



**eGovernment, eHealth, Technology Enhanced Learning:
Adoption in Mozambique, South Africa & Tanzania**

Comparative Report 2005

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1. Introduction

1.1 Background

Regional Impact of Information Society Technologies in Africa ("IST-Africa") is a multi-stakeholder initiative focused on reducing the Digital Divide in Sub-Saharan Africa.

European research activities are structured around consecutive multi-annual programmes, or so-called Framework Programmes. FP6 set out the priorities - including the IST priority -for the period 2002-2006; FP7 is under preparation and will cover the period 2007-2013. The new ICT priority of FP7 is fully open to international co-operation with the aim to join forces for addressing major challenges where significant added value is expected to be gained from worldwide R&D cooperation. In this context, the European Commission co-funded the **IST-Africa Initiative** as a Specific Support Action (IST-Africa 2005 – 2006) in order to disseminate European research results in Africa and promote the participation of African organisations in European research projects.

The main objectives of the **IST-Africa Initiative** are to establish a better understanding of current exploitation of Applied ICT in Africa and opportunities for adaptation of European funded research results and international research collaboration, to establish a collaboration framework for researchers and government officials in European and African States, and to create a sustainable community with strong pan-African and international participation, focused on the economic and social impact of Applied ICT in Africa.

Exploitation of ICT has enormous potential for impact in Developing Countries, to meet societal demands, more efficient delivery of public services and supporting economic development. **IST-Africa** will support the adaptation and exploitation of European ICT research results from the IST Programme of FP6, support regional impact by facilitating skills transfer through training workshops, and provide a framework for European and African researchers to explore opportunities for cooperation under FP7.

Based on priorities identified by the current African partners (representing Mozambique, South Africa and Tanzania), during 2005 and 2006 – with the support of the European Commission, **IST-Africa** will focus on a limited number of complementary activities that over time will facilitate wider impact of applied ICT across Sub-Saharan Africa.

The three primary activities being carried out during 2005 - 2006 are

- The development and delivery of 10 training modules for eBusiness, eGovernment, eHealth, eLearning, ICT for Agriculture & ICT Sensitization (with European & African case studies) as multi-day training workshops in Mozambique (10), South Africa (10), Tanzania (10) & Botswana (4)

- The publication of 2 annual comparative reports outlining the current “State-of-the-Art” and level of eAdoption in the areas of eGovernment, eHealth and eLearning in Mozambique, South Africa and Tanzania
- The organisation of 2 international conferences in Africa to facilitate EU-ACP networking, and highlight IST exploitation & international cooperation opportunities

The training courses and workshops will provide a practical foundation for adoption of applied ICT in different African States, showcase African and European good practice and exploitable research results. The training materials can be exploited across Africa through the inclusion of new case studies to address differences at a provincial or national level.

The comparative reports will build on this foundation by providing a baseline understanding of current exploitation of eGovernment, eHealth and eLearning and ICT Skills in Mozambique, South Africa and Tanzania, which are critical areas for economic & social impact. This in turn will provide a foundation for tracking ICT related research activities.

Finally, the IST-Africa Conference Series is focused on Community Building to facilitate EU-African ICT research cooperation under FP7 and successful exploitation and necessary adaptation of existing research results, to stimulate take-up of applied ICT research results by industry and the public sector, to promote knowledge sharing between commercial, government and research organisations, to exchange experiences about the current state of eAdoption at a sectoral, national or regional level, and to support International Cooperation and open up the European Research Area (ERA) to Africa.

1.2 Context of Comparative Report

This comparative report showcases the current level of national ICT and eGovernment, eHealth and eLearning adoption through presentation of relevant data and illustrative case studies, collected by responsible government and other appropriate trans-national organisations, with the goal of informing policy at national, regional and international level.

While there is considerable ICT related activity in Mozambique, South Africa and Tanzania, the results of current and completed projects are not well documented. In addition, there are often different government stakeholders involved in projects, even within the same thematic area. While this presented a challenge compiling this report, it also provided an opportunity for the IST-Africa Consortium to interact with a variety of responsible government agencies and lay the foundation for future cooperation. Only through documentation of current initiatives is it possible to determine future ICT research collaboration opportunities.

As this first report provides a baseline for future reports, and is intended to provide a structure which will facilitate the participation of other African countries in future years,

current initiatives and research activities in eGovernment, eHealth and eLearning & ICT Skills are considered in separate country specific chapters.

This report also provides an overview of some of the more important research organisations and universities active in these thematic areas in Mozambique, South Africa and Tanzania.

A standard methodology and structure has been used for each country chapter to support national and cross-border comparability in future years. Each country section includes an introduction, a summary of national ICT objectives related to eGovernment, eHealth and eLearning, a brief report on national activities during 2005 including relevant case studies and a conclusion highlighting key remaining exploitation, training or other issues.

The expected result is to (a) increased research cooperation between European and African organisations in thematic areas funded under the ICT priority of FP7, (b) inform policy at national, regional and international level, and (c) provide a framework to support inter-governmental exchanges within Africa (e.g. between SADC Member States) and between the African Union and European Commission.

As data is inevitably being collected from different government as well as trans-national organisations, all data sources are acknowledged in the report. The content of each country chapter is the responsibility of the national IST-Africa partner.

The Conclusion chapter highlights challenges and opportunities identified during the review process and challenges identified in relation to African participation in FP7.

The IST-Africa Comparative Report 2005 documents existing eGovernment, eHealth and eLearning and ICT Skills related initiatives in Mozambique, South Africa and Tanzania. The authors appreciate contact from interested readers providing information on other relevant national and cross-border activities. Future annual reports will focus on tracking developments over time, identifying future international cooperation research opportunities and identification of national and regional research centres of excellence in Africa, as this will be invaluable information to assist those interested in international research cooperation.

2. Mozambique

The Republic of Mozambique is one of the southern Africa countries, bordered by Malawi, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe. At the east it is limited by the Indian Ocean. Mozambique has an area of 799.390 km² and eleven provinces: Cabo Delgado, Niassa, Nampula, Tete, Zambézia, Manica, Sofala, Inhambane, Gaza, Maputo Província and Maputo-Cidade. According to the 1997 general population census data, 52.3% of the population of 16,099,246 was aged between 15 and 64 (median 19 years). In 2002 the population was about 18,082,523 inhabitants, of whom around 71% lived in rural area, 60% lived below the poverty line, 60.5% were illiterate and life expectancy was 45.5 years. Today the total population is 19,888,701 and the Literacy is 47.8%. Portuguese is the official language and there are several indigenous languages as national languages (2003). English is widely used in business and in government. Agriculture accounts for 81% of all employment. The EU accounts for 5% of imports and 10% of exports. Mozambique is one of the poorest countries in the world with a per capita GDP of \$1,000 in 2002.

2.1 National ICT Strategy

In December 2000 the Government of Mozambique approved an ICT (Information Communication Technologies) Policy and in June 2002 the cabinet approved the ICT Policy Implementation Strategy. The ICT Policy defines the priorities areas for future actions, namely education, human resource development, health, infrastructure, universal access and governance. The ICT Policy Implementation Strategy has as the main aim to translate the ICT Policy objectives into a tangible reality. The ICT Policy and the ICT Policy Implementation Strategy sets out challenging goals for the long-term future, where ICT shall:

- Contribute to the eradication of absolute poverty and improve the lives of Mozambican citizens;
- Fight against illiteracy and accelerate the development of human resources;
- Provide universal access to information and global knowledge;
- Raise the efficacy and efficiency of the public and private sectors;
- Improve governance and public administration;
- Create a legal and business environment favourable to the production and dissemination of ICTs;
- Make Mozambique a producer and not only a consumer of ICTs; and
- Lift Mozambique to the level of being a relevant, active and competitive partner in the Global Information Society and the world economy.

The actions and main thrust of the ICT Policy Implementation Strategy has taken the Government Programme for 2000-2004 and the Action Plan for the Reduction of Absolute

Poverty (PARPA) into consideration. The main emphasis is on establishing a firm legal enabling environment, allowing the development of a national Internet user base, and use this technical environment to establish and disseminate online services to growing circles of users in major cities, in the provinces, districts and rural areas. In both the ICT Policy and the ICT Implementation strategy, the role of ICT as a tool to achieve development goals is strongly underlined. However, the establishment of practical ways to bridge the gap between basic technology investments and applications yielding development effects is a major challenge for Mozambique because the country is now finalizing the planning stage, characterised by the development and adoption of the ICT Policy, ICT Policy Implementation Strategy, Universal Access Policy and Strategy, eGovernment Strategy and eLegislation formulation.

According to the ICT Policy and its implementation strategy, the government, civil society, private sector, academic and research institutions and development partners all have a role in achieving what is planned by the government. The key stakeholder responsible at policy level is the ICT Policy Commission (CPIInfo) and the ICT Policy Implementation Technical Unit (UTICT). The Government of Mozambique established an ICT Policy Commission in 1998 by Presidential Decree. This Commission is chaired by the Prime-Minister. Current members are the Ministers of Science and Technology (Vice-President), Education, Transport and Communications, Finance, Public Administration, Trade and Industry, the Directors of INCM (telecommunications regulator) and UTICT. One of the main tasks defined in the Commission's mandate was to design and propose an ICT Policy to the Council of Ministers, together with institutional mechanisms necessary for implementation by all sectors and institutions. UTICT was proposed and approved by the Council of Ministers within this framework in 2002. A National Consultative Forum was approved as part of the ICT Policy Implementation Strategy coordination mechanisms and is in the process of being established. It will include representatives of Government (Public Sector), Private Sector, Civil Society, Education and Research Community, and Development Partners. At the implementation level there are several key institutions from government, private sector and civil society.

