also speak a third international language: Hindi, Mandarin, Urdu and a host of European languages. The workforce is young, 29.2% being aged less than 30 and business spirited, innovative thinking and open to the world.

Mauritius has a smart brand of fine professionals, most of who qualified from internationally recognized institutions and/or world class professional bodies: chartered accountants, financial analysts, corporate lawyers, tax specialists, business consultants, IT engineers, architects. Recently, the Government of Mauritius enacted legislation encouraging foreign professionals to set up in the country.

Benefitting from a convenient time zone that makes same-day transactions possible from the US, through Europe, the Middle-East and Australasia, Mauritius is emerging as a major international business platform in this region of the world.

The Mauritian economy is one of the fastest growing in sub-Saharan Africa. In just three decades, the country has moved from a mono-crop sugar-dominated economy to being services oriented. The tertiary sector currently accounts for 70% of GDP, which is an impressive track record.

While endowed with a small, but increasingly affluent local population, Mauritius has secured preferential access to markets worth several hundreds of millions of consumers. Mauritius has agreements in place with the EU through the Cotonou agreement; with the US under the Africa Growth and Opportunity Act; with Eastern and Southern Africa, through the Common Market for Eastern and Southern Africa (COMESA) and Southern African Development Community (SADC).

## 8.2   ICT Background

Mauritius has emerged as an international and competitive ICT destination and is steadily positioning itself as a regional ICT Hub. Over the recent years, the ICT sector has experienced a rapid and sustained growth and is the fifth pillar of the Mauritian economy. In 2002, the ICT sector represented 4% of the country's GDP as compared to 6.5% in 2011. In 2011, the growth rate in the ICT sector was 10% and value added generated by the ICT sector was MRU Rs 18.7 billion (Source: SM) (1 USD approx Mru Rs 30). An increasing number of foreign companies are nowadays setting up their bases in Mauritius to conduct ICT and ICT-related activities.

In line with its vision to transform Mauritius into a Cyber Island and make of ICT an important engine of economic growth, the Mauritian Government[51] has consolidated bases for a strong ICT sector and has launched the National ICT Strategic (NICTSP) which includes 124 programmes to be implemented over the period 2007-2011. The vision and targets of the NICTSP are for the ICT sector to reach GDP contribution of 7% by 2011 from export of ICT services and employment of Mauritians in ICT increasing from 16,000 to 20,000. The National ICT Strategic Plan was reviewed in 2011 and a new strategy for the period 2011-2014 branded as "Towards i-Mauritius" has been developed, and is one of the three activities undertaken under the Competitiveness and Public Sector Efficiency (CPSE) program, which aims to sustain growth and employment, while helping Mauritius to address the impact of the global recession. A National Broadband Policy 2012 – 2020 (NBP2012) setting out a strategic vision for a broadband Intelligent Mauritius, and establishing national goals regarding broadband while elaborating specific policies to achieve those goals within the overarching National ICT Strategic Plan (NICTSP) 2011-2014 context has been launched.

The Ministry of Information and Communication Technology[52] has the following objectives:

➢ Formulate appropriate policies and provide the necessary legal framework for the development of ICT and its optimal use across all sectors

➢ Facilitate, through the implementation of an E-Government programme, the provision of Government services electronically anytime anywhere for the greater convenience of the public

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[51] www.gov.mu

[52] http://www.gov.mu/portal/site/telcomit

➢ Promote and facilitate the development of the ICT sector

➢ Ensure that the ICT culture permeates all levels of the society to bridge the digital divide to the extent possible

➢ Promote the development of ICT enabled services including e-business

➢ Encourage the adoption of new technologies and best practices in the ICT

➢ Promote capacity building in ICT

➢ Promote and facilitate IT Security within Government Systems

The Government Programme 2010 - 2015 is to create an "i-Mauritius", Intelligent Mauritius, which is to make Mauritius one of the most connected nations in the world and also reduce the digital divide as "broadband" remains one of the ways to accelerate the integration of new technologies and allows citizens to take better advantage of ICT.

Some 600 ICT companies presently operate in Mauritius, in a wide range of activities including software development, call centre operations, business process outsourcing (BPO), IT-enabled services (ITES), web-enabled services, training, hardware assembly and sales, networking, consultancy, multimedia development, disaster recovery (DR) and other support services.

Major international ICT players, including Oracle, Microsoft, IBM, HP, CISCO, Orange Business Services, Accenture, Infosys, Hinduja Group, France Telecom, Ceridien, the TNT Group, have set up their operation and development centres in Mauritius.

There are two main ICT industry associations in Mauritius, namely, the Mauritius IT Industry Association (MITIA) and the Outsourcing and Telecommunications Association of Mauritius (OTAM). MITIA is an association of major ICT companies, whereas OTAM represents the interests of the Telecom operators and the BPO players in Mauritius.

ITES-BPO is a very strong segment of the Mauritian ICT industry and has been the fastest growing sector over the recent years, with over 330 companies mainly servicing export markets such as France, the USA, the UK, Belgium and other European countries.

The Government of Mauritius is fully conscious of the key role that the legal framework has to play in ensuring a healthy and sustainable development in the ICT industry. In this context, appropriate legislations on data security, protection of intellectual property rights and cyber crimes have been enacted to encourage the effective growth of the ICT sector.

The Business Parks of Mauritius Ltd[53], a government-owned company, is responsible to spearhead the development, construction and management of state-of-the–art technology and hi-tech business parks in Mauritius. The BPML has set up the Ebène Cybercity, the first of its kind of a new generation of technology parks in this part of the world. The entire Cybercity, spread over an area of about 172 acres, is wired with fibre optic to provide high bandwidth international connectivity. The

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[53] BPML - www.e-cybercity.mu

main components of the Ebène Cybercity are the Cyber Tower 1, an intelligent 12-storey building of 42,274 square metres equipped with ultra modern features, and the Cyber Tower 2.

The telecommunications sector was liberalised at the end of 2002 and has evolved from a classical analogue network to a fully digital one, endowed with enhanced capabilities in terms of bandwidth, connectivity and value-added services. In addition, since 2002, Mauritius has been well connected to the rest of the world via satellite and through the South Africa Far East (SAFE) submarine cable providing high bandwidth international connectivity. The Eastern Africa Submarine Cable System (EASSy) will connect Mauritius and countries of Eastern Africa via a high bandwidth fibre optic cable system to the rest of the world. The Lower Indian Ocean (LION) submarine fibre cable system links Madagascar, Mauritius and Reunion Island and is some 1070 KM in length and consists of 2 fibre pairs. This cable brings resiliency to the country's connections and makes it more attractive to investors. The 3,000 km-long LION2 cable will extend the LION cable to Kenya via the island of Mayotte. The cable will provide Mayotte, for the first time, with access to a broadband Internet network benefiting from a transmission capacity and service quality equivalent to those available in Europe. (Source Mauritius Telecom)

Mauritius is among the most competitive and successful economies in Africa. It holds the pole position for ease of doing business in Africa. The country is ranked at 23rd position among 183 countries according to the World Bank's 2011 Doing Business Survey.

## 8.3    Current ICT Initiatives and projects

### 8.3.1    Universal ICT Education Programme

The Internet and Computing Core Certification (IC3), which was developed by Certiport Incorporation (USA) is the first globally accepted, standards-based, validated certification program for basic computing skills. The IC3 certificate as a starting milestone in the ICT education roadmap is also a stepping stone for more advanced ICT certification for career advancement as well as meeting Government's objective of increasing the number of persons with specialised IT skills to boost the ICT industry. The IC3 course is provided at 95% discount over published prices. The IC3 training course is of 45 hrs and training are done in state secondary colleges after school hours. As at January 2012, 140,000 people have already been trained.

### 8.3.2    Universal ICT Education Programme – Phase II

The National Computer Board has launched the UIEP Phase II whereby more than 2700 online professional IT and non–IT courses are being made available at very interesting prices to all those who complete the IC3 or already have a recognised certificate in IT in January 2010

The courses modules are bundled into 15 separate packages and includes course materials leading to popular certifications such as MCSE, MCSA, MCAD, CISCO, CompTia, Oracle, A+, N+, Server+, Linux, Project Management etc.

To date, more than 600 participants are already following their respective courses online.

### 8.3.3   Community Empowerment Programme

The objective of the Community Empowerment Programme (CEP) is to facilitate the process for the community to make use of ICT to fully participate in the socio-economic development of our country. The CEP is in line with the Government programme to encourage the development of local content and creativity. The CEP will contribute for the development of Mauritius in the following ways:

➢ Bring together the country's development stakeholders to build a strong online network of local, regional and global development communities on the web. Address the needs of various communities in Mauritius including NGOs, academic and private sectors and professionals.

➢ Democratise access to ICT.

➢ Provide comprehensive, high quality information about the country, its economic and social structure.

➢ Help to reduce the "Digital Divide" by providing concerned online information.

➢ Stimulate the development and production of local content on the Internet.

To date, 121 computer clubs with free Internet access have been set up in 23 youth centres, 17 women centres, 43 social welfare centres, 35 community centres and 3 day-care centres across the island. Around 300,000 people have been able to make use of the facilities.

It is envisaged to spread computer clubs in 170 more Centres in 2012 including village hall and NGOs. A CEP web portal will host the contents of 80 villages online.

### 8.3.4   Public Internet Access Points

Ninety-three Public Internet Access Points (PIAPs) have been set up in Post Offices and around 17,000 people have been able to make use of the facilities. This service is provided free to disabled, orphans, senior citizens, unemployed and a nominal fee for other users.

In addition, it is proposed to have 40 additional PIAPs that will be operational soon and 5 Post Offices have been identified in Rodrigues to host the PIAP project.

### 8.3.5   Cyber Caravan Project

Launched in November 2000, the Cyber Caravan Project aims at making IT facilities available to the community. The NCB presently operates two Cyber Caravans, which are equipped with 9 and 10 PCs respectively and broadband Internet connection. Training on ICT Awareness and IC3 on a regional basis is provided on board the Cyber Caravan. To date, about 166,000 people have been initiated in basic IT Skills (2 hrs course) and IC3 (45 hrs course).

### 8.3.6   Government Online Services (GOC) and e-Services

The Government Online Centre (GOC), operational since May 2005, is a centralised data centre that supports e-Government initiatives. The GOC hosts the Government Web Portal (GWP), which provides secured online Government services round-the-clock. Being a common platform for

Ministries and Departments, the GOC enables the optimisation of IT investment for the public sector. 130 websites are being hosted for Ministries and Departments and 75 for Parastatal Bodies.

The Government Web Portal[54] (GWP) is a one-stop-shop providing comprehensive information and enabling online applications on a 24 x 7 x 365 basis in a user-friendly manner. The GWP consists of a homepage and four sub-portals, namely, Citizen, Government, Non-Citizen and Business.

The GWP has a dedicated **eServices** section for online applications. This eServices section enables the submission of online applications, the receipt of online acknowledgements and the online tracking of the status of applications, amongst others.  To date, **65 eServices** are available online on the Government Web Portal. There has been an exponential growth of use of eServices especially the eFiling of income tax.

GOC also provides Internet access to over 180 secondary schools and 265 primary schools and Internet & E-mail facilities to over 8,000 employees of Ministries and Departments.

With the setting up of a National Internet Exchange Point (NIXP) on the GOC platform, Internet Service Providers (ISPs) in Mauritius can peer through to GOC so that local bandwidth is contained in Mauritius thereby saving on international bandwidth.

### 8.3.7   National Computer Emergency Response Team (CERT-MU)

The CERT-MU mission is to provide information and assistance to its constituents in implementing proactive measures to reduce the risks of information security incidents as well as responding to such incidents as and when they occur.

CERT-MU Services include:

➤ Information Security Incident Handling and Management
➤ Vulnerability Scanning of networks, applications and devices
➤ Disseminate latest information security news and virus alerts to organizations and public
➤ Assistance in implementation of Information Security Management System based on ISO 27001
➤ Awareness sessions for organizations on Information Security issues.
➤ Sensitise general public on Internet Safety including child online protection and anti-spam.

### 8.3.8   NCB ICT Incubator Centre

The NCB ICT Incubator Centre was set up to encourage young entrepreneurs to create start-ups in the ICT sector by providing them with logistic and business support. The NCB-ICT Incubator centre has benefitted financial assistance from the infoDev Capacity Building Grant – Support for new and start-up incubators in developing country in 2004.

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[54] www.gov.mu

Some 26 start-ups have benefited from facilities of the Incubator Centre. The ICT Incubator Centre is being revamped into the Technopreneurship concept.

BizSpark is a program offered by Microsoft to encourage innovation, creativity and promote Technopreneurship amongst today's most promising start ups by providing access to software, tools and resources at a stage where they need it most but can least afford it.

The NCB Incubator has teamed up with Microsoft BizSpark as a Network Partner for Mauritius to offer the Microsoft BizSpark Program: the innovative global program designed to help accelerate the success of Software ICT start ups by providing them the Software they want, the Support they need and the Visibility they deserve.

### 8.3.9   eID Card (Smart Card and Identification Systems)

The Ministry of ICT is looking forward to phasing in the introduction of electronic identity cards. The eID card will contain various personal details of its owner. Besides the basic identity information in visual form, it will also be used as a health card, pension card, buss pass and even a pass to access governmental services, be it on- or off-line. The card will procure access to secured areas, payment of pensions and social security benefits, electronic purses, and driving licences. Mauritius' objective is to be the first country in the region to deliver eID cards to its citizens.

## 8.4   ICT Projects with Cross-border Potential

### 8.4.1   Regional CERT (AfriCERT)

AfriCERT (the Regional CERT for Africa), which is similar to APCERT for Asia Pacific, is a coalition of CERTs of African countries. Its main objective is to enhance the cyber security of African countries through effective collaboration and communication with all stakeholders concerned across Africa.

### 8.4.2   ICT Regional Exhibition

The main objectives of organising a Regional ICT Exhibition and Conference Event are:

➢ showcase emerging technologies in the region

➢ offer a platform for business exchanges and the establishment of partnerships

➢ promote regional ICT products, services and solution

NCB organised the Infotech ICT Regional Exhibition and Conference event in 2007 and 2008 with following objectives:

➢ Meet and participate in business exchanges with local and international players and stakeholders of the ICT sector

➢ Create awareness on achievements and developments in the ICT sector in the region

➢ Provide information on ICT products, services and technologies in the region

➢ Explore areas of collaboration and tie ups through networking activities

Some 60 foreign delegates from 15 countries in Africa, Asia, Europe and the United States of America attended the ICT Regional Conference.

The National Computer Board (NCB) and the Mauritius IT Industry Association (MITIA) jointly organised the 1st annual edition of ProIT in 2011. ProIT is a professional B2B Exhibition and Conference event that enables operators of the ICT industry to showcase their expertise, products and solutions. The event targets mainly professionals of the ICT sector, SME's, corporates and the business community. Regional players from ARTIC (Association Réunionnaise des professionnels des Technologies d'Information et de Communication) participated in the event. It is proposed to include more regional players from other countries to make the event an ICT Regional Exhibition and Conference.

### 8.4.3   Regional Internet Exchange Point

The setting up of a regional Internet Exchange Point is to keep local contents within the region. Its purpose is to efficiently route all intra-Regional Internet traffic among the operators without having to pass through the United States or Europe. This will allow the regional data carriers to significantly optimize upstream capacity costs, enhance their existing bandwidth capacities and reduce the size of the routing tables worldwide

### 8.4.4   Regional Centre of Excellence

The setting up of a Regional Centre of Excellence is to foster ICT development in the region with objective to:

➢ Providing training to ICT professionals of countries in the African region

➢ Sharing of policy experience and know-how of developed countries

➢ Enhancing R&D in ICT

It is proposed to set up the Mauritian ICT Academy which will aim at equipping the youth of Mauritius with knowledge, skills and being benchmarked globally through International Certifications so that to ensure the sustained development of the ICT sector. L'Agence Française de Développement (AFD) is showing interest in funding the project.

### 8.4.5   Regional Technopreneurship Park

The setting up of a Regional Technopreneurship Park is to foster business incubation and technopreneurship development in the region so as to have:

➢  Market access to regional market

➢ Network of Business Angels and Mentors in the region

➢ Access to finance from regional financial institutions

## 8.6   National ICT Research Capacity and Priorities for Cooperation

The following universities and research centres in Mauritius are undertaking ICT-related initiatives in the research field. Based on consultation, each institute has outlined its current research expertise, track record and mapping to Challenges in FP7-ICT as outlined below:

➢ **University of Mauritius[55]**

  o Bioinformatics

  The objectives of this group are to study algorithms used in Bioinformatics, to contribute new algorithms, to study how Bioinformatics data is stored and accessed throughout the world, and to look into how Mauritius can contribute to Bioinformatics Data Banks. This can be map to **Challenge 5 – ICT for Health** under objective ICT-2011.5.3

  o Efficient Computing

  The main aim of the research group is to propose computer-based solutions that improve the productivity of the individual and, consequently, improve the effectiveness of the organisation the individual belongs to. The current activities are:

  - o Consultancy for Aapravasii Ghat Trust fund (Aapravasii Ghat is a UNESCO world heritage centre)
  - o Proposal for EDP in Leveraging Web 2.0 in Mauritian Enterprises

  This is relevant to ICT **Challenge 8 ICT for Learning and Access to Cultural Resources** and under objective ICT-2011.8.2

  o IPv6

  IPV6 is the new generation Internet Protocol devised to replace the previous one (IPV4) which cannot provide sufficient internet addresses to cater for future needs. Also IPV6 provides for simpler configuration and better support for real-time data. The objectives of the group are to perform verifications on how the performance of different network-based applications can be improved using IPV6, how the QoS support available in IPV6 can be exploited and also to look into ways of helping the deployment of IPV6 in Mauritius. This is relevant to ICT **Challenge 1, Network of the Future** – objective 1.1.

  o Context awareness

  Context-Awareness is an emerging area of Computer Science, whereby computer systems can make decisions and take actions based on context information such as location, time temperature or the presence of specific individuals. The objective of this group is to investigate how the use of context-awareness can improve the lives of users and how context-awareness can be put to the service of the Mauritian society. This is relevant to **Challenge 5 – ICT for health**. The current status is that the University of Mauritius is working on a paper entitled "Access Control Mechanisms for Collaborative Context-Aware HealthCare Services in Mauritius".

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[55] http://www.uom.ac.mu

o   Intelligent systems

The group concentrates on research in fields such as Biometrics, Computer Vision, Artificial intelligence and Human Computer Interaction

o   Mobile and Ubiquitous Computing

The main objective of this research group is to use these technologies to enhance the quality of life of human beings. The research group will investigate the human, social, technical, hardware and software issues involved with mobile and ubiquitous computing. Research projects in different areas including infrastructure development, identifying new concepts and building ubiquitous applications will be undertaken. The group will also address the issue of expert human resource development in this area. The focus will be making the group "one of the best in the region" to start with.

> **University of Technology, Mauritius[56]**

o   Implementation of a USSD API

o   Impact of broadband on the Mauritian economy

o   Digital Propagation models for Mauritius

o   Optimisation of mobile applications protocols

o   A technology independent framework for partitioning & retracting context awareness applications in pervasive environments

o   IP traceback

o   IS outsourcing for SIDS

o   Data mining using agent technology in distributed systems

o   Web Caching algorithms for highly customizable portals

o   ERP for SMEs

o   Learning difficulties in geometry

o   Web pages optimal search

o   Mobile power optimization

o   Mathlab tool development on options

o   Secure Access through Authentication and Biometrics/Smart Cards Technologies

o   GPU Computing with Iterative Solution Methods for High Order Compact Schemes

o   Performance Optimization of Database-Driven Websites using HTML5 Client Side Query Caching

o   Reliability Assessments and Predictions over Mobile and Ubiquitous Computing

o   Use of ICT for the Study of Atmospheric Carbon Dioxide in Mauritius and its effect on the Coastal Sea Water Acidification

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[56] http://www.utm.ac.mu

> ➢ **Mauritius Research Council[57]**

  - o Adaptive Coding Techniques for Time Varying Channels

    Adaptive coding techniques for time varying channels such as HF (2-30) MHz have been under investigation for several decades [Honary 1981, Katakol 1987, Zolghadr 1989, Bate 1992, etc…]. Forward error correction applied to these channels are designed to give the desired performance for the worst channel rate. Hence when the channel is relatively error free unnecessary error correction power and redundancy is being employed. This naturally reduces the overall information rate. In order to transmit data efficiently in a time varying channel an ideal error control scheme should achieve a lower average output bit error rate than that obtainable with a fixed rate system. This is done by matching the code to the changing channel conditions.

    A number of embedded coding techniques employing block codes for time varying channels have been proposed and investigated. A novel statistical channel evaluation technique based on the trellis of block codes has also been devised. The HF link has been established with a receiver station in Mauritius and measurement of data from UK has shown that it is working as expected.

  - o Developing successful entry strategies for BPO operations in Mauritius

    The main objectives of this project are to identify actions required to enhance the competitiveness of Mauritius as a Global BPO service provider and profile the country to become a natural offshore location for major companies and business partners for outsourcing business services.

    The scope of the project is to:
    - Understand BPO and its business scope for Mauritius
    - Briefly study the global BPO industry and identify sub-sectors compatible with capabilities available in Mauritius
    - Generic BPO centre selection criteria
    - Review and analysis of Mauritius as an offshore BPO service centre
    - Proposition of effective enabling policies for Mauritius and recommendations.

  - o Electronic Commerce tools and methodology using web-based technologies

  - o Evaluation of the importance of corporate e-learning in providing a competitive edge to Mauritian companies

    E-Learning enables learners to access, at any time and from anywhere, learning materials, forums with fellow learners, assistance and feedback from a trainer or tutor as well as assignments and tests. This implies a shift in the focus of training from trainer-centred to learner-centred.

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[57] http://www.mrc.org.mu/

The focus of the study was to assess the following:

- awareness of e-learning,
- readiness and barriers to embark and sustain e-learning initiatives,
- possible areas to implement e-learning.

This is relevant to *Challenge 8* – Technology-Enhanced Learning

o  Information and Communications Technology Thematic Working Group

The Council constituted a Science & Technology Think Tank with a view to revising its research priorities. The Think Tank recommended that the future priorities of MRC be centered on nine themes, which are as follows:

- Land and Land Use
- Water Resources
- Energy and Energy Efficiency
- Marine Resources
- Biomedical Research
- Biotechnology
- Manufacturing Technology
- Science & Technology Education
- **Information & Communications Technology**

o  IT Security

o  MU-CERT

## ➢ NICTERN

National Information and Communication Technology Evaluation and Research Network (NICTERN) comprise of people tasked with responsibilities of analysing collected data, undertaking research on various aspects of the NICTSP and produce, on a biennial basis, a Mauritius State of the ICT Report which would be an integrated document that would cover not just progress made on the different dimensions of interventions, but also recommend further course of action.

To date the NICTERN has developed a Mauritius ICT Indicators Web Portal[58], which is a one-stop shop access for information on indicators about the development of the Information Society and the Information Economy in Mauritius. It provides decision makers with early, accurate ICT indicators that will help them in setting the policies and strategies related to the ICT sector.

**National Participation in FP7**

Mauritius is currently involved in two FP7 projects – IST-Africa and 6DEPLOY-2. There is now an appetite for participation in internationally funded research including EU funded research, and the number of funded projects is expected to increase in future years. However, despite its status as a

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[58] http://www.gov.mu/portal/sites/indicators/index.html

middle income country, Mauritius is affected – like most other IST-Africa Partner Countries, by the significant gaps between calls, the high level of competition under specific thematic areas which are aligned with national implementation policy in Africa (e.g. TEL) and the long timeframe for projects to be evaluated and negotiated obviously has implications for participation.

**Level of Research Maturity**

The general level of research maturity in Mauritius is good but there are specific challenges associated with the relative geographic isolation of Mauritius as an Island group in the Indian Ocean. The two national universities and other institutions involved in ICT in Mauritius are primarily focused on teaching. Collaboration and building relationships with Regional/European research institutions and the culture change required to undertake research is still under development.

Now that ICT has become the third most important economic pillar, there is a sense of urgency in the government and in the research community to leverage the opportunity that the IST-Africa Strategic Partnership presents. This is reflected by the enthusiasm to get involved in the development of Living Labs in Mauritius, to reinforce the impact of other government activities.

While there is clearly a strong – and successful focus on technology adoption and developing applications, strengthening research capacity within the country is on the government's agenda. There is now a much higher level of awareness of pan-African and international ideas of what level of research maturity is required and a greater focus on the development of research results with the potential to achieve sustainable socio-economic impact.

Joining the IST-Africa Consortium has enabled the National Computer Board to raise awareness at the highest level of the Mauritian research community about the Framework Programme, the types of ICT related research being undertaken internationally and the opportunities available to partner with other countries in research proposals which may benefit Mauritius and the region.

Participation of Mauritius in the IST-Africa also provides the opportunity to learn about projects and good practices from other countries that can be adapted and replicated locally.

As a result of the participation of Mauritius in the IST-Africa Consortium, research institutions in Mauritius have become much more aware of the Framework Programme and specific calls and more pro-active about research. For example, the University of Mauritius was involved in a project proposal entitled "An Integrated Framework of Enhanced Transmission Strategies for LTE Advanced"  in connection with the ICT Call 8 (FP7-ICT-2011-8) but unfortunately it was not funded.

## 9.    REPUBLIC OF MOZAMBIQUE

### 9.1    Introduction

The Republic of Mozambique is located in Southern Africa, bordered by Malawi, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe. At the east it is limited by the Mozambique Channel. Mozambique has an area of 799,380 km² and eleven provinces: Cabo Delgado, Niassa, Nampula, Tete, Zambézia, Manica, Sofala, Inhambane, Gaza, Maputo Província and Maputo-Cidade. The population is estimated at 22.9 million inhabitants (2011) with literacy rate of 47.8%. Fifty two percent of the population is aged between 15 and 64 (median 17 years)[59]. Portuguese is the official language and there are several indigenous languages as national languages. English is widely used in business and in government.

Fiscal reforms, including the introduction of a value-added tax and reform of the customs service, have improved the government's revenue collection abilities. In spite of these gains, Mozambique remains dependent upon foreign assistance for more than half of its annual budget, and the majority of the population remains below the poverty line.

Subsistence agriculture continues to employ the vast majority of the country's work force and smallholder agricultural productivity and productivity growth is weak. A substantial trade imbalance persists although the opening of the Mozalaluminum smelter, the country's largest foreign investment project to date, has increased export earnings. At the end of 2007, and after years of negotiations, the government took over Portugal's majority share of the CahoraBassa Hydroelectricity (HCB) company, a dam that was not transferred to Mozambique at independence because of the ensuing civil war and unpaid debts. More power is needed for additional investment projects in titanium extraction and processing and garment manufacturing that could further close the import/export gap. Mozambique's once substantial foreign debt has been reduced through forgiveness and rescheduling under the IMF's Heavily Indebted Poor Countries (HIPC) and Enhanced HIPC initiatives, and is now at a manageable level.

Mozambique grew at an average annual rate of 9% in the decade up to 2007, one of Africa's strongest performances. However, heavy reliance on aluminium, which accounts for about one-third of exports, subjects the economy to volatile international prices. The sharp decline in aluminium prices during the global economic crisis lowered GDP growth by several percentage points. Despite 8.3% GDP growth in 2010, the increasing cost of living prompted citizens to riot in September 2010, after bread price increases were announced. In an attempt to contain the cost of living, the

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[59] CIA Factbook

government implemented subsidies, decreased taxes and tariffs, and instituted other fiscal measures.

The country was one of the first in the region to reform its telecommunications landscape, immediately after a long civil war ended in 1992. The mobile sub-sector has experienced excellent growth rates following the introduction of competition in 2003 between Vodacom Mozambique and mCel, the incumbent mobile subsidiary of the national telco, TDM. However, market penetration is still well below the African average.

The licensing of a third mobile network in 2010 is expected to deliver a boost to subscriber growth in the sector but also drive the average revenue per user lower again which had already stabilised following the introduction of mobile broadband services and higher tariffs. The government is intent on introducing competition to the fixed-line sector as well, but it is hesitating to privatise TDM. All other services are open to competition, subject to licensing by the industry regulator, INCM.

Internet usage in the country has been hampered by the inadequate fixed-line infrastructure and the high cost of international bandwidth, but this market sector has started to accelerate following the introduction of various kinds of broadband services including ADSL, cable modems, WiMAX wireless broadband and mobile data services, and then the landing of the first international submarine fibre optic cable in the country (Seacom) in 2009. Further improvements can be expected from the ongoing rollout of 3G mobile services and a national fibre backbone network as well as the landing of the second international fibre (EASSy) in 2010. According to 2010 figures there were 88,100 fixed phone lines in use compared with 7.2 million mobile phones, with 21,172 Internet hosts and 613.600 Internet users.

## 9.2   ICT Background

In 1998, the Government of Mozambique established an ICT Policy Commission, chaired by the Prime Minister, whose primary mandate was to draw up a national ICT Policy. Following a two-year nationwide debate involving all stakeholders – public and private sectors, civil society, academic and research institutions, donor agencies, etc. -, the national ICT Policy was approved by the Council of Ministers in December 2000; in June 2002, one and a half years later, an ICT Policy Implementation Strategy was adopted, which sets out not only concrete benchmarks and targets to be achieved but also indicators or measurement parameters whereby to assess progress.

Both the ICT Policy and the Implementation Strategy have selected human capacity, infrastructure, legal and regulatory framework, e-Government, content and applications, business development, etc. as key areas of intervention, which means that ICTs are not seen as a priority sector competing for attention with other development priorities, but rather as an enabler, development tool or cross-cutting issue that must inform and permeate all sectors and development programmes.

In the ICT Policy Implementation Strategy, e-Government is appointed as the key element to realize the objectives set up by the Public Sector Reform Strategy of improving public sector performance, efficiency and cost-effectiveness through the use of ICTs as well a goal also defined in the Public

Sector Reform Strategy of changing the public entities attitude and set up which is self-centred into a citizen-centred paradigm.

As part of the implementation of the ICT Policy Implementation Strategy and mobilization of resources, many ICT projects were launched in the public sector and among those can be found the Electronic Government Network Project, SchoolNet Project (supported by private sector - Microsoft, HP, etc.), eSISTAFE (State Financial Administration System), the Land Information Management System, SISCAL (System for Licensing and Registration of Enterprises), Criminal Registry System, Civil Registration System, Civil Identification Registry System, Emigration Registry System, Driving License Registry System. ICT initiatives did not only flourish at the public sector, the private sector has also been very innovative in providing many eCommerce and eBusiness applications to citizens and the public sector.

The Electronic Government Network Project (GovNet), is of special significance, because it is aimed to provide the Government with a high-capacity electronic communication infrastructure that is reliable and safe for 'rapid, efficient and effective transportation of information'. This infrastructure will support the implementation of information systems and the installation of all applications that will enable Government-to-Government (G2G), Government-to-Business (G2B), and Government-to-Citizens (G2C) operations. To realise this objective and also provide different communication alternatives at a low cost, Mozambique is involved in two important infrastructure projects, namely EASSY (Eastern African Submarine Cable System) and the SEACOM, which will provide landing stations in Mozambique for international connectivity.

## 9.3   Current ICT Initiatives and projects

Mozambique is currently investing in several ICT projects as a consequence of the gradual realisation of the ICT Policy and its implementing strategy and the Mozambican eGovernment Strategy. Most of the projects implemented in de public sector concur to the implementation of the eGovernment in Mozambique although it is not yet being implemented as set on the strategy. Some of the projects currently implemented are listed in the following section.

### 9.3.1   Electronic Government Network (GovNET)

GovNet project has being implemented since 2004, and at that time was defined as the Pilot Phase aimed at providing the necessary support in the definition of the technical (hardware, software, networking) requirements, communication protocols to be put in place, naming conventions to be established, definition of security rules. During the Pilot phase the institutions that were connected were the central level of the government, all located in Maputo. Following the Pilot Phase due to its successful implementation, the Italian Government extended its funding and the Extension Phase took place benefiting 4 to 5 institutions at provincial level. From 2010 a third phase has started expanding connectivity to the districts. It is planned to cover all of the 128 existing districts in Mozambique.

**Funding**:  Italian Government, World Bank and Government of Mozambique, and implemented by the National ICT Institute (INTIC), the former ICT Policy Implementation Unit (UTICT).

**Geographic scope**: National covering government agencies.

### 9.3.2   State Financial Administration System eSISTAFE

The State Financial Administration System also designated as e-SISTAFE and currently under implementation takes advantage of the capabilities offered by ICTs and it is proposed to provide financial administration services through the Internet using a single Bank account for all government institutions expenditures. Through this system the institutional budgets are assigned and monthly reports are also presented allowing the Ministry of Finance to present the annual State Financial Report in a timely fashion, present quarterly reports about the execution of the budget and submit the proposed State Budget to the Parliament before 30th September each year.

This project also demonstrates that government transactions such as G2G (government-to-government), G2B (government-to-business) and G2C (government-to-citizen) can be done more effective and efficient when availed electronically so long as all the security mechanisms are taken. This project is being implemented by the Ministry of Finance, through the Development Centre of Financial Information Systems (CEDSIF).

**Funding**: World Bank

**Geographic scope**: National covering government agencies.

### 9.3.3   Mozambique eGovernment Communication Infrastructure Project (MEGCIP) (2010 – 2014)

Hosted at the Ministry of Science and Technology, with the main objective of supporting the Government of Mozambique efforts to lower communication costs by using international capacity to extend the geographic reach of the broadband networks and contribute in improving the efficiency and transparency through e-Government applications. This project has several components which deal with communication infrastructure, policy and regulation, eGovernment applications and institutional capacity building and different parts of the project components are implemented by the Ministry of Science and Technology, National ICT Institute (INTIC), The Ministry of Transport and Communication and the Mozambican National Institute of Communications (INCM).

**Funding:**  World Bank, with an implementation time frame of 2010 to 2015 with a total budget of $30,000,000 USD

**Geographic scope:** National

### 9.3.4   Mobile ICT Unit

The Mozambican Mobile Unit address the problem of ICT skilled human resources in the country by providing a number of training courses in variety settings, which has proven to be ideal for the needs of those that live in districts isolated from all ICT facilities provide in the cities. In the case of

Mozambique these facilities have been delivered in a tract with a container that was set as a classroom, equipped with 10 computers and 20 sets. This mobile ICT technology has provided access to learning by offering interesting and relevant programs for public servants and other community members. Within the Mobile Unit, these groups can also access a variety of information provided by the Internet and communicate with people from all over the world through email.

**Funding:** UNDP and Italian Government

**Geographic scope:** Districts

### 9.3.5  Provincial Digital ResourceCentres (CPRDs)

Provincial Digital Resource Centres (CPRDs) are an organizational mechanism that helps concentrate ICT infrastructure, skills and investment and provide a single entry point for ICT deployment and activity in the provinces, stimulate local demand and use of ICT by all sectors of development and support capacity building and development of local content. The first CPRDs were established in 2004 in the Provinces of Inhambane and Tete by the ICT Policy Implementation Unit, with funds provided by UNDP.

The successful impact that these centres have created within these provinces, with the provision of ICT training courses, computer maintenance, network administration, data base designs and many other ICT services that were not offered at a provincial level have led to further funding from UNDP, Microsoft, Government funds through the Public Sector Reform Program and Italian Government, which allowed for the extension of these facilities to 6 more provinces (Nampula, Gaza, Sofala, Zambezia, Cabo Delgado and Niassa) from 2005 to 2009.

At the moment funds have being secured from the Finnish Government through the STIFIMO project to establish three additional centres in the remaining 3 provinces (Maputo, Maputo City and Manica).

The CPRDs have been working as local hubs with a multi-sectoral and multi-functional approach, fostering linkages with local media to multiply the benefits of Internet connectivity and rural access to information, reducing internal digital divide.

**Funding:**     UNDP, Italian Government, Microsoft Corporation, Mozambican Government and Finnish Government

**Geographic scope:** National

### 9.3.6  Government Portal

The Government Portal initiative is aimed at providing a single entry point to Government information and services which are organized according to the interests and needs of its consumers, allowing that those are available anytime, anyplace and anywhere. The Government Portal was lauched in 2006 by the former Prime Minister Luisa Dias Diogo. Following that several Provincial government Portals have being developed and at this stage forms are being added

through which citizens can access the services provided, taking in that way the Mozambican steps towards eGovernment a few steps further.

**Funding**: Italian Government through the GovNET Project described above above

**Geographic scope**: National covering government agencies.

### 9.3.7   Human Capacity Building

One of the biggest constraints that were identified during the process of drafting the ICT Policy, its implementation strategy and eGovernment Strategy was the lack of qualified human resources that could maintain the system, equipment and infrastructure that could be put in place. To overcome this, a number of ICT capacity building programs are being implemented in the government institutions at all levels. The programs implemented are aimed at providing the necessary skills to use designed applications, administrate networks, manage and design data bases and web pages as well as produce word documents, worksheets, presentations, send and receive electronic messages, search for information on the Internet and produce and content and applications.