The key roles of the Ministry of Science and Technology, the Ministry of Education and Culture, the Ministry of Transport and Communication, the Ministry of Trade and Industry, the Ministry of Agriculture, Ministry of Interior and Ministry of Justice and the Ministry of State Administration should be noted in the formulation of Universal Access Policy, eLegislation, eGovernment Strategy as well as in the implementation of the projects proposed in the draft eGovernment Strategy, Universal Access Pilot Project, Provincial Digital Resource Centres and Telecentres (including CMCs – Community Multimedia Centres).

As stated in the ICT Policy Implementation Strategy, the ICT Policy Commission will adopt a Communication and Advocacy Strategy to support raising the funds necessary to implement the planned projects and activities. The focus will be aimed in approaching development

partners, cooperation and development agencies, the DOT Force of G-8, and the ICT Task Force of the United Nations as well as governments, development agencies and funding or credit institutions on a bi-lateral or multi-lateral approaches to support the Government of Mozambique efforts in implementing its ICT Strategy. The ICT implementation strategy is and will be funded through a combination of mechanisms including:

- the Government's regular budget;
- Universal Access Fund;
- Contributions from donor agencies and organisations;
- Loans from financial organisations;
- Joint public/private financing; and
- Other sources not prohibited by law.

As projects and programmes for the Mozambique ICT Strategy are not limited to those in the Strategy document, all sectors and institutions are urged by CPIInfo to integrate an ICT component into their development programmes, with concrete goals to be reached, together with the financial, technical and material resources required for successful implementation.

As part of the implementation of this ICT strategy and mobilization of resources, many ICT strategy projects are being implemented in Mozambique, funded by development partners and governments such as the ICT for Development Programme (UNDP), the Government Network Programme (Italian Government), the Mozambique ICT Institute (multiple partners), SchoolNet Project (supported by private sector - Microsoft, HP, etc.), eSISTAFE, the Land Information Management System, and the Human Resources Development Project funded by the Italian Government through UNDP, just to mention a few.

2.1.1 eGovernment Objectives

The draft eGovernment Strategy was designed with national socio-economic development as its major focus, and is thus aligned with the long-term development plans and public sector reform currently underway in Mozambique. Specific key challenges that shaped the planning, designing and proposed delivery approach of eGovernment Strategy – clearly and explicitly identified during the developing the eGovernment Strategy for Mozambique, are as follows:

- Three major programs (PARPA – Plan of Action for the Reduction of Absolute Poverty, PSR – Public Sector Reform Strategy, and ICT Policy Implementation Strategy) need to be coordinated, integrated and optimized to effect good governance.
- Current funding (from multilateral and/or bilateral sources) and enablement strategies require optimisation only at a project level and appear to lack a common strategic vision for integration of overlapping programs and initiatives.

- UTICT, while strategic in role and presence, lacks the human and institutional capacity to undertake a major initiative to synergize current ICT projects into a clear Public Sector Reform Strategy agenda.
- The electronic info-structure environment lacks an architectural integration framework to provide the foundation structure necessary for eGovernment (EG).

Private Sector and Civil Society must be consciously included as partners in the national economic and social development agenda. Taking in account successful international experiences and models, the following general objectives for eGovernment were defined:

- To improve efficiency and effectiveness in the delivery of public services.
- To ensure transparency and accountability of government.
- To provide access to information to improve business and simplify citizens' lives.

These overall objectives are based on the underlying principle of migrating eGovernment concepts from being a technologically driven agenda to one of improving government and focusing on the greater community that government serves. It underlines the belief that successful eGovernment focuses more on the 'G' (Government – structures, processes, and functions) and less on 'E' (Electronic). In order that the actual impact on the operation of government of these high-level objectives may be more readily appreciated, a set of ten 'specific objectives' were developed by the team that developed the eGovernment Strategy to translate into real, tangible terms what such objectives might allow eGovernment to actually deliver within a given timeframe. In the following table the ten specific objectives are presented, with each one qualified by a target to be achieved by 2010.

1	Rationalize and simplify public services through the use of ICT
	<i>Downloadable standardized forms and procedures of all government services are available on the Web.</i>
2	Enable all levels of Government (down to Districts and Municipalities) to have access to the secure government network.
	<i>All Ministries, Central and Local Government agencies down to Districts and Municipalities are connected by the secure government network</i>
3	Enable all Public Sector agencies to share common sources of basic data.
	<i>Authoritative data sources for use and benefit of citizens/Civil Society, Private Sector and Public Sector</i>
4	Create a dynamic entrepreneurship environment to support eGovernment initiatives

	<i>All eGovernment projects must be delivered and/or supported by locally nurtured Mozambican entrepreneurs as partners</i>
5	Enable a secure environment for collaboration and data exchange of electronic transactions (including financial and others) based on open standards.
	<i>The multifunctional financial transaction environment to be extended for G2B and G2C purposes</i>
6	Enable the development of local and indigenous content.
	<i>A significant level of local and indigenous content development activities contributing to eGovernment initiatives.</i>
7	Empower community to participate effectively in local governance.
	<i>One sustainable community-run ICT centre per district. Community-initiated governance processes implementation ready</i>
8	Enable public access to government information and services at district and municipality levels.
	<i>At least one functioning public access point in every District /Municipality. Private Sector working with Government to deliver information and services.</i>
9	Build the institutional capacity and capability necessary for the coordination and delivery of the eGovernment initiatives.
	<i>An eGovernment entity chaired at the highest level of government with (i) an effective political steering mechanism; (ii) a fully resourced national technical management unit; and (iii) a sustainable funding mechanism. Every Ministry and Province has Chief Information Officers (CIOs) participating in the CIO Council, mediated by the entity.</i>
10	Build Public Sector human resources capacity to effectively deploy ICT for public services delivery.
	<i>All public officials (down to District & Municipal level) to have job-related functional literacy in ICT</i>

2.1.2 eHealth Objectives

Health is a key indicator of national human development, and constitutes one of the priority social areas in the development programmes designed for Mozambique such as PARPA, Five Year Government Plans, Agenda 2025 and PES (Annual Economic and Social Plans). As the ICT Policy explicitly notes, despite almost complete rehabilitation of the health network in the first five post-war years, the health situation in Mozambique is still characterised by:

- An insufficient health network and long distances to health centres for many citizens;
- A short life expectancy;
- High infant and maternal mortality during childbirth;
- The prevalence of epidemics and the rapid spread of HIV/AIDS with all its dangers for the economy and for future generations.

Key benefits that ICTs can offer to the Mozambique health sector include:

- Information systems designed to modernise health services administration;
- Leveraging telemedicine to achieve more rigorous medical examinations and diagnoses through collaboration with more experienced specialists;
- Improving access by health professionals to up-to-date information on illnesses and their treatment, and the exchange of information between professionals through a secure, electronic health network;
- Public dissemination, via the Internet, of health information, including basic health care and environmental cleanliness, and methods to prevent infectious and contagious diseases such as sexually-transmitted diseases, AIDS, tuberculosis etc.;
- Fast, secure exchange of clinical data and biological findings to clinical laboratories, searches in clinical archives and transmission of digital images;
- The creation of pharmaceutical networks, enabling the on-line exchange of information on availability and supply of pharmaceutical drugs and other medicines;
- The computerisation of blood banks and of clinical service delivery to the public.

2.1.3 eLearning & ICT Skills Objectives

Education is a key sector for national development in general and more specifically, the ICT sector. It is one of the ICT Policy priority areas as well as the PARPA. ICT in the education sector is considered as having an important role to play in delivering better and more effective services to citizens, education officers, students and teachers. The great challenges that the sector is facing in Mozambique today can be characterised as:

- The high rate of illiteracy of the Mozambican population, of around 52%;
- An insufficient school network, despite rebuilding over the last few years;

- Limited financial and technical resources to solve existing problems related to improving the quality of education; and
- Insufficient teacher and student materials to support the teaching/learning process.

However, ICTs offer significant opportunities for education (especially using the Internet):

- Administrative support systems, to support processes ranging from matriculations or registration, management of exams, distribution of teachers and other educational human resources to financial management;
- Networks of electronically connected schools (SchoolNet) sharing resources and knowledge between teachers and pupils, and even between teachers and parents;
- Distance learning and teaching or 'virtual schools', using multimedia technologies and making possible the interaction between a teacher in one place and thousands of students in different parts of the country, eliminating physical distance; and
- Making study content and other support materials for teachers and students available via the Internet, either directly to the schools or through telecentres, provincial digital resources centers, community multimedia centers and other community access points.

In the same way as using ICTs in formal education, the Government will promote their use also for informal education, for example in exposing and explaining the merits and demerits of beliefs, myths and traditional rituals and other cultural heritage.