**Funding:**  Italian Government through the GovNet Project described above, World Bank through MEGCIP project also described above and UNPD

**Geographic scope**: National.

### 9.3.8   ICT Legal and Regulatory Framework

A proper development and implementation of ICT initiatives requires a legal, regulatory frame work that can protect the people and institutions that are exposed by using these kind of technologies. The legal framework also ensures or improves protection of the institutions and citizen's against different forms of electronic abuse and crime. Thus, the Government is defining a set of laws or regulations to ensure a balanced and equitable development of ICT infrastructure, adopt solutions and cryptographic codes less susceptible to violation, combat the violation of citizens' rights and attempts against public order and social and cultural values, especially pornography, abuse and violence against women and children via the Internet. To realize this, the electronic Transaction Low was prepared, which will soon be submitted to the parliament and other set of regulations will be also put in place.

**Funding:** World Bank trough MEGCIP project also described above

**Geographic scope**: National

### 9.3.9   National System of Civil Registration (SINAREC)

Mozambique does not have a central registration system to register its population right from birth nor has each citizen a unique personal number, in contrary there are different ID Cards/documents that are issued independently by different ministries, such as, ID Card, Election Card, Military Card, Health Card, Driver License Card, Passports and other identification documents. Without knowing and registering the population, a nation cannot facilitate its citizens with government services in an

efficient and effective manner. Thus this project is one of the fundamental corner stones in Mozambique's national e-governance strategy thus vital to the whole country.

The projects, aims at creating possibilities for Mozambique to efficiently and effectively plan for and implement social services for citizens, promote democracy through the availability of efficient and correct registers for voting, promote an efficient, effective and fair government, etc.

The project will run in phases, with a Pilot Phase being currently, which will apply a birth registration system with a unique ID number to a chosen set of 1000 peoples and pilot the registered population as the core of the e-government initiative including investigating and testing integrations and interoperability to the rest of the e-government.

There are also included in the project activities that will account for the creation of a legal framework for full-scale system, capacity building and also that will secure further funding.

**Partners:** Ministry of Science and Technology, Ministry of Justice, the Mozambican International Bank and the Swedish Tax Agency

### 9.3.10  Biometric Driving Licence and Motor Vehicle Registration Systems

This system is used to produce new driving licence cards without the use of special equipment, which has visible security features to facilitate a quick visual check, and it contains invisible and/or confidential security features for a second-level check.

The Motor Vehicle Registration System, apart from using this solution to register motor vehicles, it is also used, amongst others, for the purpose of issuing registration plates and motor vehicle permits, deregistration of motor vehicles, change of vehicle particulars, change of ownership of a motor vehicle, financial information and accountability, transaction auditing and management information reports also. The two systems where developed to provide driving licences and vehicle number plates with the same standard and format of the ones used in the SADAC region.

**Funding**: World Bank

**Geographic scope:** National

### 9.3.11  Biometric ID Card and Passport

The new ID card is a huge step forward in solving problems of citizens who previously had to wait for months or even years for their ID cards.  It incorporates biometrical features, which are used to establish a person's identity which can later be compared with stored reference data. The biometric identifiers used in this card are the fingerprint and the facial image, making it a secure identification document that is difficult to forge.

The system has being developed by Semlex, a Belgian company that invested 50 million dollars in setting up the new ID system and passport, and will recover its money from the sale of the ID cards, which will cost 180 meticais (about 6.6 US dollars) each, while the new passports cost 3,000 MT, or 3,750 MT if the document needs to be issued within two days. Local news sources have pointed out

that the cost is way beyond the means of ordinary people in Mozambique, where the current statutory minimum wage is 1,486 MT for agricultural workers and 2,745 MT for workers in financial services. The old ID Cards and passports remain valid until they expire.

### 9.3.12  Criminal Registration System

An application that facilitates the exchange of records about the criminal status of the citizens used to issue criminal certifications. This system is used to facilitate the exchange of information between the provincial delegations and the central institutions that deal with this information. Through the use of this system the time length of producing a criminal certification was drastically reduced. This certification is often required for new employments, bank loans etc.

**Geographic scope:** National

### 9.3.13  Licencing and Management of Mineral Resources

The Ministry for Mineral Resources in Mozambique has adopted FlexiCadastre, an enterprise scale land management solution which turns to Spatial Dimension to deliver sustainable solutions that optimise land related business processes, minimise risk, provide compliance and oversight functions and integrate seamlessly with other enterprise systems. The adopted FlexiCadastre solution uses a business rule and workflow-centric approach to facilitate the efficient administration of mineral rights and contracts in multiple global jurisdictions. The adopted solution uses a web portal for data management and reporting, advanced task management, configurable business logic, best of breed GIS technologies and innovative concepts.

### 9.3.14  Multimedia Community Centres (MCC) Programme

A Program mainly implemented by the Ministry of Science and Technology but with a contribution of different institutions such as the Centre of Informatics of the Eduardo Mondlane University (CIUEM), the National ICT Institute (INTIC) and UNESCO. The program aims at providing means by which the community have access to information using a wide range of information and communication technologies using a single point. This is also serving to reduce the digital divide, reduce poverty by enabling people to solve development problems that the community faces and strengthen the community capacity.

**Funding:** World Bank, UNESCO, UNDP

**Geographic coverage:** National

### 9.3.15  SchoolNet Mozambique

SchoolNet Mozambique is a nationwide network of professional educators and schools working to make the Mozambique educational system competitive by preparing in-school youth for Internet connectivity and technology. The network aims to enhance learning opportunities for students, teachers, and the surrounding community via the Internet. SchoolNet is also seen as a way to prepare Mozambican students for work in the Global Information Society.

Students and teachers in the SchoolNet network use the Internet as a learning tool. Mozambican students have participated in Internet-based exchanges such as the Global Environment Youth Convention and the Math Olympics.

The immediate motivation for the deployment of this network was to share a single Internet connection and therefore reduce overall monthly costs in order to assure a long-term sustainability. However, once such a network is deployed the potential to include other services, that would not be possible or at least viable if each school had just its own separate network, is tremendous, for example Voice over IP, shared Mail, Proxy and WEB servers, shared applications like virtual library, just to name a few. On the other hand, once in place and functioning, such a network can easily grow just by having more schools connected to this initial backbone. It a firm conviction of the Ministry of Education that, using the wireless technology implemented in this first phase the network could easily grow up to at least 100kms from its actual focus point which means probably a few tens of schools for the case of Inhambane province. The other major goal of this project is to develop a solution that once tested can easily be replicated in other provinces all over the country.

**Geographic scope:** National

### 9.3.16  Environmental Management and Information System for Mining Sector

The purpose of the EMIS is to facilitate environmental procedures in the mining sector to warrant the availability of technical information and data for environmental monitoring and environmental auditing store, manage and reference documents. Ideally these should be digital, store and report on environmental surveys, on samples and on analyses performed. This management system has the benefit of extending the existing Cadastre System to include Environmental procedures and actions, it also requires:

- The Environmental requirements are closely related with the application, granting and renewal of Mineral Title

- The Mining Cadastre System has a comprehensive GIS interface utilizing ArcGIS

- Integrating the two systems would allow cost savings in terms of existing hardware infrastructure

- Integrating the two systems would allow for a single system to support and maintain

- Integrating the two systems would allow for resource pooling between the Cadastre and Environmental departments

**Geographic scope:** National

### 9.4   National ICT Research Capacity and Priorities for Cooperation

The main research centers undertaking ICT initiatives in Mozambique are listed below

➢ ARPAC - National Institute for Socio-Cultural Research

➢ Mozambican ICT Institute (MICTI)[60]

➢ Eduardo Mondlane University (UEM)[61]

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[60] http://www.micti.co.mz/
[61] http://www.uem.mz/

➢ Pedagogical University (UP)[62]

➢ Higher Institute of International Relations (ISRI)[63]

➢ Catholic University (UC)[64]

➢ São Tomás University (USTM)[65]

➢ Centre of Medicine and Medical Equipment (CMAM) of the Ministry of Health (MISAU)

➢ National Health Institute (INS)[66]

➢ Higher Polytechnic and University Institute (ISPU)

➢ Mozambican Higher Institute of Science and Technology (ISCTEM)[67]

➢ Higher Institute of Transport and Communication (ISUTC)[68]

➢ Higher Institute of Health Sciences (ISCS)

➢ Higher Institute of Public Administration (ISAP)

➢ National Institute of Education Development (INDE).

Although the institutions listed above have a high potential to conduct research activities and this should be undertaken hand in hand with the learning component, which is the main area of activities for the educational institutions, they currently concentrate most of their effort on the learning component, neglecting the research activities as they do not provide revenue. Most of the educational institutions listed above are private thus they do not have a budget from the government to cover the running costs. As a result, the level of research being conducted is not very high currently. The table below provides the main research areas of the research institutions that responded to the survey and a possible match where it is possible to do so.

| Research Institution | Areas of Research | Mapping to FP7-ICT themes |
|---|---|---|
| ARPAC - National Institute for Socio-Cultural Research | Research on socio-cultural aspects related to development, considering that culture is a dimension of development. | 1, 2 and 3 if combined with the knowledge of other organizations working in the health, food and water sectors |
| Mozambican ICT Institute (MICTI) | ICT, Environment, Science & Engineering Education / Training, Manufacturing, Energy, Consultancy, Other Services | Themes 1, 4, 5 and 6 |
| Eduardo Mondlane University (UEM) | Human Resources Development, Education, Agriculture, Marine Science, Fishery, Building, Ecotourism, Manufacturing Industry and | Themes 5 and 6 |

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[62] http://www.up.ac.mz
[63] http://www.sarua.org/?q=uni_Higher%20Institute%20of%20International%20Relations%20(ISRI)
[64] http://www.ucm.ac.mz/
[65] http://www.ustm.ac.mz/
[66] http://www.ianphi.org/member-countries/country.cfm/count_id/6C8B1416-123F-73FE-89F70E8627F12B67
[67] http://www.isctem.ac.mz/
[68] http://www.transcom.co.mz/isutc/

| | Processing, Water, Mineral Resources, ICT, Social, cultural and human Sciences, Health, Transport, Environmental Sustainability, Science & Engineering Education, Energy, Commerce, Tourism, Biotechnology and others | |
|---|---|---|
| São Tomás University (USTM) | Research activities related to the use of ICT and Entrepreneurship for poverty alleviation. | |
| National Health Institute (INS) | Health systems, parasitology , virology and molecular biology, evaluation and analysis of health status, policy analyse and formulation, training and Post-graduate in health sciences | |
| Agrarian Research Institute of Mozambique (IIAM). | Cereals; Roots and tubers Grain legumes; Cashew nuts; cotton; Big and small ruminants; poultry and pigs; Animal husbandry; Natural resourcemanagement including soils; and Forest Technology transfer andtraining | |

The future areas of collaboration which are not cored by the FP7:are listed in the table below

| Area | Research Activities |
|---|---|
| eGovernment | • Research on service delivery transformation and use of ICTs and eGovernment architectures as a catalytic force for public sector reform<br>• Research on innovative services on health and education, including science laboratories, and government information and content<br>• Existing eGov applications and services and their impact to the citizens' |
| Health | • Development of Health Systems that can extend health services to more people and overcome the problem of lack of specialized personal<br>• Research on the main health areas affecting Mozambican population such as HIV AIDS, Malaria, Tuberculosis, Meningitis, Cholera<br>• Parasitological research<br>• Virology and molecular biology research |

| | |
|---|---|
| | • Evaluation and analysis of health status |
| | • Design of Policies that can help mitigate, prevent and provide better solutions for the major health diseases in the country specially the epidemic ones |
| Agriculture | • Research on type of hydraulic solutions that need to be put in place to overcome problems related to draught |
| | • Diagnose, characterize, monitor and sustainable manage viruses affecting different crops productivity |
| | • Research on agricultural logistics, market access, value chains and on services required by the technology start-ups (finance, consultation, etc.) |
| Education and Human Capacity Building | • TELEMATIC Education |
| | • Capacity building programs through ICT |
| | • Distance education platforms and pedagogies |
| ICT | • Research on robust and well standardized, easy maintenance access terminals for rural areas |
| | • Research and development of FOSS solutions and content that can address the development needs of different communities: |
| | • Research on low cost wireless solutions to address digital divide |
| | • IT Security and Auditing |
| | • Research on low cost public terminals, business models, universal access, shared network infrastructures, security architectures |
| Economic and Social Development | • Promoting entrepreneurship using ICT |
| | • Empowering communities through ICT |
| | • Research on community based content and service needs, tailored to cultural and linguistic context of rural areas |
| | • Entrepreneurship for poverty alleviation |
| Knowledge Management | • Research on knowledge platforms and services needed to support human and institutional networking as well as regional NREN integration |
| | • Development of knowledge management platforms, knowledge management systems and data bases |

**National Participation in FP7**

Mozambique in recent years has a good track record of participation in FP7, including IST-Africa, EO2HEAVEN, SAGA-EO and IRMA. This is a direct result of the greater international visibility achieved by hosting the IST-Africa 2007 Conference in Maputo. Mozambique has been very successful in recent years in attracting international funding for ICT related projects. It is clear that having secured initial projects, it becomes much easier to become involved in more proposals.

**Level of Research Maturity**

The level of research maturity in steadily strengthening, supported by the experience of being involved in internationally funded research and the impact of bi-lateral projects funded by a number of EU Member States. This is despite the difficulty created by the linguistic challenges for a Lusophone country trying to participate in international research projects. IST-Africa has made a significant contribution in this regard by facilitating relationship building with key stakeholders, exchange of experiences in Europe and Africa, focusing international attention on Information Society and ICT related challenges and opportunities in IST-Africa Partner Countries and providing opportunities to engage with international research stakeholders both in Europe and in Africa.

There is now a considerable sense of urgency in the government and in the research community to build on recent successes and momentum achieved to date. While the primary focus is still on technology adoption and developing applications, there is an increasing focus on strengthening research capacity within the country, and facilitating the continued development of post-graduate programmes. Mozambique is one of a number of IST-Africa Partner Countries (including Uganda and South Africa) which is investing in funding national research programmes

## 10.    REPUBLIC OF NAMIBIA

### 10.1    Introduction

Namibia is situated in South Western Africa, bordered by the Atlantic Ocean in the west, Angola and Zambia in the north, Botswana and Zimbabwe in the east and South Africa in the South. The country has a surface area of 824,292 km² and a population of 2.14 Million (est July 2011) with literacy rates of 85%[69]. Namibia is an arid country with generally low and highly variable rainfall. Agriculture, largely subsistence, is the main economic activity for 70% of the population, contributing about 7% of GDP. Diamonds, Minerals, Fish, Livestock and Livestock by products are the country's principal exports.

According to 2010 figures, there were 152,000 fixed phone lines in use compared with 1.5 million mobile phones. There were 76,020 Internet hosts with 127,500 Internet users (2009).

The main ICT activities in Namibia include Telecommunication, Postal services and Broadcasting.

### 10.2    ICT Background

The Namibian Government recognizes the value of Information and Communications Technology (ICT) as an industry providing the underlying productivity gains for the overall economy. Hence, the Namibian Government's *Vision 2030* stipulates that by 2030 Namibia should be a knowledge-based economy. In so doing, the government aims to establish ICT as the critical sector for the Economic Development of the country by 2030. It envisages that by embracing the development of ICT, Namibians will benefit through:

➢ Access and availability of information that assist them in their daily lives

➢ Increased competitiveness of business and commerce in the global market place

➢ Establishment of an environment conducive to the development of Namibian-based ICT providers that are competitive internationally, and create opportunities for employment and economic diversification

As its mission the Government of Namibia aims to ensure that every citizen and resident shall have affordable access to high quality information and communication services.

To achieve Vision 2030, Namibia needs to accelerate the use of ICT in Namibia and grow the sector, hence the specific objectives of the ICT policy are:

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[69] CIA World FactBook 2011

> ➢ To enhance the market and regulatory structure of ICT in Namibia , to fully liberalise (open, competitive market and private sector participation) all telecommunications services by 2010, following a controlled process

> ➢ To establish streamlined, efficient and effective regulation of the ICT industry on a fully transparent, technology neutral and competitively balanced basis

> ➢ To provide universal access to information and communication facilities in Namibia for all communities (to telephones, Internet and multi-media services) by 2011, by establishing an access point in every community or village.

> ➢ To enable affordable prices for telecommunications services, particularly low income groups by 2010

> ➢ To enable profitable investment opportunities in all segments of the market by 2010

> ➢ To successfully implement government ICT initiatives in education and training by 2013

> ➢ To successfully implement e-government initiatives by 2015

> ➢ To establish Namibia as a first class regional ICT hub that will contribute towards job creation by 2013

A dedicated Ministry of ICT was established in 2008. Namibia has made good strides in developing the ICT sector. Although the ICT sector has developed in line with most global trends - new technologies and applications - there is still room for growth. The telecommunications backbone switching and transmission network was 100 percent digitalised in 1999 with state-of-the-art underground fibre-optic cabling, which facilitates access to advanced technologies, products, applications and services. Direct communication satellite links exist with neighbouring countries as well as with the UK, USA and Germany. Namibia have two cellular operators MTC and Leo. Cellular (mobile telephone) service customers increased from 60,000 in 2000 to a record 1.535 million by 2011. [Note: National Planning Commission (NPC). 2008.  Third Development Plan (NDP3), 2007/2008-2011/12. Volume 1. Government of the Republic of Namibia.]

MTCs 3G network is deployed in over 95 percent of the country making access to the Internet available through their 3G devices and internet enabled phones, in partnership with Nokia Siemens and Motorola. This has been an enhancement of the existing GSM/GPRS/EDGE broadband technologies[70], with increasing international capacity through VSAT Internet gateways.

High education institutions are the major ICT hub for servers, computers, e-learning media system and Internet access through narrowband and broadband technologies offered by Telecom of Namibia, MTC, and other service providers, including Xnet. For example, the Polytechnic of Namibia has over 2,200 PCs and Laptops located in more than 35 labs and well as in the library and offices, 259 laptops to be used by students and staff and 120 servers.

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[70] MTC annual report 2008- annual news Vol. 013

## 10.3    Current ICT Initiatives and projects

Namibia is currently implementing a number of ICT-related initiatives in the area of Education and eGovernment projects.   The section below provides an overview of some of the projects being implemented, funding sources and geographic coverage.

### 10.3.1 TECH /NA! , Namibia's ICT in Education Initiative

TECHN/NA!, Namibia's ICT in Education Initiative is a comprehensive implementation strategy for the integration of ICTs across the entire education sector blending local expertise and international support to ensure that all educational institutions are able to efficiently utilize ICTs to meet their overall educational objectives in order to equip , educate and empower administrators, staff, teachers, and learners in ICT literacy and ICT integration skills to help bridge the digital divide with communities and meet the goals of Vision 2030 to fulfils Namibia ambition to become a knowledge-based society by 2030.

**Funding sources**: This programme is funded by the Namibian government, with local and international support

**Geographic coverage**:  National

### 10.3.2    eHealth System

The eHealth System, also known as the Integrated Health Care Information Management System (IHCIMS) was launched in 2011 and the system was designed to cater for the day-to-day operational activities and services rendered by hospitals to patients. Medical information of patients will be stored on the Integrated Health Care Information Management System in digital format. Each patient will be given a unique number, which can be used across all 34 government hospitals in Namibia. That means that patients need not carry medical passports or treatment records while visiting any government hospital for treatment. The system will replace all manual procedures and systems in the hospital, reducing strain on medical staff. By the end of 2011, 800 end users in two hospitals in Windhoek were trained on the system by a consulting company.

### 10.3.3.   eGovernance projects

The Namibian government is implementing a number of projects under its e-governance programme. These projects are implemented through the office of the Prime Minister and their coverage spread across the entire public service and are funded by the Namibian government with local and international support:

### 1. Improve government ICT infrastructure

The aim of the project is to improve the Government ICT infrastructure by creating an enabling environment for the implementation of all other e-Government projects and systems. To expand the GRN Intranet Network to include all the thirteen Regions to enable access to GRN Intranet Network 24 hours a day, 7 days a week.

## 2. Build Skilled ICT Resources

The main objective of this project is to build a skilled ICT Human Resources in the Namibian Public Service with a view to tap maximum benefit from existing computers by fully utilizing the products invested into by the GRN; accelerate the implementation of eGovernance Policy by promoting access and usage of the GRN Intranet /Internet.

## 3. Government Portal

The goal of the project is to facilitate the consumer transition from 'in-line' to 'on-line' by providing a single point of access to information and services organized according to the interests and needs of its consumers, permitting anytime, anyplace and anywhere access; This is in accordance with NDP 3 Programme 4: Implement five phases of e-Governance which calls for efficient provision of e-Services.

## 4. Electronic Documents and records management system project

The project aims to lead to the improvement of record and archives management in the public services, where this is increasing usage of electronic data and information system in the creation of its knowledge management and supporting decision –making mechanisms.

## 10.4   National ICT Research Capacity and Priorities for Cooperation

There are two particularly relevant research areas for cooperation between Namibian research organisations and their peers in Europe. One key research area is Digital Libraries and digital preservation (Indigenous Knowledge), Technology Enhanced Learning and Digital Content.  The other key area is ICT for Environmental Sustainability (Services & Climate Change Adaptation) and Energy Efficiency (specifically related to the climate and landscape of the country).

Research in Namibia is predominately carried out within the two main higher education institutions:

➢   University of Namibia[71]
➢   Polytechnic of Namibia[72]

Following consultation with representatives from both institutions during an FP7 Training Workshop in September 2010, the following mapping of expertise was identified:

| Challenges | Universities with expertise |
|---|---|
| Challenge 1: Pervasive and Trusted Network and Service Infrastructures | Polytechnic of Namibia (Cloud Computing, Future Networks, Trustworthy ICT) |
| Challenge 3: Alternative Paths to Components & Systems | University of Namibia/MRC |
| Challenge 4: Technologies for Digital Content | Polytechnic of Namibia (Digital Preservation) |

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[71] http://www.unam.na/
[72] http://www.polytechnic.edu.na/

| and Languages | |
|---|---|
| Challenge 5: ICT for Health, Ageing Well, Inclusion and Governance | Polytechnic of Namibia (VPH). University of Namibia (Governance) |
| Challenge 6: ICT for Mobility, Environmental Sustainability and Energy Efficiency | University of Namibia (Water Management) |
| Challenge 8: ICT for Learning and Access to Cultural Resources | Polytechnic of Namibia (Mobile Learning, Indigenous Knowledge in relation to Cultural Resources) |

**National Participation in FP7**

IST-Africa is the first FP7 project in which Namibia is involved (other than Africa4All Parliamentary Initiative which was instigated by IST-Africa), but Namibia has also been represented in a number of unsuccessful proposals in recent years, particularly after hosting IST-Africa 2008 in Windhoek. There is now an appetite for participation in EU funded research, and the number of proposals in which Namibia is involved is expected to increase in future years, building on relationships with German universities in particular. However, the significant gaps between calls, the high level of competition under specific thematic areas aligned with national implementation policy in Africa (e.g. TEL) and timeframe for projects to be evaluated and negotiated has implications for participation.

**Level of Research Maturity**

Namibia like Botswana is a middle income country also trying to diversify its economy, and attract foreign direct investment. However, this process is not as far developed as in Botswana. One of the key challenges is the very small number of research institutions, and the relatively low percentage of Namibian staff. While the current focus is primarily on technology adoption, there is a commitment to strengthen the research capacity within the country, and especially in facilitating the continued development of post-graduate programmes and involvement in cross-border research.

The University of Namibia and Polytechnic of Namibia are the primary research institutions in Namibia. The two institution's competencies and priority areas are as indicated in guide to initiatives and priorities.

# 11.   REPUBLIC OF SENEGAL

## 11.1   Introduction

Senegal is the most advanced Western African country along the Atlantic Ocean, with major sea and air routes to Europe, other African countries and the Americas.

Covering an area of 196,722 km², it is bordered on the north by Mauritania, east by Mali, south by Guinea and Guinea Bissau, west of the Gambia and a coastline along the Atlantic Ocean for 500 km. Dakar (550 km²), the capital, is a peninsula in the far West.

Senegal is a flat country with sandy soil not exceeding 130m except at the south-eastern border of Republic of Guinea. Three rivers cross the country from east to west: Senegal (1700 km) north, Gambia (750 km) and Casamance (300 km) south. The population is estimated at 12.6 million inhabitants (2011) with literacy rate of 39.3%.

The Republic of Senegal is a secular, democratic and social country. It ensures equality before the law for all citizens, without distinction of origin, race, sex or religion. It respects all beliefs. The official language of the Republic of Senegal is French. The national languages are Diola, Malinke, the Pular, Serer, Soninke, Wolof and other national language to be codified.

In relation to Communications, according to 2010 figures, there were 341,900 fixed phone lines in use compared with 8.344 million mobile phones.  There were 241 Internet hosts (2010) and 1.818 million Internet users (2009).

## 11.2   ICT Background

One of the objectives clearly articulated by the Government is to make Senegal a regional leader in the production of value-added services supported by ICT, in order to improve its position in the global economy. To achieve these objectives, Senegal has developed a multitude of programs related to Information Technology and Communication (ICT). In fact, for over two decades, State Authorities have decided to firmly consider ICT as an essential part of development.

Since 2000 a national strategy for developing ICT was defined and a State Computer Science Bureau and Ministry responsible for ICT has been established.

According to data from the DPEE on economic and financial situation of Senegal, 2009 Perspective on 2010: "the telecommunications sector has registered over the period 1997 to 2007, an average annual growth rate of 18.8%. "This strong growth is favored by the massive use of mobile phones, which has reached the bar of 6.4 million subscribers in September 2009. The importance given to ICT in the economic development strategy has resulted in increasing the contribution of this sector

up to 7% of GDP. According to DPEE, "the telecommunications sub-sector alone generated a turnover of 440 billion FCFA in 2006 growing by 22.5% compared to 2005". With a turnover of nearly 600 billion CFA francs generated by the business fixed telephony, mobile telephony and Internet services, direct and indirect contributions of the telecommunications sector to the GDP is increasingly important.

ICT is used widely in secondary and third level institutions. Senegal has a good telecommunication infrastructure and Internet access is cheaper than in other African countries.

## 11.3 Current ICT Initiatives and projects

### 11.3.1  Legal and Institutional Framework

After strengthening the infrastructure, the Senegal authorities have begun to prepare the legislative and regulatory component of new technologies to create a legal environment favourable to their development. The first step was the establishment by law No. 2001-15 of December 27, 2001, as amended, of the Code of Telecommunications and the Regulatory Agency for Telecommunications and Posts (ARTP) responsible for providing the telecommunications sector with an effective and transparent regulatory framework, promoting fair competition to the benefit of users of telecommunications networks and services.

The other key step in the mentoring process of ICT development in Senegal was the creation of the State Information Technology Agency (ADIE). Decree N° 2004-1038 of 23 July 2004 mandates ADIE to stimulate public action in the treatment and dissemination of information in accordance with international legal and technical standards for quality, availability, safety and performance. For this purpose, ADIE launched a process that led to the adoption of appropriate laws and regulations in 2005.

Thus, several laws were adopted and promulgated.

➢ Law No. 2008-10 of January 25, 2008 on orientation law on information society

➢ Law No. 2008-08 of January 25, 2008 on electronic transactions

➢ Law No. 2008-11 of January 25, 2008 on Cybercrime

➢ Law No. 2008-12 of January 25, 2008 on the protection of personal data

➢ Law No. 2008-49 of September 23, 2008 establishing a voluntary contribution of one percent (1%) on public procurement of goods and digital services

➢ Law No. 2008-46 of September 3, 2008 establishing a royalty on access or use of public telecommunications network (RUTEL)

➢ Law No. 2008-41 of August 20, 2008 on cryptology.

2011 marked the adoption of a telecommunication code implementing most of the directives adopted by the Economic and Monetary Union of West Africa (UEMOA) and additional acts that the Treaty of the Economic Community of African States (ECOWAS) to create a legal environment conducive to the emergence of a regional market.

A National Commission of Cryptology, attached to the General Secretariat of the Presidency of the Republic, and whose permanent secretariat is provided by the Central Technical Services of Numbers and Security of Information Systems (STCC) was established.

## 11.3.2  E-Senegal: E-government from Senegal and ICTs at the service of citizens

E-Vision Senegal aims to put the citizen and business concerns within the government, to allow access for all citizens to information, to meet the performance needs of the state and the needs of actionable information officers.

The following priorities are addressed:

➢ the development of communications infrastructure linking all government departments

➢ setting up a government information system integrating the various information sources of the administration

➢ definition of organizational entities responsible for managing the IT policy

**Results include:**

➢ Interconnect by WIMAX 665 administrative building located in 35 departments

➢ Local Network (LAN) in all 665 buildings using WiFi or Ethernet.

➢ Videoconference platform between 11 regions

➢ Interconnexion of universities and research centers.

➢ Data centre building

**Funding:** Senegal, China (intranet), Korea (wimax), France (demarches administratives)

**Geographic coverage:** National

## 11.3.3  Universal Service Fund: Consider Internet and telephony as integral part of a universal service

The major objectives are to:

➢ bridge the access gap in networks and telecommunications services (telephone and Internet) throughout the national territory by 2012;

➢ promote the economic and social development of rural populations and those in disadvantaged areas through the provision of appropriate ICT applications;

➢ expand access to the Internet via broadband infrastructure to shared resources in social projects and Community as the interconnection of academic, health institutions and schools, facilities, etc.

➢ promote the creation of knowledge communities in the territory, relying in particular on the government infrastructure and public or private initiatives.

**Funding:** Telecommunications operators

**Geographic coverage:** National

### 11.3.4  Multimedia Community Centres (MCC) Programme

The project aims to develop a network of 20 MCCs in Senegal in two years and the main objectives are to:

➢ Reduce the digital divide;

➢ Facilitate access and appropriation of ICTs by communities;

➢ Reduce poverty by enabling people to solve development problems they face;

➢ Strengthen the capacity of communities

**Implemented by the ICT Ministry with the cooperation of UNESCO**

**Geographic coverage:** National

### 11.3.5  Centre de Recherche et d'Essai (CRE) Programme

CRE are units of development of research based on the promotion and the provision of means of applications of scientific and technological innovations for well-being.

They provide an interface between citizens and the R&D sector and use ICT as a main activity

**Implemented by the Ministry in charge of Scientific Research & Higher Education[73]**

**Funding source:** Government of Senegal

**Geographic coverage:** National

### 11.3.6  Grid Computing project

With support from HP and UNESCO, the University Cheikh Anta Diop de Dakar (UCAD) has initiated a project of grid computing since 2007. The project aims to find solutions to the brain drain that is crippling Africa in the scientific conquest. The project targets university laboratories and research centres. It contributes to improve the capacity of technical and scientific teams for the control of grid computing.

**Funding source:** HP and UNESCO

**Geographic coverage:** National (could be regional)

### 11.3.7  Brain Gain Initiative

This project aims to set up a distributed socio-economic infrastructure for a knowledge-based development approach (Gaston Berger University).

In early 2009, UNESCO and HP agreed to extend the African pilot to some 100 higher education institutions in Africa and the Arab States region by 2011. Through the use of distributed computing, UNESCO, HP and other partners plan to create the first pan-regional University network and help

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[73] www.recherche.gouv.sn

reduce the number of skilled workers, scientists, academics and researchers that leave these regions.

Innovative technology and funding support allows participating universities to re-establish links between researchers who have stayed in their countries and those living abroad, connect academics to international peers, research networks and funding opportunities. Faculties and students at beneficiary universities are able to work on innovative education projects with other institutions in their regions and around the world.

**Funding source:** HP and UNESCO

**Geographic coverage:** Regional

### 11.3.8  Education and Research Network (SnRER) Initiative

The main goal of SnRER is to build a national and regional academic infrastructure to:

➢ Support research and science collaboration;

➢ Build a common information system and data center for higher education in the country;

➢ Share resources and applications: grid-computing, e-learning, VoIP, videoconference, digital library, e-health, etc.

➢ Connect to other regional or international academic network (WACREN, GEANT, INTERNET2, etc.)

There have been a lot of developments for SnRER during 2011:

➢ March 2011: SnRER Creation approved by the Ministry of Higher Education and Scientific Research

➢ March 2011: Mandated by WACREN to host the regional NOC

➢ April 2011: Training and capacity building in collaboration with partners (NSRC and the University of Oregon)

➢ April 2011-July 2011: Design campus network in 5 public universities and upgrading network equipments

**Funding sources**: No information available

**Geographic coverage and time frame**: National/regional, ongoing project

### 11.3.9  Migration from Analogue to Digital Broadcasting Project

A national committee for the migration from analogue to digital broadcasting was established in August 2010. It is under the authority of the Minister of Communications and Telecommunications.

The committee's mission is to guide, coordinate and control the actions needed to ensure the passage of the audiovisual sector to digital.

It is composed of state representatives, regulatory authorities in the audiovisual and telecommunications companies in the audiovisual sector public and private operators of telecommunications services and ICT, professional organizations, etc.

The national committee consists of a coordinating committee and specialized committees which are responsible for providing solutions to legal, technical, commercial and related content and audiovisual programs.

**Funding sources**: No information available

**Geographic scope and time frame**: National; ongoing.

### 11.3.10 Senegal Observatory on Information Systems, Networks and Info highways (OSIRIS)[74]

Established in March 1998 by a group of people working in the private sector, higher education, administration and associations, the Observatory on Information Systems, Networks and Info highways Senegal (OSIRIS) is a non-profit association.

OSIRIS raises awareness, informs and provides analysis on all matters relating to the use and appropriation of Information Communication Technology and more generally on the development of Information Society in Senegal and Africa.

OSIRIS has the following objectives:

➢ Contribute to the development of the Information Society based in particular on the recommendations of the Initiative African Society in the Age of Information adopted by the United Nations Economic Commission for Africa;

➢ Promote the use and ownership of information technology and communication;

➢ Identify all initiatives in information technology and communication and to encourage synergies;

➢ Inform policy makers of different sectors such as private citizens on the opportunities and issues related to information technology and communication;

➢ Promote international cooperation in general and sub-regional in particular in the field of information technology and communications.

### 11.3.11    CTIC Dakar: An ICT Incubator[75]

CTIC Dakar assists ICT companies, Information Technology and Communication, as well as project leaders, in their stages of creation, development and growth. It offers businesses and to project the ICT infrastructure and services necessary to ensure sustained growth and sustainable.

CTIC Dakar opened on 1st March 2011 and the official launch ceremony took place April 19, 2011.

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[74] www.osiris.sn

[75] www.cticdakar.sn

CTIC Dakar is an example of Public Private Partnership led by the ICT Incubators Foundation of Senegal (FICTIS). Partners and sponsors include both public and private international organizations.

### 11.3.12    Women and Ecommerce project

The objective throughout the project Women and E-commerce is to promote greater integration of women including women in business to domestic, regional, and global in many ways by allowing the latter to:

➢ Participate in the development of their countries in a more competitive and with greater facility;

➢ Find real information and useful for their activities;

➢ Communicate with each other and develop barter and trade in goods and services,

➢ Become known internationally and to be in contact with potential partners;

➢ Establish a circuit Solidarity trade;

➢ To sell their products in most competitive markets;

➢ To share best practices and their constraints.

➢ Reduce intermediate

➢ To have more information to facilitate innovation and technological advance.

**Implementing department**: Ministry of Family and Women's Organisations

**Geographic scope and time frame**: National; ongoing.

### 11.3.13    National Action Plan of Resolution 70 of the International Telecommunication Union (ITU)

The plan is structured around a fund of the Employment of girls in ICT and is part of the program initiated by the government to bridge the gap that separates us from other countries in the field of ICT.

**Implementing department**: Ministry in charge of ICT

**Geographic scope and time frame**: National; ongoing.

### 11.3.14    E-ICT project[76]: projects related to agriculture and livestock in the Sahel region

The E-ICT project is a multi-stakeholder initiative coordinated by the ICVolunteers organization. The project is being implemented in Senegal and Mali (Sahel region), with support from Francophone Information Highway Fund and a range of other partners.

Objectives:

➢ Develop training in ICT for better farm business management;

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[76] www.e-tic.net

➢ Raise awareness about a better management of pastoralism and health issues;

➢ Promote the adoption of practices focused on the sustainable development farming through a better accountability of breeders including an awareness of environmentally friendly agriculture and biodiversity;

➢ Promote the use and marketing of products and by-products of farming;

➢ An inventory and the establishment of a monitoring system of animals and pasture, interface "Green Network";

➢ Enhance food security

## 11.4    National ICT Research Capacity and Priorities for Cooperation

Senegal has six public institutions of higher education:

➢ Université Cheikh Anta de Dakar[77]

➢ Université Gaston Berger de Saint-Louis[78]

➢ Université de Thiès[79]

➢ Université de Bambey[80]

➢ Université de Ziguinchor[81]

➢ Ecole Polytechnique de Thiès[82]

and the main research laboratories in Senegal are located in two universities:

**1.  Université Cheikh Anta Diop de Dakar**

a.  Laboratoire d'Imagerie Médicale et de Bio-informatique

b.  Laboratoire d'Informatique, Réseaux et Télécommunications (LIRT)

c.  Laboratoire de Traitement de l'Information (LTI)

d.  Mathématiques de la Décision et d'Analyse numérique

e.  Equipe de Cryptologie

f.  Equipe de Codage

g.  Equipe Réseaux, Services et Télécommunications

**2.  Université Gaston Berger de Saint-Louis**

a.  Laboratoire d'Analyse Numérique et d'Informatique (LANI)

b.  Laboratoire d'Électronique, Informatique, Télécommunications et Énergies Renouvelables (LEITER)

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[77] http://www.ucad.sn/
[78] http://www.ugb.sn/
[79] http://www.univ-thies.sn
[80] http://www.bambey.univ.sn/
[81] http://www.univ-zig.sn/
[82] http://ept.sn/

Senegal is currently developing a Science, Technology and Innovation Plan with the assistance of UNESCO. At present there are no formal national ICT research priorities defined. However, there are initiatives initiated by researchers. Among them, include the National Symposium on Research in Computer Science and its Applications (NCRI)[83]. NCRI is a framework for meetings between scientists and researchers from around the world.