Due to the lack of resources, the only way to achieve these objectives are through the progressive implementation of an action plan based on mobilising all national capacities and those of development partners. To maximise the potential impact of ICT, the Government has defined the following ICT objectives for the education sector and, in collaboration with its various partners, will take the following steps within the ambit of the ICT Policy:

- Create incentives and develop the teaching of informatics at various levels of the National System of Education;
- Generalise the use of the Internet in schools;
- Prepare teachers to be promoters of ICTs in schools;
- Promote competitions and national exhibitions of ICTs for young scientists;
- Progressively provide schools with equipment necessary to access and master ICTs.

The ICT Policy identifies the development of human resources as a priority in parallel with education. National economic or sector specific development depends, first and foremost, on the quality of its available human resources. The Asian economies that are currently experiencing fast growth are explained by the high priority these countries have given to human capital. An educated, well training work force is a requirement for economic development. Major challenges faced by Mozambique include:

- There is a limited supply of well-qualified ICT professionals;
- The quality of technical training courses in Mozambique are generally not at an acceptable international level;
- The lack of a national hardware and software industry that could stimulate training and specialisation in these areas; and
- The absence of professional profiles and certification of different ICT courses offered.

The ICT Strategy in Mozambique relies on the creation of a solid human-resource foundation to ensure that skilled workers can be trained to address real labour market needs, create ICT-based SMEs, and contribute to the country's development objectives. Thus four levels of ICT training are defined in the ICT Strategy and are required to put in place this foundation:

- High-Level Professional and Technical ICT training: to provide the highest level of expertise to expand the small core of national experts that now exists. This effort will be led by MICTI, a higher institute for ICTs, in the context of its long-term comprehensive approach to ICT capacity development.
- Curriculum and Certification of ICT Professionals and Technicians: to satisfy the requirement for properly trained and certified trained professionals in the public sector as well as to provide ICT training to meet private-sector needs.
- SchoolNet: provide ICT training in initial phase, ICT-based education in phase two.
- ICTs to Promote Literacy: ICT resources can also be innovative tools for solving traditional development problems. They provide unique and proven tools for solving problems associated with illiteracy.

ICTs can be a powerful tool for distance learning to support all the above programmes as well as education in general. This is a sound strategy to improve labour competitiveness for the next generations of Mozambicans that will face new challenges in the local and global labour market.

2.2 Existing eAdoption Initiatives

eAdoption initiatives in Mozambique cover a wide range of socio-economic development areas linked with long-term development plans such as Agenda 2025, Action Plan for the Reduction of Absolute Poverty, Public Sector Reform Strategy, Government Five Years Plans, and Annual Economic and Social Plans. Key problems impacting on the rapid development & adoption of ICT based solutions to address development and governance issues have been identified under the national ICT Policy Implementation Strategy:

- Small size of the human-resource ICT skill base, concentration in capital - Maputo;
- Limited access to telecomms and ICT infrastructure in most of the country; and
- Late initiation of policy & regulatory reform to facilitate competition and investment.

Despite these seemingly high barriers to eAdoption, the government of Mozambique has already adopted a National ICT Policy (2000) and Implementation Strategy (2002) and created strong national awareness of the role of ICT in economic development. An earlier aspect of eAdoption in Mozambique is related to the institutional framework and leadership.

Recent eGovernment initiatives being implemented include the Government Electronic Network (GovNet), State Financial Management System (e-SISTAFE), SISCAL (Information System for Licensing and Management of Industrial and Commercial Enterprises), Integrated Custom Management System linked with custom houses and border posts control for real-time processing of declaration and cargo clearance, Land Information Management System (LIMS), Health Information System (Central System for Country Health Statistics), Civil Identification System (ID Card), Government Portal and Government departments websites, ICT Training & Sensitization of Leaders and Government Officers, an e-Parliament Pilot Project and the development of e-Government Strategy.

The Draft eGovernment Strategy has been developed and the main guiding principles for its formulation are to modernize ICT infrastructure and increase accessibility by citizens and the community, to increase the efficiency and effectiveness of Government at every level and improve Public Sector service delivery to citizens, to create new ICT-related business opportunities, and to develop applications and content reflective of national aspirations and identity. The eGovernment strategy focuses on the interoperability and integration of processes and information systems in delivering public services to the citizen.

To facilitate ICT access to a majority of low-income citizens, the Government's strategy is to deploy ICT in community centres. In this field, ongoing eAdoption initiatives include the Provincial Digital Resources Centres (CPRDs), telecentres, Digital Agencies and Multimedia Community Centres (CMCs). eHealth initiatives are focused on HIV/AIDS (e.g. Country Response Information System (CRIS), HIV/AIDS Response Project Database, Sharing Best Practices). An existing Telemedicine initiative under which there was an attempt to develop

activities between two hospitals, and the introduction of Electronic Medical Records (eMR) in one hospital are worth mentioning. eLearning & ICT for Education initiatives include SchoolNet (known as e-Schools under NEPAD), supporting schools by building ICT access, facilitating training of teachers & authoring content, Ministry of Education and Culture (MEC) distance education activities, the Virtual Multimedia Academy (VMA) and African Virtual University initiatives in which Universidade Eduardo Mondlane (UEM) is involved representing Mozambique and the Mozambique ICT Institute (MICTI) initiative.

There are many eAdoption initiatives related to infrastructure. The number of television stations has increased from one (1987) to five (2005), increasing television based education to citizens living in urban areas. The same applies to radio stations and community radio, a traditional and very important aspect of eAdoption for a country where 70% of the population live in rural areas and the illiteracy rate is close to 59%. The media is important in reaching the population in rural areas and in providing content in local languages. While access to ICT infrastructure is a major constraint, several measures have been put in place to extend the basic infrastructure needed to expand ICT use. The Ministry of Energy aims to electrify all district capitals by 2009. In rural areas electrification of Rural hospitals and secondary schools using solar power systems or other alternative sources of energy such as diesel generators has been prioritised. Electrification in rural areas is also planned on a staged basis.

An ambitious programme for the development of infrastructure for the national telecommunications network is being implemented. Its principal objective is to assure the necessary infrastructural support for implementation of a truly national information network through a well-balanced package of projects providing an effective response to the country's needs. To achieve these objectives, the country is mobilizing investment and financial resources into the design and implementation of projects with major structural impact, for example, the development of the National Transmission Network backbone; the expansion and modernization of the network and switching systems for digital telephony traffic in all provincial capitals and principal urban centres, expansion and modernisation of the network for metropolitan areas and suburbs of Maputo City, integrated projects for rural communications; and the development of mobile telephone networks. Significant advances have been made to assure the programme's implementation within the stipulated timetable. Among these actions, of particular importance are the conclusion of important construction projects for the National Transmission Network backbone and the submarine fibre optic link between Maputo and Beira with intermediate connection points in Xai-Xai, Inhambane and Vilanculos along an extension of nearly 1,000 km, with a 2.5 Gb/s capacity per pair of fibres. This important system that ensures the availability of infrastructure to support broadband applications between the south and centre of the country is complemented by a high-capacity Hertzian digital-beam link between Beira and Chimoio, and between Chimoio and Tete.

This programme should be implemented by 2010, interlinking all provincial capitals by high capacity networks using Hertzian waves, seabed based fibre optic submarine cables or joined into the electricity transmission networks. The architecture of the switching and access networks will be redesigned, taking advantage of network planning techniques, to allow a gradual transition to new technological supports based on extensive use of packet switching. Expansion of coverage in rural zones will be done by applying solutions that permit communications to be brought to these zones in equal conditions for all users, applying technologies that offer cost/efficiency advantages. Access technologies being considered include satellite communications (VSAT networks, RASCOM Project), Wi-Fi Systems, FWA solutions (fixed wireless access), point-to-point radio systems and point-multipoint systems. The rapid development of mobile networks has contributed to greater access and penetration of telecommunication services. The technological solutions being developed in this field point toward the integration of fixed and mobile networks, offering users innumerable advantages. Today there are two mobile telephony operators covering all the provincial capitals and districts along the major development corridors. They are introducing innovative services including Internet access using mobile telephony infrastructure.

To increase access to telecommunications and ICT infrastructure in rural areas, as part of the telecommunication reform project the Government is developing the Policy, Strategy and Pilot Project for Universal Access and is drafting enabling eLegislation. Objectives include:

- Extend the fibre and microwave backbone to provide all district centres with terrestrial (i.e. non-satellite) digital access (today this is very limited in reach);
- Ensure public telephone network access (fixed, mobile or wireless) in all population centres – districts, administrative posts, localities and villages above 500 in population, through payphones, kiosks or phone shops;
- Establish Internet Points-of-Presence (POP) with high-speed wireless access, and at least one public Internet facility (e.g. telecentre or private Internet café) in all district centres that can sustain demand over the long-term;
- Require that demand from local government, social infrastructure (e.g. health clinics), schools, community institutions, businesses & individuals is met, even in rural areas.

One of the fundamental components of eAdoption in Mozambique is the mobilization of partners and stakeholders for the development of ICT sector. Existing partnerships exist with UNDP Mozambique (ICT for Development Programme), Government of Italy (implementation of Government Network), Microsoft (Learning Programme to support schools), and Unlimited Potential initiative to support CPRDs. Finally, relationships with CISCO and ORACLE are both being finalised.