The primary objective of the NCRI is to provide opportunity to the IT community (researchers, teachers and industry) with an interest in the areas of networking and computer services, applications and distributed systems, telecommunication networks, Semantic Web , to meet annually to exchange and publish the latest results of their work. NCRI 2012 is seeking papers that deal with all matters relating to development of communication protocols, networks and services:

➢ Networks and Distributed Systems

➢ Multi-agent systems and complex systems

➢ Management of large-scale data

➢ Knowledge extraction, data mining, Web mining

➢ Semantic Web, Web data, Web 2.0, Web 3.0

➢ Image Processing

During the IST-Africa FP7 Training Workshop in Dakar in November 2010, a consultation was undertaken with the research community and the following mapping of expertise was identified:

| Challenges | Universities with expertise |
| --- | --- |
| Challenge 1: Pervasive and Trusted Network and Service Infrastructures | Université Cheikh Anta Diop (Sensors), Université Gaston Berger (Networking), Ecole Polytechnique de Thiès (Trustworthy ICT, Networked Media and search systems) |
| Challenge 2: Cognitive Systems and Robotics | Université Cheikh Anta Diop (Robotics) |
| Challenge 3: Alternative Paths to Components & Systems | Photonics |
| Challenge 4: Technologies for Digital Content and Languages | Université Gaston Berger (Language Technologies, Semantic Web, Intelligent Technology), Université de Bambey & Universite de Ziguinchor (Information Management) |
| Challenge 5: ICT for Health, Ageing Well, Inclusion and Governance | Université Gaston Berger (Mathematical models for eHealth). Université Cheikh Anta Diop (Image processing - eHealth) |

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[83] cnria.cci.ucad.sn

| Challenge 6: ICT for Mobility, Environmental Sustainability and Energy Efficiency | Université Cheikh Anta Diop (Water Management and Sensors), Ecole Polytechnique de Thiès (Water Management), Ecole Superieure Polytechnique de Dakar-UCAD (Energy efficient design & solar energy) |
|---|---|
| Challenge 8: ICT for Learning and Access to Cultural Resources | Université Cheikh Anta Diop (TEL & Digitisation), Université Gaston Berger (Digital processing & Digitisation), Ecole Polytechnique de Thiès (Cultural resources), Ecole Superieure Polytechnique de Dakar-UCAD (TEL) |

**National Participation in FP7**

Senegal is currently involved in a number of FP7 projects, including CAAST-Net, IST-Africa, VOICES, EuroAfrica-P8, SAGA-EO and IRMA. Senegal research centres also have a successful track record of participation in the Environment, Health and Agriculture themes of FP7, and secured a project under FP-Africa-ICT. There is now a strong appetite for participation in EU funded research, and the number of proposals including Senegal is expected to increase in future years. However, the significant gaps between calls, the high level of competition under specific thematic areas which are aligned with national implementation policy in Africa (e.g. TEL) and the long timeframe for projects to be evaluated and negotiated obviously has implications for participation.

**Level of Research Maturity**

While there is a clear focus is on technology adoption and developing applications, there is an increasing emphasis on further strengthening the research capacity within the country, and facilitating the continued development of post-graduate programmes and involvement in cross-border research. The participation of Senegal in IST-Africa project has permitted to identify ICT priorities and competencies in the country. Since this integration, there is a better understanding of FP7 scheme and more interest to the open calls.

A mapping of competencies with FP7 themes has been undertaken and two ICT related proposals involving Senegalese researchers have recently been prepared for submission. The level of maturity of ICT research in Senegal is relatively low, due to the fact that human resources working in this field are young and inexperienced. So the interests are most in the use of the technologies and the development of applications than research concern. The youth of human capital in ICT research make the mobility very important. Many of the researchers prepare their PhD thesis through the partnership with Europeans universities more especially with France. The knowledge-transfer is developed through the use of the Diaspora living outside the country. With a UNDP program, TOKTEN (Transfer Of Knowledge through Expatriated Nationals), around 88 expert missions, with 64 for universities, have been used from 2001 to 2008 (see www.tokten.sn).

## 12.   REPUBLIC OF SOUTH AFRICA

### 12.1   Introduction

The Republic of South Africa occupies the southernmost part of the African continent, stretching latitudinally from 22° to 35° south and longitudinally from 17° to 33° east, flanked on the west by the Atlantic Ocean and on the east by the Indian Ocean, whose waters meet at the country's most southern tip, Cape Agulhas. The long coastline stretches 2,798 kilometres from a desert border in the north-west, down the icy and treacherous Skeleton Coast to Cape Agulhas, then up along rolling green hills and wide beaches fronting the warm Indian Ocean, to a border with subtropical Mozambique in the north east.

South Africa has common boundaries with Namibia, Botswana and Zimbabwe, while Mozambique and Swaziland lie to the north-east.  Completely enclosed by South African territory in the south-east is the mountain kingdom of Lesotho.

There are nine provinces forming jurisdiction regions in South Africa, each with its own legislature, premier and executive councils.  The provinces, with their own distinctive landscapes, vegetation and climate, are the Western Cape, the Eastern Cape, KwaZulu-Natal, the Northern Cape, Free State, North West, Gauteng, Mpumalanga and Limpopo.

South Africa is a middle-income emerging market with abundant natural resources, well-developed financial, legal, communications, energy and transport sectors, a stock exchange ranked among the top 20 in the world, and a modern infrastructure supporting efficient distribution of goods throughout the southern African region.  Economic growth has been steady and unprecedented ranging from 2.4% in 1999, to 4.9% in 2004 and 5.1% in 2007.

South Africa has the world's 26th largest economy by GDP (Gross Domestic Product) and the world's 34th largest labour force.  It is the economic powerhouse of the African continent, and comprising 25% of the entire GDP of Africa.

According to estimates for 2011[84], South Africa has a population of 49 million, with 65% of the population between the ages of 15 – 64 and a literacy rate of 86.4%. According to figures for 2010 there are 4.32 million fixed line phone in use, 50.3 million mobile phones, 3.75 million internet hosts and 4.42 million internet users.

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[84] CIA World FactBook

## 12.2    ICT Background

The South African ICT sector is the largest on the African continent and the 20th biggest in the world.  As an increasingly important contributor to South Africa's GDP, the country's ICT and electronics sector is both sophisticated and developing.  The country has a network that is 99% digital and includes the latest in fixed-line, wireless and satellite communications, making it the most developed telecommunications network on the continent.  South Africa's IT industry is characterised by technology leadership, particularly in the field of electronic banking services.  South African companies are world leaders in pre-payment, revenue management and fraud prevention systems, and in the manufacture of set-top boxes, all exported successfully to the rest of the world.  Several international corporates, recognised as leaders in the IT sector, operate subsidiaries from South Africa, including IBM, Unisys, Microsoft, Intel, Systems Application Protocol (SAP), Dell, Novell and Compaq.

The ICT industry includes hardware, software, networking and related professional products and services.  South Africa's ICT and electronics sectors are expected to continue showing strong growth in the future.  Testing and piloting systems and applications are growing businesses in South Africa, with the diversity of the local market, first world know-how in business and a developing country environment making it an ideal test lab for new innovations.

ICT activities were fragmented across a number of government departments. In 2007 Cabinet approved the National Information Society and Development (ISAD) Plan.  According to the ISAD Plan, different departments will initiate programmes according to their mandate.  The ISAD Plan recognises the importance of ICT R&D and innovation.  The ISAD cluster adopted eight thematic areas of work.  These include e-Health, e-Education, ICT/R&D and Innovation, ICTs for SMME Development, Local Content Development, e-Documentation, e-Government and ICT Infrastructure. In 2008 Cabinet approved a Programme of Action, drawing together the various departments and their resources with clearly defined outcomes that must be delivered over a set period.  A new government Cluster, called the Forum of South African Directors General (FOSAD) Information Society and Development Cluster, was created to deal with the coordination and integration of all government ICT initiatives and the advancement of "a people-centred, development-oriented and inclusive information society".

The purpose of the South African ICT R&D&I strategy is to create an enabling system for the advancement of ICT R&D and innovation, within the context of the broader national strategy.  It aims to improve economic competitiveness and the quality of life for South Africans.  The 2015 ICT vision is as follows:

"South Africa is an inclusive information society where ICT-based innovation flourishes. Entrepreneurs from historically disadvantaged population groups, rural communities and the knowledge-intensive industry benefit and contribute to the well-being and quality of life of our citizens. South Africa has a strong national ICT brand that captures the vibrancy of an industry and research community striving for excellence, characterised by innovative approaches to local and

global challenges, and recognised for its contribution to the economic growth and well-being of our people and region."

In line with this vision the key ICT R&D&I strategic objectives are:

➢ To develop focused and strengthened ICT research activities to achieve world-class research competencies in identified key S&T areas;

➢ To build a strong and robust ICT innovation environment, with an indigenous ICT sector that is competitive and growing; and

➢ To build advanced human capital (ICT skills base) for research and industry, as well as the proliferation of ICT in other sectors of the economy.

The following supporting objectives underpin the ICT R&D&I strategy:

➢ The creation of an enabling environment, through effective policy, strategy and support structures, which will lead to effective implementation

➢ The development of strong R&D cooperation with countries who are key players in ICT R&D.

➢ The provision of resources for the ICT R&D and Innovation System, which will result in ICT GERD funding at OECD levels by 2015.

➢ The development of an effective research infrastructure with local and international collaboration.

Proposed strategic interventions for implementation of the ICT R&D&I strategy include:

➢ The Advanced Human Capital Development Programme which aims to dramatically improve post-graduate enrolment and completion rate in ICT by supporting young researchers as students in employment.

➢ The Critical Mass Research Programme will support focus and critical mass R&D in identified technology and application domains through an array of instruments that link established researchers and draw in new researchers including post-doctoral researchers and international experts available in the NSI system.  These include core grant proposal funding, research chairs, networks and centres of excellence, institutes etc.

➢ The International ICT R&D Collaboration Programme supports the objectives of the Strategy through collaboration via collaborative R&D projects, researcher mobility and science and technology networking.

➢ The Large Innovation Initiatives and Grand Challenges addresses the innovation chasm by stimulating broad collaboration across disciplines and amongst players in various stages of the innovation pipeline by leveraging the Innovation Fund and other instruments.

➢ The ICT R&D in Industry Programme addresses current low levels of investment in ICT R&D and low uptake by industry and other sectors of society of research results from academic and other research institutions.  This will be done through awareness and advocacy, incentives,

industry research collaboration support e.g. as in THRIP, and people mobility by building on the ICT R&D Roadmap programme and stimulating intergovernmental and parastatal collaboration.

➢ The ICT R&D and Society Programme contributes to the realisation of the benefits of ICT R&D for improved quality of life and in support of an inclusive information society through a multidisciplinary information society research programme, market neglect innovation and a Young Scientist & Engineer programme.

➢ The R&D Infrastructure Programme enables simulation, experimentation, collaboration and other research processes, implemented through a number of specific infrastructures, by supporting research groups through equipment grants as required.

➢ Futures Research, Future Technologies and Strategy Implementation and Renewal Support encourages renewal of ICT R&D and enables effective planning of ICT aspects of the NSI through ICT Futures Research and Research in Future and Emerging Technologies and by providing effective support for implementation of the strategy.

➢ Funding the ICT R&D Strategy supports implementation of the ICT R&D&I strategy through increased funding levels to facilitate investment levels in line with national R&D&I strategy goals (R&D of 1% of GDP by 2008 and 1.5% by 2012).

The strategy will be implemented by universities, science councils, business incubators, science/technology parks, industry and government.  The DST is responsible for the oversight and co-ordination of the strategy, which runs from 2007 – 2016 across a number of stages.

Key performance indicators for measuring effective implementation include:

➢ Human resource development indicators – will ultimately be measured through PhD graduation rate and ICT Full-Time Equivalent researchers with PhDs.  Due to the lag that can be expected in these indicators, these measures will be supplemented by the short-term indicators such as the enrolment of Bachelors, Honours, Masters and PhD levels as early indications of the effects of the ICT R&D and Innovation Strategy.

➢ Research performance indicators – will be measured by the country's share in global ICT publications and the Relative Citation Index for ICT publications attributable to South Africa.

➢ Innovation performance – will be measured through US/EU/South African ICT patent share and business expenditure on ICT R&D and Innovation.

## 12.3  National ICT Research Capacity

South Africa has 23 institutions of higher education as well as research centres who have the human and infrastructural capacity to successfully participate in joint collaborative projects under FP7:
➢ CSIR/Meraka Institute[85]

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[85] http://www.meraka.org.za

- ➢ Medical Research Council[86]
- ➢ Cape Peninsula University of Technology[87]
- ➢ Central University of Technology[88]
- ➢ Durban University of Technology[89]
- ➢ Fort Hare University[90]
- ➢ Monash University[91]
- ➢ Nelson Mandela Metro University[92]
- ➢ North West University[93]
- ➢ Rhodes University - Department of Comp Science[94]
- ➢ Stellenbosch University - Engineering Department[95]
- ➢ Tshwane University of Technology[96]
- ➢ UKZN School of Development Studies[97]
- ➢ UNISA[98]
- ➢ University of Cape Town[99]
- ➢ University of Free State[100]
- ➢ University of Johannesburg[101]
- ➢ University of KwaZulu Natal[102]
- ➢ University of Limpopo[103]
- ➢ University of Pretoria[104]
- ➢ University of Venda[105]
- ➢ University of Zululand[106]
- ➢ Vaal University of Technology[107]
- ➢ Walter Sisulu University[108]
- ➢ University of the Western Cape[109]

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[86] http://www.mrc.ac.za/
[87] http://www.cput.ac.za/
[88] http://www.cut.ac.za/
[89] http://www.dut.ac.za
[90] http://ufh.ac.za/
[91] http://www.monash.ac.za/
[92] http://www.nmmu.ac.za/
[93] http://www.nwu.ac.za
[94] http://www.cs.ru.ac.za
[95] http://www.eng.sun.ac.za/portal/page/portal/Engineering/Engineering_Home
[96] http://www.tut.ac.za
[97] http://sds.ukzn.ac.za/
[98] http://www.unisa.ac.za
[99] http://www.uct.ac.za
[100] http://www.ufs.ac.za
[101] http://www.uj.ac.za/
[102] http://www.ukzn.ac.za/
[103] http://www.ul.ac.za/
[104] http://www.up.ac.za
[105] http://www.univen.ac.za
[106] http://www.uzulu.ac.za/
[107] http://www.vut.ac.za
[108] http://www.wsu.ac.za

➢ Wits University School of Comp Science[110]

Other institutions with research capacity include: Mintek, CITI, Sangonet, EMS Industries, BMI-T, Connection Telecom, INDUTECH, IT Naledi, Lutatech and Moloko Holdings

**National Participation in FP7**

South Africa has a strong track record of participation in a broad range of fields under FP7.

**Level of Research Maturity**

Since Q1 2011, the DST embarked on the process of reprioritising areas of ICT RDI funding and identifying new areas that have a significant potential to contribute to the growth of South African economy. This process was termed the *ICT Implementation Roadmap Exercise*. Its purpose is to review the existing ICT RDI strategy; definition of new focus areas and interventions; new budget options and an improved understanding of the full ICT RDI landscape in South Africa. The exercise took stock of current ICT RDI capabilities and initiatives, analyses trends from a national and global perspective, and from this, identified future directions for the ICT RDI sector in South Africa.

A process was followed, which included a baseline desktop research study, consultation with experts in the fields and series of workshops with relevant stakeholders within South African ICT RDI ecosystem. In total, 63 technology themes and trends were identified and analysed throughout the process. Utilising this total list, 27 market opportunities of interest to South African ICT RDI ecosystem were identified, evaluated and clustered. From this process, six main clusters were evident. The following are the six clusters and the opportunities under each cluster

➢ Broadband Infrastructure and Services (Digital TV migration; broadband and digital dividend)
➢ Development ( e-inclusion; ICT for development and ICT for Agriculture)
➢ Sustainability and Environment (green and ICT; Smart infrastructure; Global Change; Geospatial applications)
➢ Grand Science  (Astronomy; Biomedical sciences)
➢ Industry Applications ( Smart infrastructure; Mining, Manufacture; Future internet applications; Content creation and delivery; Import replacement; Supply chain optimisation; Asset management)
➢ The Service Economy (m-health; e-Services; e-Education; Business model innovation; Payment solutions; Outsourced SA capability; Systems integration; Content and services localisation; Mobile enablement; Trust and security).

The development of capabilities and directing funding to these areas will revolve working around a partnership between government and the private sector, academia and science councils. The ultimate goal of ICT Implementation Roadmap is to accelerate the growth of ICT RDI in South Africa.

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[109] http://www.uwc.ac.za/
[110] http://www.cs.wits.ac.za

## 13.    REPUBLIC OF TANZANIA

### 13.1    Introduction

The United Republic of Tanzania has a population of approximately 42 million inhabitants and occupies 947,300 sq km. It is the result of a political union between mainland Tanganyika and the off-shore islands of Zanzibar and Pemba. Zanzibar has its own government and its own Ministry of Education and several other ministries, which do not fall under union matters.

In Tanzania, the population in 2011 was 42.7 million[111] (42% of the population between 0-14 years, 55% between 15-64 years and 3% above 65 years of age) and a literacy rate of 69%. The country has 26 administrative regions with Dodoma as the official capital and home to Tanzanian Parliament while the government ministries and major institutions and diplomatic missions are located in Dar es Salaam. There are 120 ethnic groups on the mainland with Swahili and English being widely spoken.  However, Swahili is the national language with English being used as the official primary language of commerce administration and higher education.

Today, the mobile telephone market is one of the fastest growing sector, moreover, mobile subscriber base has been rise from 15 millions people in 2009 to 20.9 millions which is equal to an increase of 27.5% of the mobile subscribers per year. This shows that mobile phone penetration is growing at a considerable rate. Out of the 20.7 million mobile phone subscribers, only 4.8 million (25%) of the subscriber's access and use internet with mobile internet having more users about 2.2 (45.4% of the internet users) millions users. The major mobile operators in Tanzania are Vodacom, Airtel, Tigo, TTCL-mobile, Zantel-mobile and Sasatel, their subscriptions are shown in Table 2 below. Mobile phones' users are free to own more than one SIM card depending to the mobile operators' differences in geographical coverage or cost of communication within the same network/other network or sometimes the offer provided by the mobile subscriber, varying quality of the network, and the cheapest prepaid deal currently on offer.