2.3 National Activities during 2005

As part of realising the ICT Policy Implementation Strategy, Mozambique is investing in several ICT projects whose extent, influence and objectives are correlated to those of Public Sector Reform Programs (PSRPs), with the possibility of exploiting common factors (inputs, outputs, training, management, involved agencies). This has guided the development of the Mozambican eGovernment Strategy (MOZ EG) in 2005, that has identified the Public Sector Reform (PSR) priority areas and designed suitable eGovernment projects.

The implementation of these initiatives and the provision of Internet-based services by most banks, resulted in the urgent requirement to establish rules and legal instruments (eLegislation) to improve the legal certainty and security of online business transactions (both e-government and e-commerce) and online activities in general. Thus, in 2005 the government also started drafting the Mozambican eLegislation, which will create the required legal certainty for the occurrence of e-business, e-commerce, and e-government transactions.

The government is aware that capacity building programs for institutions and individuals, focused on Mozambican eGovernment Strategy needs are critical for sustainability. A number of training programs are being planned to create a critical mass of local knowledge workers, skilled managers, trained technicians, early-adopters, end-users and entrepreneurs. This will produce a core of educated professionals with the necessary technical capability to provide and maintain ICT infrastructure and services, and adapt new technologies for local needs. Beyond the creation of skills a number of incentives will be deployed to boost 'brain-gain' and reduce the current 'brain drain' that affect many countries across Africa.

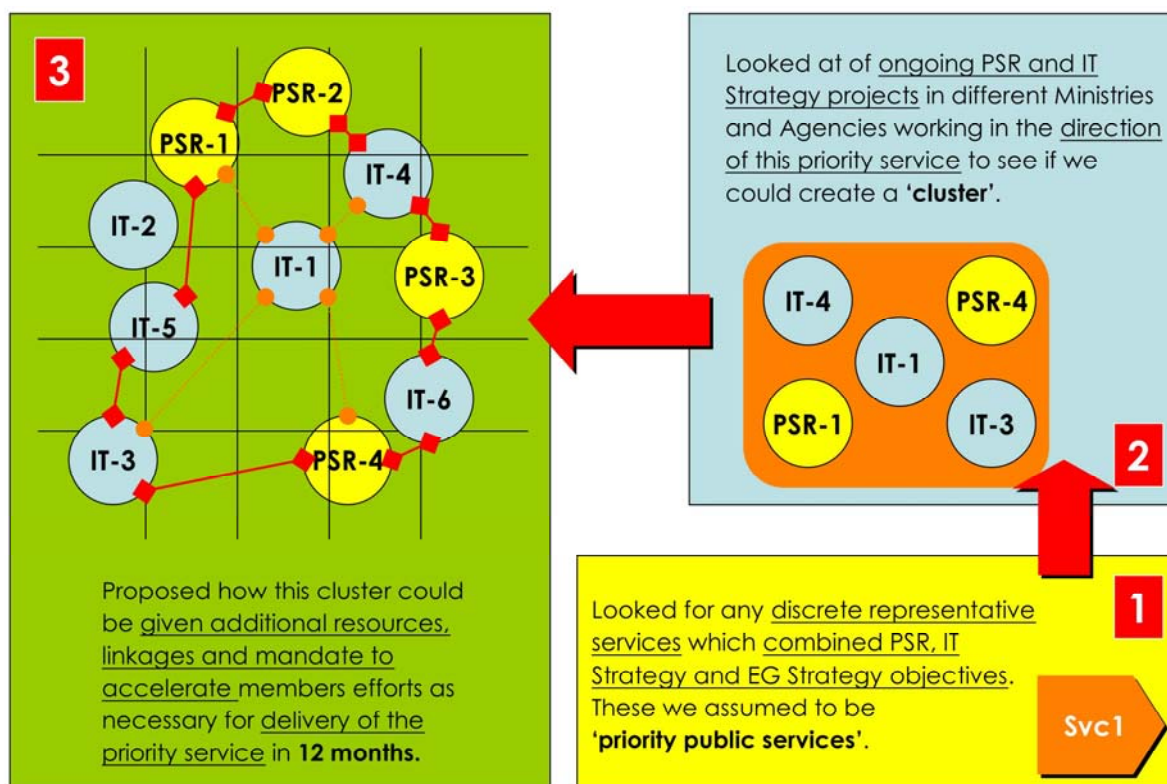
While implementing the MOZ EG in 2006 and 2007 and creating human capacity in public institutions, appropriate regulations can be put in place to privatise some public services, to create a strong indigenous private sector and allow the public sector to focus on maintaining and enforcing the regulatory environment, managing only systems essential to government administration. Appropriate ICT strategies will be defined to foster the use of ICTs across all sectors, aligned with the national programmes being implemented such as the Government 5 Years Plan, Public Sector Reforms Programs and eGovernment Strategy.

2.3.1 eGovernment Initiatives during 2005

After approval of the ICT Policy in 2000 and of its implementation strategy in 2002, several government departments started to computerize their processes to provide better services to the public. However this was being done in an ad hoc manner, without taking into consideration how processes could be simplified to achieve the main goal of providing better services to citizens. Some of the bodies implementing these projects were involved in the *Public Sector Reform Program* (PSRP), but the information systems being developed lacked systematic, coherent integration. This lack of coordination would have resulted in the failure

to achieve the objectives of the Public Sector Reform Program and the holistic results advocated by the *ICT Policy* and its *Implementation Strategy*. As a result the Mozambican eGovernment Strategy (MOZ EG) was drafted in 2005 to address these risks and to provide guidelines for how ICT should be integrated across the public sector as a whole.

To draft the MOZ EG a survey of ongoing and/or approved and near to be implemented PSRPs and ICT projects was undertaken, which provided a basis for the mapping and rationale to design suitable Flagships. These in turn provided the foundation required for the proposed eGovernment program. The mapping process followed the steps shown below in the diagram below (anti-clockwise from bottom right):



This exercise identified the following potential Flagships:

- *Common Communication Platform & Interoperability Framework*, allowing all government networks to share resources and e-services on a common platform;
- *Transparency/Accountability Transaction*, to enable Public Sector fiscal transparency and avoid cash transactions with citizens and businesses;
- *Citizen Identity Registration System*, to allow all Government systems to share common basic data on citizens;
- *Business Entity Registration & Facilitation System*, so that all Government systems can share common basic data on businesses and other legal entities;
- *Land & Property Development*, to allow all Municipalities to be better able to manage land use and building registration;

- *Local Government Horizontal Integration System*, to enable the development of local content, access to Government information and services at a District and Municipality level and empower the community to participate effectively in local governance.

Public Sector bodies likely to be involved in identified Flagships were surveyed to determine the nature and extent of ongoing PSRPs and/or ICT initiatives, their role, contribution & input to the policy area in which each Flagship would operate. These surveys allowed elaboration of the wider influence of Flagships in developing and establishing 'key elements' for eGovernment (human and institutional capacity building; policies and regulations; common communication platform) thus plugging gaps between PSRPs and ICT programs and facilitating their structured integration. Through this, critical success factors (such as high-profile political will; leadership and management; PPP models; monitoring and evaluation protocols; etc.) were identified that would lend strength, credibility and longevity.

For each flagship a cluster was created, made up by representatives of institutions that directly or indirectly contribute relevant services. For instance, there are many institutions that provide subsets of Citizen Identity services (e.g. the Ministry of Justice which provides birth, marriage, death registry and certificates, the Ministry of Internal Affairs - Identity Cards and Passports, and the Ministry of Transport and Communication - Driving Licences).

Other 2005 initiatives under the PSRP and ICT Policy Implementation Strategy include:

1. The One-Stop Shop being implanted by the Ministry of Industry and Commerce and the Ministry of State Administration to harmonise government services for citizens;
2. The State Personnel Information System (SIP) implemented by the Ministry of State Administration (MAE), in collaboration with the Ministry of Finance (MF) and the Administrative Tribunal (TA), to facilitate the management of Public Sector human resources since each plays an important role. The Ministry of Public Administration is responsible for evaluation and monitoring the promotion and career progress of public servants, the Ministry of Finance is responsible for calculating their service time and paying their salaries, and the Administrative Tribunal is responsible for verifying the legality of each contractual process and approve admissions of new public servants.
3. The GovNet Extension Phase (GovNet-Extension) aims to provide technical assistance and advisory services to the Government and extend the Pilot Phase network beyond 15 institutions to all remaining Ministries & Provincial Governments, including up to 7 provincial directorates in each of the 10 provinces. GovNet is the future common communications platform that interconnects all government institutions, allowing for effective and efficient information flow between government institutions (Government-to-Government, G2G) as well as to the private sector (Government-to-Business, G2B) and citizens (Government-to-Citizen, G2C).

While planning the GovNet-Extension Phase, the need to address network nodes, link loading capacity and placement, specifically for common applications and database repository systems was identified and a study was carried out to successfully determine the network topology that would provide optimal network routing strategies to cover the whole country.

2.3.2 eHealth Initiatives during 2005

eHealth initiatives during 2005 were mainly focused on HIV/AIDS control, medicines and medical equipment management. A Country Response Information System (CRIS) has been designed comprised of a database that provides information related to who-is-doing-what-where. This database provides information recorded by all public and non-governmental organizations working in the area of HIV/AIDS. There are 11 CRIS provincial assistants who collect data and send it to a central office at the Concelho Nacional de Combate ao Sida (CNCS) for compilation and reports. Four types of reports are issued regularly based on organization, geographical location, types of intervention and types of population.