The recent introduction of the 3G wireless broadband service has greatly boosted Internet usage. Although indicators show rapid growth in the Tanzanian ICT infrastructure, communication facilities are available mainly in the urban areas leaving the rural areas where the majority of Tanzanians live being underserved.

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[111] CIA World FactBook

Mobile phones have became a solution for transactions made by society in their everyday life such as making payments of water/electricity bills or sending and receiving money through their mobile phones, popularly known as M-Pesa provided by Vodacom Tanzania, Zap provided by Zain (currently known as Airtel) and Z-Pesa provided by the Zantel mobile subscribers. Some of the notable forms of the M-Pesa usage include saving money, pay bills, buying goods and buying airtime.

| S/N | NAME OF COMPANY | APPROXIMATELLY NUMBER OF MOBILE PHONE SUBSCRIBERS |
|---|---|---|
| 1 | TTCL | No clear data |
| 2 | TIGO | 4,477,510  (By December 2010) |
| 3 | ZANTEL | 1,920,000  (By May 2011) |
| 4 | VODACOM | 10,000,000 (By June 2010) |
| 5 | AIRTEL | No clear data |

**Source:** Millicom International Cellular S.A (2010) & Mobile Operators Companies

**Table 2**: Number of mobile phone subscribers per company

According to TCRA 2010 Report on Internet and Data services in Tanzania, the number of Internet users is growing with a rate of 24% per-annum. In 2008 there were 3.5 million Internet users, with an increase up to up 4.8 million users in April 2010o. Table 3 below shows the statistics.

|  | 2008 | 2009 | April -2010 |
|---|---|---|---|
| Cable | 261,808 | 285,948 | 269,536 |
| Fixed Wireless | 1,284,748 | 1,380,684 | 1,514,580 |
| Mobile Wireless | 1,125,748 | 1,839,288 | 2,206,480 |
| VSAT | 441,760 | 488,524 | 477,524 |
| Other Broadband | 450,036 | 383,948 | 388,176 |
| TOTAL | 3,563,732 | 4,378,392 | 4,856,296 |

**Source: TCRA**

**Table 3**: Number of Internet users in Tanzania by access type since 2008

The Internet penetration is still low with only 11% of the Tanzanians especially with those in urban areas accessing and using the Internet. However, there is an expectation of increase in internet penetration in both rural and urban areas after completion of deploying the national fibre backbone.

## 13.2   ICT Background

The Tanzania Development Vision 2025 envisages a nation imbued with five main attributes: high quality livelihood; peace, stability and unity; good governance; a well educated and learning society; and a strong and competitive economy capable of producing sustainable growth and shared benefits. It is also noteworthy that Vision 2025 explicitly includes ICT by noting, "The new opportunities that ICT is opening up can be harnessed to meet the goals of the Vision".

The National ICT Policy (2003) is a reflection of national goals, objectives and aspirations as expressed in Vision 2025, setting out digital opportunities that Tanzania can exploit towards meeting

the Vision 2025. The Policy has articulated ten main focus areas in harnessing ICT in Tanzania which include strategic ICT leadership; ICT infrastructure; ICT Industry; Human Capital; Legal and Regulatory Framework; Productive Sectors; Service Sectors; Public Service; Local Content; and Universal Access.

Under the Bilateral agreement between the Government of Finland and the Government of Tanzania through the TANZICT[112] project the national ICT Policy of 2003 is under review as part of the development of a new implementation strategy.

The Government established the Ministry of Communication, Science and Technology in 2008, which among other tasks, is charged with the responsibility to create a conducive environment for investment, introduction and use of ICT in national development efforts and government operations.

Implementation of the National ICT Policy in Tanzania involves various stakeholders both public and private. With the Ministry of Communication, Science and technologies taking the lead, all government Ministries, Departments and Agencies (MDAs) are required to prepare relevant sector specific ICT strategies for effective application of ICT. There are also development partners, and NGOs working with and facilitating MDAs in developing ICT strategies as well as carrying out specific projects toward implementation of ICT. The Tanzania Commission for Science and Technology plays a role in promoting ICT along with other technologies for development and also assists sector ministries in developing ICT strategies. In this regard, COSTECH championed the development of ICT strategies in the health, education, good governance particularly local government sectors.

There are about 173,552 landlines and 17.67 million mobiles in use by October 2009. The domestic fixed-line telephone network is less than 1 connection per 100 persons while the mobile-cellular service, aided by multiple providers, is increasing. Like most of the African countries, Tanzania has recorded exponential growth in the growth of mobile phones. The growth in fixed lines has been minimal in comparison.

The rapid development of the telecommunications market means that the cost of owning and using digital equipment continues to decrease making ICTs increasingly accessible to the average Tanzanian. It is hoped that the ICT landscape will change dramatically with the recent landing of the submarine cables on the East African Coast of such companies as SEACOM and EASSY. Another Kenya-based company, TEAMS has the potential of reaching Tanzania. It is projected that the fibre optic technology would lower telecommunication costs by 95%.

The cost of connectivity is very high in Tanzania, which creates barriers to the spread and use of the Internet, which is a major vehicle for the transfer of data and access to information. Many higher education institutions use VSAT for bandwidth Internet. A national ICT network of university, other institutions of higher learning and research institutions was launched in 2002 to provide an

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[112] http://tanzict.or.tz/

electronic network for connecting all higher education institutions in the country, as well as research institutes. Registered as a trust in 2008 as the Tanzania Education Research Network (TERNET), it has potential membership that can reach 150. The goals of the network include: the establishment of a high capacity network infrastructure connecting educational and research institutions; introduce ICT and its use in education; reduce the digital divide between rural and urban training institutions; establish a human resource base of highly qualified in the ICT field.

## 13.3   Current ICT Initiatives and projects

### 13.3.1  Science Technology and Higher Education Program (STHEP)

Science Technology and Higher Education Program (STHEP) is a World Bank funded project to the Government of Tanzania, implemented through the Ministry of Education and Vocational Training (MoEVT) program with support from the Ministry of Communication Science and Technology (MCST). This is a seven-year program that is broken down into two phases of activities. APL1 activities has to be implemented within the first two years and APL2 activities will be accomplished within the last five years of the program. The long-term purpose of STHEP is to improve development of human capital in area of Science and Technology (S&T) and create a knowledge-based economy within the next ten years. 128 Higher Education and Research Institutions (HERIs) are under STHEP program.

STHEP has four program components: Component 1A – Investments in Priority Discipline for Economic Growth; Component 1B – Expanded capacity for Teachers preparation and for graduate's studies in education; Component 2A – Strengthening Key Higher Education Agencies and Institutions; Component 2B – Investments in ICT based Higher Education Systems. STHEP Component 2B is focusing on four (4) major areas being; National Research and Education Network (NREN), Education Management Information system (EMIS), E-Library, and E-Learning. Shared mechanisms to support the implementation of Component 2B of STHEP have being established between all 128 HERIs under this program.

**Funding agency:** World Bank

### 13.3.2  National Research and Education Network (NREN)

Within STHEP, a major objective of component 2B is to provide a National Research and Education Network (NREN) to: better manage the increasing numbers of students as the education sector expands; improve the quality of data used in decision making and resource management; enhance knowledge sharing; improve transparency; improve classroom student-teacher participation; and improve research capability.

**ICT Infrastructure**

The Government of the United Republic of Tanzania through the Ministry of Communication, Science and Technology (MCST) - the National coordinating Ministry for the development of all ICT related activities - is currently building the National ICT Optic Fiber Cable (OFC) infrastructure

Backbone (NICTBB). The NICTBB will connect all district and regional headquarters in the country. The project officially started in February 2009, and is expected to deliver services and full operations by the third quarter of 2010.

**Last Mile Connectivity**

128 Higher Education and Research Institutions have been identified to be connected through the NREN. Because of the limited funds available for phase 1 of the STHEP implementation, recommendations were made to connect only 27 higher education and research institutions in phase 1 and the remaining institutions to be connected in phase 2.

**ICT Applications**

Building on the NICTBB and NREN, STHEP intends to implement both an Education Management Information System (EMIS) and an e-Library system to support education and research activities. The e-Library system includes both library management system (LMS) functionality, as well as digital library functionality, i.e. making digital content available for direct access by end users through digital technologies. The EMIS and e-Library systems may each consist of more than one software application. During the first two years of APL1, STHEP through COSTECH will focus on building up the required expertise in collaboration with the Higher Education and Research Institution (HERI) stakeholders. This collaboration will form the basis of, and be facilitated by new organizational bodies that will allow for formalized cooperation and shared decision-making (referred to below as "shared mechanisms"), which will later provide the ongoing support and maintenance essential for APL 2 to start.

A shared mechanism is a mechanism to bring together a wide range of stakeholders who have not previously collaborated in this way. The shared mechanisms will be governed by a Steering Committee and Stakeholders Forum.

**Connectivity Arrangement**

Under the auspicious of the AU, AAU and UbuntuNet, submarine cable service providers alliance negotiated model for accessing educational and research networks for an individual university or higher learning institutions through the access to the national NREN (COSTECH), which will be connected to the regional NREN which in turn will be connected via submarine cable to regional NREN (Europe in this case) and then connected beyond that to other networks. The Large developed NRENs of Europe and North America do this to ensure that the traffic is for education and research to justify the price discount offered for IP traffic. At the same time the submarine cable providers SEACOM, EASSy and TEAMs are also offering a discounted education and research bandwidth price, knowing that this circuit has been terminated at a NREN network for education purposes through SEACOM connectivity at the capacity of STM-1. Currently the Open University of Tanzania (OUT), Dar es Salaam Institute of Technology (DIT), College of Business Education (CBE), Ardhi University (ARU), Herbart Kairuki Memorial University of Medicine, Institute of Transport, Mikocheni Agriculture Research Institute (MARI), Tanzania Industrial Research and

Development Organization (TIRDO) are connected to the COSTECH NOC and directly linked with European GEANT2 through the Ubuntu Alliance.

In Tanzania, TERNET[113] is a technical NGO supporting COSTECH in the implementation of the NREN and is a member of the Ubuntunet Alliance of which other members are Ebale (DRC), Ethernet (Ethiopia), KENET (Kenya), MAREN (Malawi), Morenet (Mozambique), Rwednet (Rwanda), SomaliREN (Somalia), SUIN (Sudan), TENET (South Africa), RENU (Uganda) and ZAMREN (Zambia). TERNET is committed to the **AfricaConnect** project for interconnecting these African NRENs' through cross border fibre to allow peering and exchange of research and education traffic regionally.

**Funding agency:** World Bank

### 13.3.3  eHealth Strategy

This is an effort by the Ministry of Health to develop an ICT strategy for guiding ICT applications in the sector.

**Funding**: from the Government of Tanzania, with the process facilitated by the International Institute for Communication and Development of The Netherlands.

**Geographic scope**: National covering all health facilities and agencies.

#### 13.3.3.1  Afya Mtandao - Networking/ Connecting Health facilities for sharing knowledge and data of Heath Facilities

Initially this network was established by the Christian Social Services Commission with funding provided by International Institute for Communication and Development IICD of the Netherlands.

The network is now in the process of expending to include faith based hospitals owned by Muslim Council (BAKWATA) and Private Hospitals

### 13.3.4  Enterprise Resource System for Ports and Airports

Implementation of Enterprise Resource System by the Tanzania Ports Authority to be used in all sea and lake ports

Implementation of Enterprise Resource System by the Airports authority to be used in all Airports

**Funding** provided jointly by the Tanzania Ports Authority and SITA Enterprise. Coverage is all Airports

### 13.3.5  Tanzania Beyond Tomorrow

Project by the Ministry of Education and Vocational Training to provide laptops for school children.

**Funding**: World Bank funded project

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[113] www.ternet.or.tz

**Geographic scope**: National

### 13.3.6  National ICT Backbone – covering all regions and district headquarters

The National ICT infrastructure involves construction of National ICT Backbone (NICTBB) using Optic fibre cable as a medium of transport. The project will cover all regions and district headquarters in Tanzania mainland and Zanzibar and also provide cross border connectivity to Kenya, Uganda, Rwanda, Burudi, DRC, Zambia and Malawi.

### 13.3.7  TANZICT

TANZICT is an Information Society and ICT Sector development project, whose starting point is based on Tanzanian information society aspirations and developments. This require the build-up of absorptive and innovative capabilities throughout the Tanzanian emerging ICT ecosystem. The overall objective of the Project is a strengthened Tanzanian information society with enhanced capacities to contribute to the achievement of the Government's socio-economic development goals. The purpose of the Project is a reviewed and improved Tanzanian ICT policy framework and strengthened arrangements for its implementation. This project commenced in August 2011.

**Funding**: Government of Finland

### 13.3.8  Dar Business ICT Incubator (DTBI)

The new Dar Teknohama Business Incubator (DTBi) hosted by COSTECH will support local technology-driven companies as well as young entrepreneurs with high growth potential. Dar Teknohama is assisting early stage ICT companies by lowering the cost of business and increasing the chances of business survival by offering access to shared resources and facilities, providing mentoring services, networking opportunities and access to finance and markets.

Tanzanian entrepreneurs and small enterprises are critical drivers of innovation, but they face numerous challenges. Business incubators can be effective mechanisms for helping them establish themselves and become sustainable. The expected impact of the DTBI is an increase in enterprises that in turn creates jobs and helps boost the economy. The DTBI commenced activities during 2011.

**Funding:** Infodev, Vodacom and COSTECH

### 13.3.9  Tanzania ICT Technology Park

Over the next 5-10 years, ICT Technology Park, a public and Private partnership between the Government of Tanzania and SEACOM,  could serve as an anchor for Tanzania's aspirations of job creation and modernization. In a context of increasing international competition within Africa, Tanzania's long term objective to create high-end jobs in value-added services can be achieved only if targeted investments are made today through a joint public private partnership. The creation of ICT Technology Park and deployment of the right investments today will pave the way to shape and capture rich opportunities in the future.

Tanzania's journey will be based on a set of building blocks:

➢ Creating the necessary infrastructure – including the development of ICT Technology Park – to enable and foster development

➢ Developing a sound BPO strategy that focuses the country on the appropriate niches and lays the foundation (such as investments in education) to create jobs

➢ Laying the groundwork to make Tanzania more attractive to foreign companies and individuals

➢ Creating a focal point for innovation, facilitated by technology education and an incubator providing co-working space, seed funding and mentorship to ICT entrepreneurs located in the ICT Technology Park

**Funding**: SEACOM and COSTECH

### 13.4    National ICT Research Capacity and Priorities for Cooperation

The following national organisations are involved in ICT-related initiatives:

➢ University Computing Centre[114], University of Dar es Salaam

➢ College of Engineering[115], University of Dar es Salaam

➢ School of Informatics and Communication Technologies[116], University of Dar es Salaam

➢ Dar es Salaam Institute of Technology[117]

➢ Ifakara Health Institute[118]

➢ Open University of Tanzania[119]

➢ University of Dodoma[120]

➢ Centre for Information and Communication Technology[121], Ardhi University

➢ Sokoine University of Agriculture[122]

➢ Muhimbili University of Health Sciences[123]

➢ Tumaini University College[124]

| | Name of Institution | Areas of Research |
|---|---|---|
| 1 | Dar Es Salaam Institute of Technology | Tele-medicine (Challenge 5)<br>E-Learning (Challenge 8) |
| | ICT Centre of Excellence | High Performace Computing (Challenge 1)<br>• Bioinformatics Science |

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[114] http://www.ucc.co.tz/
[115] http://coet.udsm.ac.tz/
[116] http://www.sict.udsm.ac.tz/
[117] http://www.dit.ac.tz/
[118] http://www.ihi.or.tz/
[119] http://www.out.ac.tz/
[120] http://www.udom.ac.tz
[121] http://www.aru.ac.tz/cat.php?id=25
[122] http://www.suanet.ac.tz/
[123] http://www.muchs.ac.tz
[124] http://www.tumaini.ac.tz

|   |   |   |
|---|---|---|
|   |   | • Atmospheric Science<br>• Oceonography<br>• Phoenics<br>• Seismic Application<br>• Finite Element Analysis<br>• Computational Fluids Dynamic<br>• Material Modelling |
| 2 | Ifakara Health Institute | E-Health /Health Informatics (Challenge 5) |
| 3 | University of Dar es Salaam | Health Informatics (Challenge 5) |
| 4 | Institute of Finance management<br>Center for ICT Research and Innovations | e-Government, e-Health (Challenge 5), e-Learning (Challenge 8), mobility, energy, agriculture, e-infrastructure, entrepreneurship. |
| 5 | Muhimbili University of Health and Allied Sciences | Public Health Informatics (Challenge 5)<br>E-learning (Challenge 8) |

**National Participation in FP7**

In addition to IST-Africa, as a direct result of the IST-Africa Training Workshop on FP7-Africa-2010 in Dar es Salaam in September 2009, there was a strong participation of Tanzanian institutions in proposals submitted. Tanzania is currently involved in a number of projects under the FP7-Africa-2010 Call including WHaTeR, Sunray, AvecNet , EQUIP, ETATMBA, APARET, ARCADE HSSR, CHEPSAA, PERFORM and INSARD.

Based on this success, there is now a considerable appetite for participation in EU funded research, and the number of funded projects is expected to increase in future years. However, the significant gaps between calls, the high level of competition under specific thematic areas which are aligned with national implementation policy in Africa (e.g. TEL), the lack of a meaningful budget for SICA projects specifically focused on international cooperation and the long timeframe for projects to be evaluated and negotiated obviously has implications for participation.

**Level of Research Maturity**

One of the advantages that Tanzania has is a critical mass of research institutions. While the current primary focus is on technology adoption and developing applications, there is a strong policy focus (driven by COSTECH and MCST) on further strengthening the research capacity within the country, increasing the focus of research activities on their contribution to socio-economic impact, and facilitating the continued development of post-graduate programmes.

# 14.    REPUBLIC OF UGANDA

## 14.1  Introduction

The Republic of Uganda is located in East Africa, bordered by Democratic Republic of the Congo, Kenya, Rwanda, Sudan and Tanzania. Uganda has an area of 241,038 km² and 112 administrative districts. Forty eight percent of the population of 34.6 million is aged between 15 and 64 (median 15 years)[125]. English is the official language with literacy of 67%.

Uganda has extensive natural resources, including fertile soils, regular rainfall, and sizable mineral deposits of copper, cobalt, gold, and other minerals. Agriculture is the most important sector of the economy, employing over 80% of the work force.

According to 2010 figures Uganda has 327,100 fixed landlines, 12.8 million mobile phones, 19,927 Internet hosts and 3.2 million Internet users.