Another database has been developed to track, select and implement proposals for HIV/AIDS prevention initiatives. It will house monitoring information including an indicator system for implementation and fund use, which will be updated monthly at provincial level.

Finally, the Centre of Medicines and Medical Equipment (CMAM) of the Ministry of Health (MISAU) has developed a new Integrated MIS to improve the ability to quantify, procure, and distribute medicines and medical supplies through their supply chain. Before this was introduced, MISAU's CMAM used a combination of manual and automated systems that were not integrated and did not allow CMAM to manage the flow of products through their facilities in an efficient and effective manner. It is expected that once the system is up and running, MISAU's stock-outs and over-stocking will decrease significantly as real time management information about drug situation countrywide will be available at central level. (Report on CMAM Integrated Management Information System Project, 29 August 2005)

The fundamental components of this new system is a warehouse management, accounting and financial management systems. The system also includes modules for contract management, distribution planning, performance monitoring, and cost recovery.

2.3.3 eLearning & ICT Skills Initiatives during 2005

In 2005 the SchoolNet Mozambique Business plan was transformed into an Operational Plan and integrated into the Revised Educational Sector Strategic Plan (ESSP II) for 2005 to 2009. The ESSP II strongly focuses on professionalizing secondary education by putting emphasis on skills that will ensure that students graduating from secondary schools have practical skills and knowledge to readily secure employment or create self-employment. The Ministry of Education and Culture has approved the integration of ICT into all educational activities to realize this objective. This will also extend to vocational and teacher training colleges.

Mozambique's SchoolNet Business Plan aims to establish itself as an integral component of the Ministry of Education and Culture's ICT Strategy in Education, as well as to meet one of the ICT Policy Implementation Strategy objectives, that of achieving universal ICT access, by providing access to all schools. To achieve this, over the next few years the Ministry of Education and Culture will target more than 200 schools, and plans to introduce ICT to all secondary, technical and vocational schools and teacher training colleges across the country.

During 2005, SchoolNet Mozambique has produced the following outputs:

- More Schools in Maputo City have received Internet connectivity, in partnership with Cable TV, a private company that also provides Internet connectivity;
- More computer labs were set up, with Escola Industrial de Maputo in Maputo City being the largest in Mozambique, having 40 computers using Open source;
- A refurbishment centre was also set up at Instituto Industrial de Maputo in Maputo City, alongside the Open Source training lab with 25 computers. The lab is used to provide training for students and members of the public; and
- Two training modules were organized and delivered to 10 teachers (curriculum developers), in collaboration with Microsoft. The first on ICT curriculum development, which also covered basic ICT skills, and the second on web design and development of learning contents. Besides this, other training activities aimed at providing ICT basic skills to secondary teachers took place throughout the country.

These training activities with Microsoft fall under its Partners in Learning program, designed to empower schools to increase student learning through teacher development and leadership. Through Partners in Learning, Microsoft is partnering with educator and curriculum development experts to deliver quality learning and development experiences for educators, resources to support success in the classroom and opportunities to network with colleagues.

The Ministry of Education and Culture through SchoolNet Mozambique and the National Institute of Education Development (INDE) has also initiated a revision of the secondary schools curriculum to include ICT education. While a pilot implementation started during 2006, this process will be completed and the new curriculum officially launched by 2008.

The Human People to People (ADPP) NGO has a strategy to enable future teachers to lead fellow teachers, students and the community to find information on development issues. This will be implemented through Pedagogical Workshops, Information and Communication Community Centres where teachers and headmasters can gather, share experiences, gain inspiration and materials to use in their effort to educate children, and where the community may find solutions to important problems in their local life and environment. These centres have been in place since 1999 in cooperation with the Ministry of Education. Through this initiative, 18,000 teachers, children, and community members have being reached.

The strategy defines activities to be carried on when working with different audiences:

- **Children, Youths from schools and school leavers**- Educational and entertaining films, computer training, use of CD-ROMs, lessons in Mathematics, Natural-sciences, History and Geography, Programs from Mozambican Television and DSTV channels, use of library, activities and courses for professional clubs, sanitary education, prevention of HIV/AIDS, theatre, cultural events, sport, English lessons, visits to other schools, cooperation with development instructors from DAPP Mozambique;
- **Headmasters and teachers** - Distance education, monthly meetings, research library, capacity building seminars, dispute resolution workshops, computer training, video, TV and digital TV programs, production of didactic material, debates, production of school documentation, local administration and teachers, Ministry of Education visits, radio news, cooperation with Development instructors from DAPP Mozambique; and
- **Local authorities and local community** – Computer lessons, English lessons, educational and entertainment programs from video and TV, production of paper to district administration, lessons about children's right, sports and cultural events, activities against HIV/AIDS, using the library, cooperation with Development instructors from DAPP Mozambique.

The Ministry of Education and Culture (MEC) in Nampula and Eduardo Mondlane University (UEM) are piloting activities on distance education using ICTs. MEC piloted a distance education centre, which opened in 2004, to test modules prepared for teachers and students, while UEM is running ICT courses for students using videos and the Internet to facilitate study groups follow the ICT module offered by the African Virtual University.

UEM in collaboration with University of South Africa (UNISA) and the University of Science and Technology of Sudan established in 2003 a Virtual Multimedia Academy under the Regional Informatics Network for Africa (RINAF) project financed by UNESCO, to collaboratively develop distance education materials. Under this program Media and Publicity content has been translated, adapted and made available to students and lecturers.

2.4 Comparative National ICT Statistics

Mozambique has significant variations in population density along the country, with more population concentrations along the coast and in specific economic and transportation corridors. Some parts of the country are much more readily served with ICTs, than others.

In order to change this situation, the Government of Mozambique is carrying out a credible and reasonably effective poverty reduction program, where the developmental focus for the ICT sector is the achievement of social equality.

The telecommunications infrastructure consists of a national backbone, covering all provinces up to the district level. This network is a combination of different technologies such as VSAT, wireless loop, copper cable and fiber optic cable along the coast, and now being extended to non-coastal provinces.

The balance between fixed and mobile telephony services has changed since 2001. By 2005, there were 950,000 mobile customers, with fixed service customers reducing from 89,500 (2001) to approximately 77,000 today. Approximately 30% of the country's landmass is already reachable by mobile signals and by end of 2005 this had increased to 35% - 40%.

Mozambique has several radio stations, including community radios that play an important role in information, education, culture, health and civic campaigns in remote areas. The radio network covers approximately 60% - 70% of the population throughout the country.

The provision of E-mail and Internet services in Mozambique was initiated by the Eduardo Mondlane University Informatics Centre (CIUEM) in 1993. Now there are around 10 - 12 active ISPs and 25,000 - 30,000 Internet account holders. Overall, Internet access is still expensive, especially medium to high-speed dedicated access for institutions, Internet cafes, etc. Typical prices for simple dial-up Internet access are around US\$ 25-30 per month.

The availability of computers and Internet connectivity in the education sector is still low, and is limited to higher education institutions and some pre-university secondary schools. At primary level there are a very small number of schools where students and teachers have computer and Internet access. The Ministry of Education and Culture, through the Schoolnet program is providing access and training in ICTs to schools throughout the country and defined that, by 2008, all secondary schools will have computer labs. Two Institutes for Distance Learning (for secondary and tertiary education) are being planned by the Ministry.

In the Health Sector the scenario is not better than in Education. In general some computers are available in central and general hospitals and private clinics. Exceptionally computers can also be found in lower category hospitals. The few existing computers are used for different purposes, mainly by doctors and administrative staff.

2.4.1 Country Background Information

Mozambique	2002	2004
Population (millions)	18.1 ¹	18.96 ¹
Adult literacy rate (% ages 15 and over)	56.7% ² (2000/1)	53.6% ³ (2003)
Gross National Income (GNI) per capita	Not Available	USD2708
Gross Domestic Product (GDP) per capita	Not Available	USD320 ³
Scientists and engineers in R&D (number of persons)	468 ⁴	Not Available
Expenditure on R&D (budget)	20,899,000.2 ⁴	Not Available

2.4.2 ICT Infrastructure & Access

Mozambique	2002	2004
Telephone mainlines		
Per 1,000 people	0.46 ⁸	0.31 ⁸
Mobile phone (per 1,000 people)	254,000 ⁴	950,000 ⁵
Radios (per 1,000 people)	49.5 ⁴ (2001)	Not Available
Television sets (per 1,000 people)	5.1 ⁴ (2001)	Not Available

2.4.3 Computers & Internet

Mozambique	2002	2004
Personal Computers		
Per 1,000 people (per 100 people)	0.3 ⁶ (2000)	Not Available
Installed in education (thousands)	Not Available	Not Available
Internet		
Users (thousands)	60,000 ⁴	Not Available
Service provider charge (\$) (per month)	USD35 ⁷	Not Available

2.4.4 ICT Expenditure

Mozambique	2002	2004
Total ICT (\$, millions)	Not Available	Not Available
ICT as % of GDP	Not Available	Not Available
ICT per capita (\$)	Not Available	Not Available

Sources:

- 1 INE, www.ine.gov.mz, 2006;
 - 2 INE, QUIBB, 2001/2;
 - 3 Document “Mozambique: Building the Information Society”, compiled for the WSIS/Tunis/2005;
 - 4 Indicadores de Ciência e Tecnologia, MESCT/2002/3;
 - 5 Document “Sector Overview & International Experience, Intelecom”, 2005;
 - 6 ITU Report, 2000;
 - 7 SCAN-ICT survey, 2000;
- TDM, www.tdm.mz/portdm/rc2002.pdf, www.tdm.mz/portdm/rc2004.pdf.