Uganda is striving to meet the Information and Communications Technology (ICT) development objectives laid out in the World Summit on the Information Society (WSIS) Plan of Action.

## 14.2    ICT Background

The Information and Communications Technology (ICT) sector is now regarded as a vital pillar for the social economic development of the country as indicated in the current National Development Plan (2010). The ICT sector is divided into three areas namely; Policy, Regulatory and Operational with the Ministry of ICT as the lead agency.

The ICT sector is dynamic and vibrant. The sector has registered double digit growth since 2000 and grew by 33% in 2006/2007. Investment inflows have been very strong and in 2006, the sector attracted in excess of US $73 million. Direct employment stands at 6000 while over 350,000 people are indirectly employed. Sector dynamism is a result of Uganda's good ICT legal and regulatory framework, a stable micro economic environment and economic reforms pursued since the early 1990s.

The telecommunications sub-sector, formerly dominated by a single national operator, has been progressively liberalised over the last 10 years. Infrastructure capacity is rapidly improving. Most national and regional transmission links are digital. Optical fiber links connect major economic

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[125]  CIA Factbook

centres, with expansion in progress. There is extensive use of microwave in the backbone infrastructure and Vsat Services. International gateways are satellite based but connection to the world optic fiber network is eminent. This dynamism is a result of a good legal and regulatory framework, a stable micro economic environment and economic reforms pursued since the early 1990s.

 Although still small, export of ICT services has started generating foreign exchange inflows. With virtually no earnings in 2001, the sector now earns over US $ 10 million per annum. It is emerging that ICTs in Uganda have been identified as a major tool for achieving socio-economic development by the Government of Uganda. In order for the government to implement the long term National Development Programmes (NDP) timely, relevant information must be available at all levels of implementation. The integration of ICT into the NDP will substantially spur growth, increase incomes and employment through skilled and semi skilled job creation in the country.

The Government of Uganda has recognized the critical importance of ICT in national development, and has initiated a policy framework to implement these technologies throughout the country. Several policies, statutes, and other initiatives have been developed. The most recent of these include: (i) A National ICT Policy was approved in 2003 with the aim of promoting the development of ICT infrastructure in the country, with the Ministry of Works Housing, and Communications as the primary coordinating agency within the Government; (ii) A Draft broadcasting policy is in place; (iii) The Uganda Communications Commission is implementing a Rural Development Policy; (iv) The new Communications Policy (Draft) seeks to connect all schools, sub-counties, urban centers, health centers and public libraries by 2010; (v) The Government is promoting Public-Private Partnerships to build the requisite backbone infrastructure.

With the vision to offer better services to the citizens and business communities, the government of Uganda formulated the e-government strategy in 2004. This followed many years of government efforts to put e-government in practice through formulation of policies and structures to support its implementation. Literature available shows that Uganda received substantial support from donor agencies in the area of ICT for development. This has translated into a myriad ICT projects being implemented in various sectors of Ugandan society, most notably in rural infrastructure, education, livelihoods and health.

## 14.3   Current ICT Initiatives and projects

Uganda is currently implementing a number of ICT-related initiatives in the area of eGovernment, Technology-enhanced Learning, eHealth, eCommerce and ICT for Rural Development. The section below provides an overview of the projects being implemented, funding sources and geographic coverage.

### 14.3.1 eGovernment

#### *14.3.1.1 National backbone infrastructure and e-government project*

The Government of Uganda through the Ministry of Information Communication Technology is spearheading the development of the National Data Transmission Backbone Infrastructure (NBI) and the Electronic Government Infrastructure (EGI) The over US$ 100 million project is designed to complement the private sector initiatives to relieve the acute shortage of bandwidth and takes the form of public-private partnership with the ultimate benefits being to the consumer. It is planned that implementation will be in three phases which are similar but only differentiated by magnitude of scope in terms of geographical coverage. When completed the NBI will link all the districts of Uganda by 2010.

The first phase will establish the NBI in three towns of Kampala, Jinja and Entebbe and the EGovernment that shall link ministries. The NBI is intended to ensure that high bandwidth data connection is available in all major towns of Uganda at reasonable rates. The EGI is designed to reduce the cost of doing business in government, improving communication between government agencies and reducing the need for officials to commute for meetings and thus increasing efficiency.

**Funding sources**: Uganda government and implement by the Uganda Ministry of ICT

**Geographic scope and time frame:** National; ongoing.

#### *14.3.1.2      Migration from analogue to digital broadcasting project*

This project aims to provide choice to consumers with different service providers through
-   Interoperability of systems
-   Ensuring the presence of a competitive market
-   Efficient use of spectrum
The development of the national postal code to be harmonized regionally.

**Funding sources**: Chinese government and implementation by the Uganda Ministry of ICT

**Geographic scope and time frame**: National; ongoing.

#### *14.3.1.3      Voter registration- Electro commission Uganda project*

This project aims to enhance transparency, accountability in the election management process, increase voter confidence in the electoral process in the 2010 general elections (scheduled to take place in February 2011). This project is supported by the International foundation for Electoral systems and USAID

The purpose is to support the voter registration process and enhance the credibility of the voter registers by strengthening access to the register and providing it online

**Organization(s)/funding sources**: USAID and Uganda government, Implemented overseen by Uganda Electoral Commission

**Geographic scope and time frame**: National

### 14.3.1.4    *National Identity Cards project*

The project is focused on implementing a biometric and central data management and identity card registration. It aims to help government to have easy identification of Ugandans on the government pay roll, social security, police and army and within the east African community. The project, which is the initial stages, will cost over 189billions

**Organization(s)/funding sources**:  Uganda Government, Implementation overseen by Uganda Ministry of ICT

**Geographic scope and time frame**: National

### 14.3.2  Technology-enhanced Learning

### 14.3.2.1  *Connectivity for Educator Development Project (Connect Ed)*

Phase I of the Connectivity for Educator Development Project (Connect Ed) set up computer centres and Internet points of presence at Kyambogo University (KyU) and at eight primary teachers' colleges (PTCs). It provided computer literacy and materials development training for teacher educators, and began to re-purpose the print-based national PTC curriculum into an interactive, accessible online version. Connect-ED Phase II builds on the infrastructure established in Phase I but with closer collaboration with the Ministry of Education and Sports and KyU.

 The focus is on sustainability and long-term ICT strategies for KyU and the PTCs and on continuing to provide computer training and completing the digitization and enhancement of the national PTC curriculum.

**Organisation(s)/funding sources**: Phase I was funded by USAID. Initial partners included Computer Frontiers (for Internet connectivity), World Links (for Development for training in the colleges), Schools Online (for equipment procurement), and Academy for Educational Development (for the projects at ITEK). Phase II is supported by International Education Systems, a division of Education Development Center, an international, non-profit organisation.

**Geographic scope and time frame**: National. Phase I: 2001-2003; Phase II: 2003 to present.

More information available at http://ies.edc.org/ourwork/project.php?id=3448

### 14.3.2.2  *National Curriculum Development Centre (NCDC)*

The National Curriculum Development Centre (NCDC) established the Curriculum Net project in an effort to create electronic learning materials using CD-ROMs. The project is now using ICTs to provide instructors with multimedia materials they can use in selected core subjects.

Government approval was given in 2004 for ICT-based curriculum materials in mathematics and geography for primary schools and mathematics and science for secondary schools, thus enabling use of the material by all schools in the country.

**Organisation(s)/funding sources**: SchoolNet Uganda with funding from IDRC

**Geographic scope and time frame**: National; 2001-on going

More information available at www.idrc.ca/en/ev-64993-201-1-DO_TOPIC.html

### 14.3.2.3  VSAT project

This project is using VSATs to offset the high cost of connectivity and to demonstrate the use of ICT-equipped schools as school-based community learning centers.

**Organisation(s)/funding sources**: World Links, Schools Online, the Bill and Melinda Gates Foundation and SchoolNet Uganda

**Geographic scope and time frame**: Rural focus; ongoing.

More information available at www.schoolnetuganda.sc.ug/homepage.php?option=vsatproject

### 14.3.2.4 SchoolNet Uganda project

SchoolNet Uganda's mission is to make graduates of Uganda's education system more globally competitive. SchoolNet Uganda supports educators and learners by providing pedagogical and technical expertise and advice, infrastructure and human resources, coordination, training and capacity-building, and developing local and international partnerships.

**Organization(s)/funding sources**: Multiple partners depending on projects

**Geographic scope and time frame**: National; ongoing

More information is available at www.schoolnetuganda.sc.ug/homepage.php?option=home

### 14.3.2.5 Content Development at National Teachers Colleges, Uganda

The goal of this content development project is to use computers and Internet to develop educational materials for secondary schools and National Teachers' Colleges (NTCs) throughout Uganda. Its main focus is on developing educational content. For example, it aims to create over 20 modules for all ordinary level subjects and place them on CD-ROMs so that they can be used by other National Teacher Colleges (NTCs) and secondary schools.

To make the project sustainable, large numbers of Kyambogo University staff as well as staff from the NTCs are being trained on how to work with computers and internet to look at, create and share educational materials. The goal is to make abridged versions of the finished products available as printed pamphlets, via a website, on CD-ROMs, and through intranet web servers. The content development programme started in 2005, has 2000 users and can potentially reach 40,000 students and teachers throughout Uganda.

Specific short-term objectives of the project are: Develop and digitise more than 20 courses at Kyambogo University, Develop high quality teaching modules to be used at NTCs and secondary schools throughout Uganda, Provide quality control checks on the educational content developed

Devise a good dissemination system for the digital content developed

**Organization(s)/funding sources**: IICD supported programme:

**Geographic scope and time frame**: National

More information is available at

http://www.capacity.org/en/content/download/3656/54913/file/issue+10.pdf

### 14.3.2.6 Connecting Classrooms project

The British Council launched a project to link schools in Uganda to other schools in Africa and the UK. The project, code-named Connecting Classrooms, aimed at co-coordinating ICT, science, vocational skills, global citizenship, and cultural science in the schools.

**Organisation(s)/funding sources**: The British Council

**Geographic scope and time frame**: Limited number of schools; 2006-2007.

More information is available at www.britishcouncil.org/uganda-governance-connecting-classrooms.htm

### 14.3.2.7 Providing donated computers to schools plus capacity-building support to recipient local partners

**Organization(s)/funding sources**: World Computer Exchange in partnership with local organizations.

**Geographic scope and time frame**: National

More information available at www.worldcomputerexchange.org/

### 14.3.2.8 Uconnect – Providing computer connectivity and training for schools

Uconnect is a non-profit NGO that aims to advance public education by using ICT to improve the quality and efficiency of communications. Activities focus on providing computer connectivity and training for schools and recently on providing ICT training to officials of 22 mostly rural districts.

More that 225 schools have benefited to date and 22 district offices have been connected to the Internet.

**Organisation(s)/funding sources**: Multiple sponsors are involved such as telecom, hardware, learning software, transportation, and Internet provider companies.

**Geographic scope and time frame**: National; began in the late 1990s and continues to thrive.

More information available at www.uconnect.org/

### 14.3.2.9 Providing equipment and training to schools

The Uganda Ministry of Education and Sports has undertaken several initiatives over the past years as part of its policy implementation agenda. Examples include providing equipment and training to

selected schools, providing Microsoft software to government-aided secondary schools, and including the approval of a curriculum for ICT training for secondary schools.

**Organization(s)/funding sources**: The Ministry has allocated some funds for these initiatives and is discussing provision of additional support with various donors.

**Geographic scope and time frame**: National; 2006-2007.

### 14.3.2.10  I-Network Project

I-Network Uganda is a national network of individuals and organizations that act as a platform for sharing knowledge and information on applying ICTs. One of its programmes, District Net, focuses on providing public information using ICTs.

**Organization(s)/funding sources**: ICT4D practitioners including IICD project partners; policymakers such as ministries; students and teachers; NGOs; rural communities

**Geographic scope and time frame**: National; over 700 registered members from the public, private, and civil society sectors. Began in 2002; ongoing.

More information available at www.i-network.or.ug/

### 14.3.3  eHealth

### 14.3.3.1 Improving health care delivery through continuing medical education for rural health workers

This project is focused on improving health care delivery through continuing medical education (CME) for rural health workers by using ICTs and multimedia. The major focus is on gathering and repackaging high-quality health information for dissemination through ICTs. Training in the use of basic ICTs is provided.

**Organisation(s)/funding sources**: Co-sponsored by Cordaid and IICD and implemented by Uganda Martyrs University, Faculty of Health Sciences, and the three hospitals of Itojo in Ntungamo district, Nkozi in Mpigi district and Mutolere in Kisoro district

**Geographic scope and time frame**: District-based; ongoing.

More information is available at www.iicd.org/projects/articles/iicdprojects.2005-12-09.7746900390

### 14.3.3.2 ICT Maintenance Facilities for rural technical colleges

ICT maintenance facilities for rural Uganda have been established at five technical colleges. An ICT maintenance facility will be set up at each college to provide technical support and to introduce a new course called ICT Installation and Maintenance to train technicians.

**Organisation(s)/funding sources:** The Uganda Institute of Information and Communications Technology, established by Uganda Communications Commission, manages the project with the support of the International Institute for Communication and Development (IICD).

**Geographic scope and time frame**: The five UTCs are located in or near upcountry towns and are geographically well distributed throughout the country. Launched in 2005; ongoing.

More information is available at www.iicd.org/projects/articles/iicdprojects.2005-07-29.8068367475

### 14.3.3.3 e-Network

Makerere University Faculty of Computing and Information Technology has won an Africa Union (AU) bid to create an e-network that will provide connectivity for Eastern and Central African countries to a pan-African network through fibre optics and wireless links. This will enable the sharing of resources such as BlackBoard digital learning software, backups, and elearning courses. The faculty has a department that trains staff in e-learning and supports elearning in the whole of the university.

**Organisation(s)/funding sources**: Funding is provided by the Government of India through the AU. Makerere will be the lead university serving Comoros, Djibouti, Eriteria, Ethiopia, Kenya, Madagascar, Mauritius, Rwanda, Seychelles, Somalia, Sudan, Tanzania, and Uganda.

**Geographic scope and time frame**: Eastern and central African regions; project was announced in July 2006.

More information available at http://cit.ac.ug/site/downloads/issue4.pdf

### 14.3.3.4 Electronic Rural Health Information project: Feasibility and Acceptability of e-Card Maternal-Child Health Passport in Rural Community

Towards the end of 2010, the Ministry of Health will release a Mother-Child Health Passport (MCH HP). The Mother-Child Health Passport is an initiative to improve maternal and child health in Uganda. It has already been started in a number of African countries including Malawi, Benin, Tanzania and Kenya. It replaces and combines the antenatal and child health cards. This Mother-Child Health Passport is a medical document that records pertinent facts, findings, and observations about an individual child's health history including natal history, past and present illnesses, tests, treatments and outcomes. It will also chronologically document the care of the mother during pregnancy and the child after delivery, thus offering an important element contributing to high-quality care. As with the rest of Africa, it will be paper based and therefore will have the inherent problems associated with manual paper based medical documentation systems. To ameliorate these problems, the paper system should be supplemented by an electronic system. This will revolutionise the health care system and efforts need to be made to enable the health system proceed from manual or semi-automatic data processing to a new method of entering, storage, and searching and protecting data using an affordable and safe electronic system.

This will also improve efficiency in data for health care and administration such health insurance accounts and other health surveys.

**Organisation(s)/funding sources**: Uganda Government in collaboration with ICTs for African Rural Development (ICTARD), Uganda Martyrs University, Nkozi. Department of Computer Science and Information Systems (CSIS)

**Geographic scope and time frame**: National

More information available from Ms. Hellene Karamagi, email: hellenek@gmail.com

### 14.3.3.5 Malaria Diagnostic Systems project

The overall objective of the malaria diagnostic systems project is to design and implement as easy to use computerized system that has the capabilities to perform accurate diagnosis of malaria, recommend appropriate treatment for malaria, capture and update malaria patient data in real time, provide a platform for sharing data among health establishments, streamline the reporting to the ministry of health and also generate relevant patients and dug management reports

**Organisation(s)/funding sources**: Uganda Government

**Geographic scope and time frame**: National

### 14.3.4  eCommerce

### 14.3.4.1 District Business Information Centers

This project aims to address the needs of the community demand driven ICT based services

**Organization and funding sources**: UNIDO with funding from the Austrian Development Agency (ADA) and in close cooperation with local public and private sector representatives has developed a network of business information centers (BIC) in 8 districts, to see how they can support them in terms of ICT access. These include Arua, Gulu, Jinja, Kabale, Masaka, Masindi, mbale and Soroti

**Geographic scope and time frame**: 8 districts' on start but extending to another 8 districts in Uganda, 6 to be funded by government (Ministry of ICT) and 2 to be funded by UNIDO the project is National; ongoing

### 14.3.4.2 Reflect ICT Resource Centre

The Reflect ICT resource centre has been equipped with computers (Internet connected), printers, digital camera and video, generator, UPS, public address system, World Space radio, and solar-operated radios, along with other office equipment including a photocopier. The aim is to facilitate access to agricultural, health, and commercial information based on needs that the 10 community identified.

**Organization(s)/funding sources**: DIFD, and community contributions.

**Geographic scope and time frame**: The project is located in Bukuuku sub-county in Kabarole district, western Uganda.

More information available at http://217.206.205.24/Initiatives/ict/home.htm

### 14.3.4.3 Village Phone Project

The Village Phone Project provides micro loans to eight local businesses to enable establishing a community phone service. Testing of additional technologies will be done.

**Organization(s)/funding sources**: Grameen Foundation in partnership with MTN Uganda

**Geographic scope and time frame**: Started in 2003 in selected communities; ongoing.

More information available at

www.grameenfoundation.org/where_we_work/sub_saharan_africa/uganda/village_phone_uganda/

## 14.3.5  ICT for Rural Development

### 14.3.5.1 Energy for Rural Transformation (ERT) Project

Uganda's rural populations currently either have poor or no access to information communication technologies (ICT) and services.  The ERT hopes to redress this imbalance by developing renewable energy and ICTs growth opportunities for communities all around the country. The second phase of the ERT will see the establishment of numerous 30-50MW power units around the country

This project aims to assist rural entrepreneurs with access to previously unreachable markets., will harness local entrepreneurial capacity, in expanding access of rural communities to modern renewable energy.  Investments in power generation will increase the reliability and lower the cost of electricity, which is a major setback to businesses

**Organization(s)/funding sources** The World Bank has agreed to invest US$75 million. Implementation overseen by Office of Rural Communications Development Fund (RCDF).