2.5 Challenges and Recommendations

The major ICT adoption challenges in Mozambique are related to implementation issues associated with the national ICT Strategy and its projects, and the establishment and enactment of effective structures for the coordination of implementation in the areas of eGovernment, eHealth, and eLearning & ICT Skills Development.

2.5.1 eGovernment

With the conclusion of eGovernment Strategy formulation, the major challenges are related with the establishment and enactment of eGovernment Coordination Mechanisms, namely the Joint CIRESP/CPInfo Forums, Permanent Secretary Forum, eGovernment Strategy Implementation Committee, and eGovernment Technical Secretariat. Another key challenge - and also a major recommendation, is linked with the urgent need to successfully develop and adopt the policy, standards and regulatory documents specifically for the eGovernment Interoperability framework, the eGovernment info-structure, eGovernment infra-structure, the eGovernment architecture (including technical, functional and process issues).

The prompt establishment of a legal framework is a key recommendation, specifically related to issues addressed by the eLegislation project (e.g. digital signatures, content liability, domain name registration and management, cyber crime, etc.). They support and enable the effective introduction of eGovernment systems and delivery of public services using ICTs.

It is a key challenge to keep the promises of the ICT4D (ICT for Development) programme and eGovernment, by striving to ensure that the majority of the Mozambican population, including the poor and illiterate living in remote, rural areas, will benefit from this new technological development and reaps the benefits it offers. The successful implementation of the Universal Access Policy and Strategy and its Pilot Project is challenging but essential.

It must however, be clearly recognized that this digital revolution presents increased opportunities and associated risks. The establishment of systems and procedures to effectively manage eGovernment related risks is a critical issue that must be addressed.

2.5.2 eHealth

In light of the opportunities offered by ICTs, the Government of Mozambique has identified the following recommendations and challenges for the health sector:

- Establish computerised administration for hospitals and health services
- Introduce and extend telemedicine coverage to all central and provincial hospitals;
- Create an electronic health information network for professionals in this sector;
- Use the Internet for public health education related to the nature of infectious and contagious diseases (e.g. sexually-transmitted diseases, HIV/AIDS, Malaria), together with advice for prevention;

- Create an integrated network for State pharmacies with up-to-date information on what medicines are available or out of stock;
- Work closely the health professionals, to promote the use of ICTs in the sector;
- Record and disseminate success stories about the use of ICTs in health;
- Provide training and encourage all healthcare professionals to acquire ICT skills.

2.5.3 eLearning & ICT Skills Development

The Government of Mozambique, in close collaboration with its various partners, will adopt action to address the following challenges and recommendations that are based on the ICT Policy priorities defined for the sector:

- Definition of professional profiles for ICTs
- Standardise the curriculum and training process of training centres in this area;
- Encourage adoption and provision of universally-recognised certification systems for ICT professionals;
- Create Centres of Excellence to train computer professionals and training on how to implement ICT solutions;
- Establish a certification process to recognise foreign and domestic ICT qualifications;
- Define basic computer training programmes for government officials, management and community leaders;
- Promote competitions that recognise and reward individuals and organisations who apply ICT solutions to successfully address national problems being addressed; and
- Introduce and promote the use of distance learning and eLearning techniques for IT training.

2.6 Research Organisations active in target areas

The key stakeholder responsible for ICT Strategy at a policy level in Mozambique is the ICT Policy Commission (CPInfo) and the ICT Policy Implementation Technical Unit (UTICT). The key stakeholder responsible for research development is the Ministry of Science and Technology.

There are a number of universities and research centres active in the areas of eGovernment, eHealth, eLearning & ICT Skills Development in Mozambique. These include:

- Mozambican ICT Institute (MICTI)
- Eduardo Mondlane University (UEM);
- Pedagogical University;
- Higher Institute of International Relations (ISRI)
- Catholic University
- São Tomás University;
- Eduardo Mondlane University Informatics Centre (CIUEM)
- Centre of Medicines and Medical Equipment (CMAM) of the Ministry of Health (MISAU)
- National Health Institute
- Higher Polytechnic and University Institute (ISPU)
- Mozambican Higher Institute of science and Technology (ISCITEM)
- Higher Institute of Transport and Communication (ISUTC)
- Higher Institute of Health Science;
- Higher Institute of Public Administration (ISAP)
- National Institute of Education Development (INDE); and
- Agrarian Research Institute of Mozambique.

In future reports, a more comprehensive list of potential research partners in Mozambique will be published, together with information on current research and exploitation activities.

3. South Africa

The Republic of South Africa is bordered by Botswana, Lesotho, Mozambique, Namibia and Zimbabwe. 65% of the population (46,888,200, Statistics South Africa 2005) is aged between 15 and 64 (median 24.5 years). Literacy is 86.4% with 11 official languages including Afrikaans and English. Services account for 64.9% of GDP. The EU accounts for 45.8% of imports and 40% of exports. South Africa is a middle-income country with per capita GNI (Gross National Income) of \$3,650 (2004).

3.1 National ICT Strategy

If South Africans are to truly participate in the knowledge economy, every effort must be made to prevent social exclusion. President Thabo Mbeki has stressed the importance of ICTs for social and economic development at numerous South African and international fora. "*We must continue the fight for liberation against poverty, against under-development, against marginalisation*" and "*information and communication technology ... is a critically important tool in that struggle*" (Imbizo for African Youth, 2001).

In 2001 the Presidential National Commission on Information Society and Development (PNC on ISAD), and the Presidential International Advisory Council on Information Society and Development (PIAC on ISAD), consisting of representatives from the international, public and private sectors, were established. Both Commissions advise Government on the optimal use of ICTs to address South Africa's development challenges and enhance global competitiveness particularly with regard to education, health and Small, Medium and Micro Enterprises (SMMEs).

A number of key enabling legislative and policy frameworks have been implemented. The Electronic Communications and Transactions Act (2002) regulates electronic communications and transactions to further the knowledge economy and general social prosperity. The Act provides for: a national e-strategy; promotion of universal access to electronic communications & transactions and use of electronic transactions by SMMEs; supports human resource development; and encourages the use of e-Government services.

The Convergence Bill aims to remove policies hindering the development of cross-sector applications, services and businesses. The legislation will reflect the integration of telecommunications with IT, broadcasting and broadcasting signal distribution. Convergence legislation will ensure that citizens are empowered with better access to knowledge and information at competitive prices, thus encouraging investment and economic growth.

The Department of Communications' overall strategy is to develop policies and legislation aimed at liberalising the telecommunications sector to grow the economy, attract foreign direct investment, increase competition, encourage broad-based BEE and develop and sustain

SMMEs. The Telkom IPO was one of the first steps. Liberalisation should also improve service delivery and expand the provision of telecommunications services. The introduction of the under-serviced area licences will enable marginalised communities to receive telecommunications services, while creating telecommunications SMMEs in the rural areas¹.

Increased telecom sector competition is expected to reduce consumer costs and remove constraints to growth. Telecom sector liberalisation will enable Value added networks (VAN) to carry voice over the internet using any protocol; private telecommunications network facilities operators may resell spare capacity and facilities, which would increase access to communities and consumers; and costs have been discounted by 50 percent to Internet Service Providers of public schools, universities and training institutions.

The Post Office has been re-positioned as an agent of ICT service delivery, in line with its universal service mandate. ICT infrastructure rollout in remote rural areas through the Post Office provides a reliable deposit, savings and money transfer facility for most citizens that previously did not have access to financial services. Other policies governing the operations of the South African Broadcasting Corporation (SABC) (including the promotion of South African broadcasting content in previously marginalized languages) are being implemented.

Other enabling legislative and policy frameworks have been provided by various government departments to help integrate ICTs into teaching, learning, health and government. The Department of Public Service Administration (DPSA), responsible for developing national eGovernment strategy, has made significant progress in co-ordinating other government departments and agencies. This strategy will be implemented by the State Information Technology Agency (SITA). The Departments of Health and Education have both addressed ICT challenges in their legislative processes i.e. drafting of strategic priorities for the National Health System (2004 – 2009) and the Draft White Paper on e-Education (2003)².

DPSA is undertaking a comprehensive public sector consultation process, and the policy framework and e-Government Programme is expected to be adopted towards the end of 2006.

Current initiatives include the Batho Pele Gateway launched in 2004, and roll-out of Multi Purpose Community Centres for public access. Mobile applications are being developed and e-procurement systems implemented to improve efficiency and reduce corruption. A web enabled Electronic Inventory of Government Information Systems is under development.

The Integrated Justice System is beyond conceptualisation and the IJS 2000 Plus Strategy has focused on an ICT procurement strategy and interoperability framework for current systems.