**Geographic scope and time frame**: National

### 14.3.5.2 Adaptive Bandwidth Management in Cooperative Wireless Networks: Affordable and equitable access to the Internet

In 2006, the Community Wireless Resource Centre (CWRC), that was established under the Department of Electrical Engineering, Faculty of Technology, Makerere University, setup local wireless networks at three sites – Nabweru Telecentre, Lira Canadian Physicans for Aid and Relief (CPAR) telecentre and Kabale/Kachwekano Telecentres. The wireless networks were established with technical support from IT+46, a Swedish ICT organisation, and with financial support from the International Development Research Centre (IDRC) in the amount of US$ 89,866. The general objective of the CWRC is to provide or enhance sustainable Internet connectivity infrastructure, particularly in rural or under served areas in Uganda, by means of wireless technology. The specific objectives are to (1) implement and support the maintenance of community wireless networks, initially targeting the IDRC-funded Telecentres by establishing a Community Wireless Resource Center in the Department of Electrical Engineering, Faculty of Technology, at Makerere University; (2) build capacity, among students at the Electrical Engineering department and the technical staff

at the Telecentres, in the design,installation and maintenance of community wireless networks including bandwidth management and efficient traffic provisioning; (3) undertake research to assess the technical feasibility and economic business/partnership models of community wireless networks; and (4) document and share the results widely.

**Organization(s)/funding sources**:  Uganda Government under the MSI World Bank project

More information available at http://cwrc.it46.se/

### 14.3.5.3 NUFFIC ICT projects for Uganda's universities

The "Building a Sustainable ICT Training Capacity in the Public Universities in Uganda" NUFFIC One project 2003 – 2008 has been very successful in boosting the capacity of public universities in the field Information Technology and Communications (ICT). The project addressed the issue of ICT capacity building in the four Public Universities in Uganda. The target group was the staff and students in the Ugandan institutions and mid-career ICT professionals. The main activities required expertise from the Netherlands, for support in curriculum development and implementation, in development of research capacity and to advise in the establishment of a Centre of Excellence for ICT Training and Research.

The project which cost about 4 million Euros, has had great impact in the areas of curriculum development and implementation, human resource capacity development, research capacity development, ICT infrastructure development, collaborations among the Public Universities, gender policy, ICT Policy and Master Plans, and the establishment of a Centre of Excellence for ICT Training and Research at Makerere University, for the public Universities in Uganda.

As a result of this project, spin off projects have come up, such as: Netherlands Program for Institutional strengthening of Post secondary education and training capacity (NPT) project on 'Strengthening ICT Training and Research Capacity in the Four Public Universities in Uganda'; and NPT Project on 'Strengthening the Institutional Capacity of Uganda's Technical Colleges. All the project activities and objectives were completed including a boost in human resource of 5 new MSc and 5 PhD graduates.

Due to the excellent performance of this project it was deemed useful to design a follow-up project in such a way that the projects overlap. To this effect a proposal was written leading to Nuffic awarding the four Public Universities another NPT project on 'Strengthening ICT Training and Research Capacity in the Four Public Universities in Uganda'. The overall objective of the Project is to strengthen the Capacity of Makerere University Faculty of Computing the public about ICT issues and in return CIT provides IT support.

Besides, in 2008 CIT together with the Southern Faculty of Computing & Information Technology and IT, the Institute of Computer Science at Mbarara University of Science and Technology, the Departments of Computer Science at Kyambogo and Gulu Universities collaborated to develop, implement and manage relevant educational and research programs for poverty alleviation, rural

and economic development. The lead institution in the South is Makerere University with Mbarara University of Science and Technology, Gulu University and Kyambogo University as partners; and the lead institution in the North is the University of Groningen with Radboud University Nijmegen (RUN) and Eindhoven University of Technology (TUE) as the consortium partners.

The target group is University staff and students in the above institutions and ICT Policy makers. The project will be implemented from June 2008 – 2011 with a maximum Nuffic grant of €5.7 million. It is expected that at completion, the project will be worth €6.2 million.

More information is available at http://sida.mak.ac.ug/?p=919

## 14.4    National ICT Research Capacity and Priorities for Cooperation

The list below provides an overview of universities and research centres in Uganda that are undertaking ICT-related initiatives:

➢ Busoga University[126]

➢ Bugema University[127]

➢ Gulu University[128]

- Research into the use of e-governance, e-inclusion and people's freedoms. The place of ICT in attaining equitable power decisions among the populace etc;
- Research on use of ICT in health support and provision among minority groups such as youths, elderly etc.
- Development of local information resources' repositories, to leverage the current foreign provided resources, that users are unable to access.
- Development of learning environments for primary, secondary and college students; harnessing cultural and indigenous resources for local solutions.

➢ Kampala International University[129]

➢ Kyambogo University[130]

➢ Makerere University, Faculty of ICT[131]

➢ Makerere University, Business School[132]

- Research into ICT solutions for governance and policy modelling addressing ICT tools for trusted governance and policy impact analysis. This research should help deal with future scenarios involving even greater complexity and citizens' involvement, in particular addressing the needs of the younger generation - *Call 7*

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[126] http://www.busogauniversity.ac.ug/
[127] http://www.bugemauniv.ac.ug/
[128] http://www.gu.ac.ug
[129] http://www.kiu.ac.ug
[130] http://www.kyu.ac.ug
[131] http://cit.mak.ac.ug/
[132] http://www.mubs.ac.ug

- We have prepared a proposal for funding on "Use of mobile phones and community policing to promote road safety through behavior and attitude change".

➤ East African School of Library and Information Science, Makerere University[133]

➤ Mbarara University of Science & Technology[134]

➤ Ndejje University[135]

➤ The Inter-University Council for East Africa[136]

➤ Uganda Martyrs University[137]

- The Effect of Introducing Audiovisual Learning Materials on Distance Learning Students' Performance and its Cost Implications for Uganda Martyrs University. Research carried by the Center for Distance Learning Studies staff May 2009-May 2010

Seven main national research priorities for ICT development in Uganda have been identified: ICTs and Governance; ICTs and Citizen Empowerment; ICTs to support human rights protection, peace and conflict resolution; eHealth; eEducation; Rural Access to ICT.

### ICTs and Governance

Prior to Liberalization of telecommunications services in Uganda, public access to Executive, legislature and government officials was rather difficult, and in some cases impossible. However, there is now progressively more access to the executive, the judiciary and parliamentarians, and important structures in government, due to ICTs. This may involve development of e-government open source software applications.

### ICTs and Citizen Empowerment

ICTs have the potential to rapidly build capacity through intensive sharing of information at all levels, and prompting action where necessary.

### ICTs and Human Rights protection, peace and conflict resolution

ICTs can be extensively used to enhance citizens' awareness of their human rights.

### ICTs and Health

Health related threats such as HIV/AIDS, malaria and tuberculosis are affecting the development of Uganda. However, proper information on treatments and better disease management can help prevent these diseases and offer better patient care. Timely, accurate, and relevant information is essential for an efficient and effective health system. ICTs can help collect community health information, support doctors and nurses in their daily work; enhance health administration and the distribution of medical supplies.

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[133] http://easlis.mak.ac.ug/
[134] http://www.must.ac.ug
[135] http://www.ndejjeuniversity.ac.ug
[136] http://www.iucea.org
[137] http://www.umu.ac.ug/

### ICTs and Education

The Government approved the ICT-based Curriculum materials in Mathematics and Geography for primary schools and Mathematics and Science for secondary schools. The significance of government approval is that the curriculum developed could be used by all schools in Uganda immediately, provided they had IT access and could go through the formal examination process of the Uganda National Examination Board (UNEB).

### Rural access to ICTs

TELECENTRES:  Mainstreaming of ICT in agricultural information dissemination

The Acacia supported Electronic Delivery of Agricultural Information to Rural Communities project was developed in recognition of the need to make agricultural research information accessible to end users (notably farmers and extension agents) and in response to the Government of Uganda's call to improve agricultural productivity. The project developed local content in a local language – Luganda – as well as English, through the acquisition and packaging of useful agricultural information, generated at the National Agricultural Research Organization (NARO) and other institutions. The project also captured and digitized significant and relevant indigenous knowledge. This content was then disseminated to rural communities through three existing IDRC-funded telecentres (Nakaseke, Buwama and Nabweru). Various electronic delivery options were used including both traditional and modern ICTs, notably radio, television, video, print media, CD-ROM, email and a website.

### 14.4.1  National research priorities currently not covered under FP7-ICT

The following research areas that are important from a national perspective are not currently covered under FP7-ICT:

➢  Special ICT facilities for the disabled

➢  A survey of the existing ICT human resource capacity

➢  Integration of radio and other ICTs for rural development

➢  Gender and ICT

➢  Health information dissemination mechanisms

➢  Mainstreaming of ICT in agricultural information dissemination

➢  Establishment of investment, trade and tourism information services in local Governments

➢  Monitoring and Evaluation of ICT projects

➢  Perceptions of information systems projects

ICT issues currently being considered as research priorities also include the following issues:

➢  E-governance can only be implemented effectively if the right human resource, software and systems are in place and the citizens are ICT literate and sensitized.

➢ Research is required in relation to appropriate technology (software) that is free or affordable, ICTs for the marginalized groups such as the disabled, the illiterate, and ICTs for rural transformation.

➢ Research is required in relation to how ICTs can effectively transform the agricultural sector in Uganda and increase household income.

➢ This will involve implementation of large-scale projects, which calls for research in areas such as perceptions/ failures of information system projects to minimize project failures.

➢ There is also need to undertake research on how ICTs can improve health service delivery especially among the poor.

**National Participation in FP7**

Uganda is involved in a number of FP7 co-funded projects including CAAST-Net, IST-Africa, and EO2HEAVEN.

Mbarara University of Science and technology is involved in HURAPRIM (Co-funded under Africa Call 2010 – Grant Agreement 265727), an international collaborative research project with six African and three European partners, that aims to develop and assess policies and key interventions to address the personnel crisis in the Health Sector, particularly related to Africa.

Mbarara University of Science and technology and Makerere University are involved in the three year duration AMASA FP7 project (Accessing Medicines in Africa and South Asia), lead by the University of Edinburgh, with partners from Belgium, Switzerland, South Africa and India.

**Level of Research Maturity**

The level of research maturity varies to some degree from research institution to research institution within Uganda, as well as from department to department.

Makere University and Mbarara University of Science and Technology are most actively involved in ICT related projects that map to a number of ICT related thematic challenges under FP7.

Related to Challenge 4: Technologies for Digital Content and Languages, Makere University is partnering with Southern Sudan under the East African School of Library and Information Science to deliver training and digitisation of content.

Uganda is involved in a number of projects related to Challenge 5: ICT for Health, Ageing Well, Inclusion and Governance.

The Department of Community Health, Ministry of Health is involved in a Health Futures, a global research consortium on health, environment change and adaptive capacity.

Uganda joined the IST-Africa initiative in 2007. To date over 30 institutions and over 100 individual researchers have benefited from participation in IST-Africa FP7 Training Workshops as well as presenting research papers at IST-Africa Conferences. This process has facilitating creating a working relationship between different institutions active in the area of ICT research, both within Uganda, as well as on a cross-border basis with other African and European institutions. This has helped to identify the strength and weakness of the research capacity within different institutions.

As a result of the success of IST-Africa activities in meeting the expectations of Ugandan researchers, UNCST has developed a high level of convening power among the ICT stakeholders in Uganda. It has helped UNCST achieve the status of a reference entity in the ICT sector with considerable leverage over the different stakeholders, which has helped in developing national and continental networks. The national networks include linkages with universities, government institutions, schools, R&D institutions, as well as the private sector. Furthermore, participation in the IST-Africa conferences in Africa and Europe is laying the foundation for networking at a global level.

The institution has used its position as a consortium member to champion emerging areas such as Living Labs that are relevant to the wider adoption and socio-economic impact of ICT in Uganda.

IST-Africa conferences have also undoubtedly stimulated considerable interest among the ICT research community in Uganda, with researchers competing each year to make presentations and have papers accepted into the IST-Africa conference proceedings, which are internationally recognised. This is evidenced by the number of papers and publications that have accrued from Uganda since IST-Africa 2008 when the Ugandan ICT researchers started active participation.

Table gives a summary of the number different institutions that have submitted and published papers in the IST-Africa conference since 2008.

*Contributions of Publications by Different Institutions*

| Institution | Number of papers | Percentage |
|-------------|------------------|------------|
| University | 39 | 57% |
| Other Educational institutions | 2 | 3% |
| Private Sector | 13 | 19% |
| Government | 14 | 21% |
| **Total** | **68** | **100%** |

Implementation of the IST-Africa Initiative in Uganda has also resulted in the building of cross-border partnerships at ministerial level in certain portfolios with other IST-Africa Partner Countries, particularly with Namibia, Mauritius and Egypt.

As a result of the participation of the Ugandan ICT Minister at the IST-Africa 2008 Conference in Windhoek, Namibia, this lead to the visit by a ministerial delegation from Namibia to Kampala to share lessons learnt from liberalization of the ICT sector in Uganda. Furthermore, Uganda in its

strategy to develop its BPO industries had partnered with Mauritius in a bid to learn from their well developed BPO industry.

The Egyptian Ministry of Communications and Information Technology and Ugandan Ministry of ICT have also signed a framework agreement on ICT collaboration. The agreement comes within the Egyptian Ministry of communications and Information Technology (MCIT) strategy targeting African markets and enhancing cooperation with African governments.

The agreement reflects the eagerness of the two countries to support mutual partnerships and business ventures. It also encourages research and development in the fields of infrastructure, technology capacity building, heritage documentation and other various fields in ICT industry and related services. The five-year agreement ascertains both countries aspirations to encourage mutual investments, and to cooperate in expanding and developing ICT markets.

Highlighted in this agreement is the existing capacity building activities such as an initiative in which Egypt's Information Technology Institute (ITI) affiliated to MCIT, offers technical support for about 3,000 Ugandan youths. At the request of the President of the Republic of Uganda in his meeting with MCIT delegation during the last Egyptian visit to Uganda, these young people are trained on outsourcing industry and IT export across borders. The IT programmes are executed in Uganda, with the collaboration of the Ugandan Makerere University.

As for documenting the cultural heritage of Uganda, both Egyptian and Ugandan sides agreed that cooperation should encompass providing IT training in cultural heritage documentation.

The two sides will also collaborate on Uganda's emergency cyber response unit, the Uganda Technology Park project and other skills-building initiatives.

In another development, the East Africa Community (EAC) is placing greater emphasis on ICTs as means to conduct business, using newly laid fibre optic cables. In addition to the above, the region is now embracing e-governance strategies encompassing government sectors, regulators, operators and civil society. Regional discussions are on-going with EAC Partner States focusing on policy and regulatory issues, projects, institutions, harmonization and governance including the processes for implementation. The policy harmonization framework originates from the potential impact of ICTs on economic growth and regional cooperation. Considering that the EAC partner states are at different stages of ICT development in terms of penetration of ICT infrastructure, service provision and policy, processes of harmonization becomes critical as we move towards the formation of the common market. Ideally, there is significant room in the new discourse for regional co-operation and ICT policy harmonization to meet the single market agenda of the EAC. At the outset, the region is determined to strengthen its economic, social cultural and other ties for balanced and sustainable development through the customs union and common market as stages that shall lead to a monetary union and ultimately a political federation as intimated by the EAC Treaty.

Research is critical to establishing the needs of countries and groups within them, and to conceptualizing approaches that are likely to be effective in resolving country-specific problems.

Through a National ICT Research and Innovation system, actualization of research can be achieved by the development of a research agenda that should be placed in the context of examining how the introduction of ICTs changes the value chain and economic equation in the economy.

In the last twenty years, the ICT sector in Uganda has undergone major transformation as it adjusts to meeting the needs of a developing country in the global economy. However this process has not had the exhaustive benefit of public interest research and rigorous analysis on which to base policy and regulatory decisions. Therefore the Uganda Government is engaged in efforts to: establish mechanisms for promoting and coordinating efforts in research and development for ICT; establish a fund to support research and development efforts, with due regard to promoting innovation and participation of national professionals; and encourage private sector investment in local research and development in collaboration with local universities and institutions. The national ICT research priorities being advocated for to meet the actual research needs and interests of the country include the following: ICTs for Government and e-Government; ICTs for Health & eHealth; ICTs for Learning & eLearning; ICTs for Enterprises & eCommerce; Network Technologies; Digital Content and Digital Libraries; Geographic Information Systems; and Internet Technologies. Notably, these areas are in tandem with the different IST-Africa challenge areas.

Currently, with the support of IST-Africa and other projects in the area of ICT there are many research efforts in the ICT arena which are unfortunately isolated and fragmented. Furthermore, the research efforts sometimes do not translate into marketable, practical and usable solutions.

ICT research funding is currently complicated and insufficient mainly because of its Silos-based nature which odds with the dynamic, interdisciplinary and cross-fertilization nature of modern ICT related innovations. Some of the efforts are funded by different partners in an uncoordinated manner. Another setback in the current setting is the lack of central and sufficient repository for ICT research funding information.

Although there is a drive to win investors into the ICT research area in Uganda, the constraint of a clear market for ICT research might lead to underinvestment in ICT research and innovation in Uganda. The progress of the research efforts in Uganda can benefit greatly from a proper monitoring and evaluation system which is unfortunately currently lacking in the current ICT research setting.

We should therefore be cognizant of the fact that the ultimate goal of ICT Research is Innovation and the system is part of a larger system involving Government, Academia, Industry and Civil Society. Regional Impact of Information Society Technologies in Africa (IST-Africa) is a multi-stakeholder initiative focused on improving African research capacity and development of policies concerning Information and Communications Technologies.

Initially before Uganda joining the consortium there was little collaboration among the national institutions in Uganda. Most focus was on the ICT ministry which was also young in the field of ICT. Many researches had not experienced the benefits of collaboration and networking, and many were not known or had their papers not published. With Ugandans joining the consortium a lot of developments have emerged

Under the management of UNCST, the IST-Africa project has managed to mobilize the ICT community in Uganda. This was made possible through organizing training workshops and conferences in ICT, and the participants were introduced to FP7.

The researchers in Uganda have been able to come together and work together on different projects. The following examples illustrate partnerships that have been built under the tutelage of IST-Africa.

(i)     Makerere University Uganda and Uganda Martys University together with the Museum of London Group, United Kingdom developed a concept of a possible partnership project for archives of digital resources for educational purposes. A network at LinkedIn has been developed to continue with the participation.

(ii)    A collaboration effort between Ugandan and South African schools emerged in building OERs using the network model approach.

The project facilitated the training and coaching of Ugandan researchers in ICT in proposal writing, networking modalities', EU project financial management and partner search

At a continental level, UNCST has established regional networking relations with especially the countries in the consortium and this led to Uganda intra-African partnerships with Senegal, who later Uganda seconded to join the consortium

The project also led the establishment of NCPs for the different thematic areas in Uganda. Staff from UNCST was nominated and recommended to take part in representing Uganda in EU under different thematic areas. This initiative has allowed joining of different groups like the e-health group, idealist where trainings have been conducted to help the NCPs carry out their work with ease.