¹ <http://www.doc.gov.za>

² <http://www.education.gov.za/>

The Department of Health identified telemedicine as one of the strategies to be employed to redress problems of inequality in the country. The programme initially provided telemedicine equipment for 28 sites of the first phase of the South African National Telemedicine Service. More recent tele-health applications have been developed using a variety of innovative technologies. Mobile technology is being used to send a short message (SMS) to patients and satellite technology used to broadcast HIV/AIDS information.

The Department of Education recognises the role of non-government organisations (NGOs), foundations and private companies who have been the main sources of ICT in schools to date. Initiatives, such as the Thutong Educational Portal, which provides online curriculum resources and communication forums, are important mechanisms of support. The Further Education and Training (FET) curriculum starting in 2006 has the stated aim of equipping learners with skills needed to find their place in a modern, global economy. ICT has a major role in the new curriculum, both in IT training and the use of ICT in all learning areas.

Funding for ICT initiatives is processed by the National Treasury through the Medium Term Expenditure Framework. The necessary co-ordination of project activities is affected through the Government IT Officer Council, DPSA and SITA.

The Department of Communications also focuses on developing the necessary human resource capacity in the ICT sector. Apart from training initiatives, the department was involved with other government departments in launching the African Advanced Institute for ICT (Meraka Institute).

3.1.1 eGovernment Objectives

The vision for achieving e-Government in South Africa is to render services around life episodes of citizens, from the cradle to the grave. Such services must be accessible to all citizens anytime, anywhere and through different access devices and media³.

The Batho Pele Principles inform the transformation of the public service and efforts made to improve service delivery through the establishment of acceptable quality standards. The Batho Pele objectives state that equal access to government services involves consultation, choice in services offered, service standards and value for money.

These principles also drive adoption of e-Government with an understanding that uptake of e-Government is driven by customer needs. Strategies for using ICT to deliver customer focused services must be developed to achieve this economically, securely, and effectively.

The currently approved vision for e-Government is expressed in the document entitled, "Electronic Government, The Digital Future: A Public Service IT Policy Framework",

³ Department of Public Service Administration, "South African E-government Conceptual Framework", 31 October 2005

published in 2001 and released by Cabinet for further consultation. The Policy Framework recommends that an e-Government initiative should address three main domains:

- E-Government: The application of IT intra-governmental operations (G2G)
- E-Service: The application of IT to transform public service delivery (G2C)
- E-Business: The application of IT to operations performed by government in the manner of G2B transactions (e.g. procurement)

DPSA are responsible for policy development, co-ordination and accountability for effective and efficient utilisation of IT in government including the provision of a government IT projects office to ensure the co-ordination of all projects.

An important milestone has been the proposed ICT Governance model, which includes a conceptual framework, policy, strategy, architecture and an implementation approach. This will help organise, coordinate and supervise deliverables and other supportive activities.

Government is a major player in the development of e-commerce, not only as a policy maker and regulator, but also as an actor in the market⁴. Government procures more than half of all ICT services and infrastructure in the country and the number of public service workstations connected to the Internet is steadily increasing. The government will continue to:

- Increase Productivity - this calls for better output in terms of the quantity and quality of traditional results, or the performance of previously impossible tasks;
- Drive Cost effectiveness - this comes about due to reduction in time duration, complexity or possible repetition/duplication of tasks;
- Improve Service Delivery – achieving the *Batho Pele* objectives for offering equal access to government services, more and better information, and greater choice.
- Key objectives of the E-Government strategy are to:
 - Link all three service delivery spheres, providing a single view of government;
 - Facilitate the creation of effective business models and service delivery mechanisms;
 - Deploy cost-efficient and technology-based solutions in a timely fashion;
 - Ensure that solutions are aligned to needs & imperatives of government & citizens;
 - Offer citizens universal access to necessary information at all times;
 - Ensure a common, effective, look & feel for citizen interaction with government;
 - Provide a ‘user-friendly’ communication & transaction channel with society;
 - Eliminate unnecessary expenditure in the development of ICT systems by centralising procurement, installation, implementation & maintenance of these systems;

⁴ Department of Public Service Administration, “South African E-government Conceptual Framework”, 31 October 2005

- Promote resource-sharing between departments;
- Support the development of the local, indigenous software industry
- Support digital inclusion for all through education & training interventions;
- Create a focal point with necessary capacity to sustain the e-government programme

Success of these e-government initiatives is underpinned by the following five primary focus areas or pillars in the ICT House of Values⁵:

- **Interoperability** - Government ICT systems (including networks, platforms, applications and data) must have the capacity to ‘talk’ to each other, allowing for sharing of electronic messages and documents, collaborative applications, distributed data processing and report generation, seamless transaction services, ‘whole-of government’ search queries, integrated ICT systems management etc.;
- **ICT Security** – governmental electronic documents, data and ICT systems must be protected from unauthorised access, malicious code and denial-of-service attacks;
- **Economies-Of-Scale** - Government must leverage its ICT buying muscle to encourage compliance with other key ICT focus areas;
- **Eliminate Duplication** - Government must abolish unnecessary duplication of similar ICT functions, projects and resources (including collection, processing and archiving of the same data), as well as practices of ‘re-inventing the wheel’;
- **Digital Inclusion** - At least 80% of citizens did not have access to ICT infrastructure. Improving access to previously disadvantaged communities is a core activity focus.

Other key issues include:

- **Crucial ICT Skills** - Skills development in ICT must steadily improve with demand. The current situation shows that more focus is needed in this development area.
- **ICT Research Programme** - The e-government initiative will, to a great extent, be dependent on research aimed, among other things, at the government needs and the development of solutions to these needs based on future IT trends and offerings.
- **Monitoring and Evaluation** - Wide consultations are crucial for implementing a credible government policy and strategy. South Africa has quite weak laws governing Internet crime. A legislation review could promote international co-operation to eradicate IT viruses, denial of service attacks, identity theft, child pornography, and other cyber crimes. Broader co-operation must be pursued to achieve: promotion of and compliance with international standards, collaboration with NGOs & neighbours; and enhanced integration of developing countries through collaborative alliances.

⁵ Department of Public Service Administration, “South African E-government Conceptual Framework”, 31 October 2005

- Open Source Software (OSS)- The E-Government Programme is oriented to exploit the OSS movement and participate vigorously in its local and international evolution.

3.1.2 eHealth Objectives

The Department of Health (DoH) has developed a set of strategic priorities for the National Health System for the period 2004 – 2009. The priorities are based on the assessment of what has been achieved in the past 10 years and what needs to be done to meet the health needs of all South Africans. The following are the priorities for the next five years⁶:

- improve governance and management of the National Health System (NHS);
- promote healthy lifestyles;
- contribute towards human dignity by improving quality of care;
- improve the management of communicable diseases and non-communicable illnesses;
- strengthen primary health care, emergency services & hospital delivery systems;
- strengthen support services;
- human resources planning, development and management;
- planning, budgeting and monitoring and evaluation;
- prepare and implement legislation; and
- strengthen international relations.

One of the challenges faced by DoH is to provide equitable access to cost effective, quality health care delivery for all the citizens. ICTs “as a tool” can be used optimally by the health sector for the purpose of efficient and effective delivery of health care.

Through ICT usage, major South African medical centres can provide medical expertise and technical support to primary rural health care communities in different parts of South Africa across provincial boundaries. Delivery of ICT in health can improve general links and communications between developed economic centres and the underdeveloped rural areas.

Although telephone access has increased substantially since 1998 at primary healthcare facilities, c. 20% of clinics do not have a telephone, and only c. 20% have an alternative means of communication. National availability of telephones in health facilities is c. 80.5%.

Telemedicine was identified as a key strategy to redress problems of inequality in health in the country. Telemedicine is provided by the public health care service, almost exclusively for persons without medical aid and it is directed mostly towards Primary Health Care (PHC).

The National Health Information System of South Africa (NHIS/SA) has been “conceived” to be an overall parent system made up of sub-systems or “Components”. The Priority

⁶ <http://www.doh.gov.za>

Components⁷ identified for development by the NHIS/SA Committee include the National Health Care Management Information System (NHC/MIS), a patient centred health information system with Patient Registration a priority module. An Electronic Patient Record tender information request was published during 2005.

3.1.3 eLearning & ICT Skills Objectives

The Government recognises the key role ICT can play in economy development, society, education and training. The Department of Education has published an e-Education Policy that sets out a framework for an implementation strategy that aims to expand the use of ICTs and improve the quality of teaching and learning to better compete in the global economy⁸. Every South African manager, teacher and learner will receive ICT training by 2013, allowing them to use ICTs confidently and creatively to help them achieve personal goals and to be full participants in the global community through lifelong learning.

The Department of Education will adopt a multi-pronged strategy for the gradual integration of ICTs at all levels of the education and training system. National targets will guide the implementation of the e-Education policy with benchmarks and annual targets set for:

- the number of e-schools and their level of e-readiness;
- the number of teachers trained at various levels of ICT proficiency;
- the type of content available to learners;
- the ratio of learners to computers;
- the range of technologies used in classrooms; and
- Internet connectivity.

The main goal of the policy is to ensure that every student will be ICT capable by 2013. An implementation plan was developed to give guidance on how to implement this policy. The incorporation of ICTs into education is weak in terms of inclusion in the current curriculum and computer and Internet access. The percentage of schools with e-mail access was 6% in 2000⁹. An Analysis of Education Management Information Systems (EMIS) of 2002 indicates that 44% of schools have computers and over 26% use computers for teaching and learning.

Provincial departments have developed business plans that include roll-out strategies and funding mechanisms for ICT implementation. However, there is still a great need for aggressive intervention in assisting provinces to meet national implementation plan targets.

⁷ www.doh.gov.za/programmes/tele/july01.html

⁸ <http://www.education.gov.za>

⁹ Presidential National Commission on Information Society & Development, "Towards An Inclusive Information Society for South Africa, A Country Report to Government", November 2005.

The main policy frameworks that govern public sector support for integrating ICT into teaching and learning are the Department of Education's Education Policy and the 1996 Telecommunications Act 103, administered by the Department of Communication. The policy for the National Senior Certificate and the New Curriculum Statements for each subject also have a direct bearing on ICT use in each subject. Furthermore, the Film and Publications Amendment Bill contains provisions related to child online safety.

The strategic approach to implementing national e-Education policy rests on e-Learning and e-Administration. The Draft White Paper on Transforming Learning and Teaching through Information and Communication Technologies (ICTs), Department of Education, 2004 states the policy intention to use ICTs to extend and enrich educational experiences across the curriculum, moving teachers and learners from 'learning about ICTs' to 'learning with ICTs' and 'learning through the use of ICTs'. The national implementation plan developed by the Department of Education (DoE) and provinces and approved by Heads of Education Department Committee (HEDCOM) serves as a guide towards reaching the set standards.

The Telecommunications Act 103 of 1996 (amended 2001) provides for the development of an education network (EduNet) connecting all institutions. DoE is working with the Meraka Institute to develop a hybrid model using existing and EduNet-owned infrastructure, broadcasting (content download) and telecomms (interactive) technologies for rural & urban requirements, providing equitable broadband access. It also makes provision for a 50% discount connectivity rate. The e-Education sector has a leading role in EduNet issues.

3.2 Existing eAdoption Initiatives

The Government Vision 2014 aspires to move the country from being a consumer to a major producer of ICT products and services. The cornerstones of this Inclusive Information Society are a vibrant ICT sector, an enabling policy and regulatory environment, accessible ICT infrastructure and broadband connectivity, and skilled and knowledgeable citizenry¹⁰.

The South African Government recognises the importance of matching ICT strategies with this vision, and existing eAdoption initiatives have largely focused on addressing issues of access, service delivery, anti-corruption, citizen centred and Public Private Partnerships (PPPs). Various government departments have provided enabling legislative and policy frameworks to help integrate ICTs into teaching and learning, health and government. This has been supported by a process of “managed liberalisation” in the telecomms sector.

3.2.1 Service Delivery

Faced with many challenges in providing equitable healthcare access, the Department of Health has developed a strategy for leveraging the use of ICTs in healthcare. Twenty-eight pilot telemedicine sites have been established across the country to promote the provision of medical expertise to primary rural healthcare communities. Other technologies such as mobile and satellite are being harnessed to provide citizen centred services and learning.

Infrastructure in rural areas is a major barrier to rolling out school connectivity. RSA is part of the NEPAD e-Schools Initiative, providing the basis for an ICT solution, especially for rural schools. Six schools in each of 16 African Countries are part of the project.

The Post Office has been re-positioned as an agent of ICT service delivery in line with its universal service mandate and has delivered over 800 Public Information Terminals (PITS).

The government has implemented transverse projects such as financial, personnel management systems and supply chain management systems (Persal, Bas and Logis), police case management systems, motor vehicle registration systems used by Department of Transport, pensions and unemployment insurance systems used by Department of Welfare and Labour respectively, and subsidy management system used by Department of Housing. The South African Government undertook a study on Inventory of Government-wide Information Systems (IGIS) in 2001. Implementation recommendations are now available.

3.2.2 Citizen Centred

Green papers, draft laws and regulations are posted on government web sites. Citizens can review policy proposals and documents online and submit comments before a policy issue

¹⁰ Presidential National Commission on Information Society & Development, “Towards An Inclusive Information Society for South Africa, A Country Report to Government”, November 2005

reaches the Green Paper stage. A portal now supports all eleven official languages and an Open Source Software desktop application has been translated into South African Official languages. This allows citizens to contribute directly to public policymaking.

The South African Post Office's Paymaster to the Nation project aims to provide better services to pensioners, particularly those living in remote rural areas. Under the scheme, welfare grants and pensions are paid into a Postbank account that is linked to a biometric enabled smart card containing a magnetic strip and a chip, which contains the beneficiary's fingerprints and photo to eliminate fraud in the government to business (G2B) domain. The South African Revenue Services (SARS) already supports Internet filing of tax returns.

3.2.3 Anti-corruption

The Government launched the South Africa's National Anti-Corruption Programme followed by the Public Service and National Anti-Corruption Summits, and hosted the 9th International Anti-Corruption Conference in 1999. In 2002, Government adopted the Public Service Anti-Corruption Strategy. The Independent Electoral Commission (IEC) has developed an e-procurement system for open, transparent bidding of government tenders.

3.2.4 Access

Mobile penetration has risen to over 50%, increasing opportunities for access to information.

South Africa has leveraged the tools of multi-access government to promote "free and fair" national elections since 2004. The IEC developed partnerships with cell phone service providers, enabling voters to submit identify numbers using SMS and receive a message indicating voting eligibility and voting station details. Custom-designed handheld scanners captured information from bar-coded ID books and streamlined the voter registration process¹¹.

A further strategy employed to increase affordable universal access is that of granting Under-serviced Area Licenses (USALs). The licensees are Small Medium Enterprises (SMMEs) that provide telecommunication services in areas designated as under-serviced.

South Africa has worked hard to improve access including an e-Government information portal (Batho Pele Gateway) launched in 2004. The Batho Pele Gateway Portal and associated call centre provide an opportunity for the public to comment and provide feedback on the government Programme of Action or any other matter of interest to citizens.

355 Multi Purpose Community Centres (including Telecenters and school cyber labs) have been established to provide people in villages with access to ICT and ICT related services.

¹¹ Accenture, "Leadership in Customer Service: New Expectations New Experiences", April 2005

All universities and about 6,000 schools are ICT enabled and an educational portal, Thutong, has been established to help educators and learners to access curriculum related information.

3.2.5 PPPs

The corporate sector plays an important role in supporting community, health and education programmes. The Mogalakwena HP iCommunity project and Microsoft Digital Villages are partnerships between government, communities and private sector. In many sectors there are significant capacity challenges and a need for stronger awareness and capacity building.

3.3 National Activities during 2005

Significant technological and policy advances are changing the eAdoption environment in South Africa. Major technology innovations are extending the reach of telecommunications into remote rural communities. South Africa is leading the continent in the implementation of broadband with 120,000 users at the end of 2005, and this is expected to double during 2006. South Africa has also launched its first municipal-owned telecommunications network.

South Africa has made significant efforts to increase access for citizens in disadvantaged communities by improving local ICT infrastructure. Innovative mechanisms have been implemented to support community access to citizens, including establishing Multi-Purpose Community Centre's (MPCCs), Telecentres, e-Gateway Service Counters and Public Information Terminals (PITs). G2G activities include an inventory of government systems, eIGIS, an integrated justice system IJS, a Smartcard-ID that focuses on the automation of fingerprints and the development of an electronic Population Registry. Mobile technology is being used to enhance service delivery. The Electoral Commission (IEC) implemented an internet-based eProcurement system to streamline their procurement processes. There are many examples of local and provincial initiatives and G2B developments in revenue collection. Donor funded activities and Private Public Partnerships are also in progress.

Current DoE initiatives include the Thutong Educational Portal, providing on-line curriculum resources and forums are important support mechanisms that need to be utilised to the fullest. The Further Education and Training (FET) curriculum starting in 2006 aims to equip learners with skills needed to secure their future in a modern, global economy. ICT has a major role in the new curriculum, both in IT training and use of ICT in all learning areas.

Provinces are at different levels of ICT integration in education. However, significant progress has been made with provincial implementation in the Western Cape (Khanya); Gauteng (Gauteng OnLine) and Northern Cape (Connectivity Project).

NGOs, foundations and private companies have been the main sources of ICT in schools to date. Over the last five years, the Government, the private sector, and NGOs have responded positively to the challenge of bridging the digital divide. Efforts include ICT Professional

Development initiatives such as SCOPE (Finnish Development Support), SchoolNet SA and the South African Institute for Distance Education.

3.3.1 eGovernment Initiatives during 2005

South Africa's vision for eGovernment focuses on G2G, G2C and G2B. The DPSA has a vision of a single public service and improved mobility of employees across government.

3.3.1.1 Government to Government G2G Activities

These projects focus on internal efficiency, integration and interoperability. Key eGovernment policy development and co-ordination is being undertaken by the Department of Public Service Administration (DPSA).

3.3.1.1.1 eIGIS - Electronic Inventory of Government Information Systems

A study on Inventory of Government-wide Information Systems (IGIS) in 2001 makes recommendations for implementation including monitoring of expenditure, achieving economies of scale, minimum interoperability standards, security, architecture, management of projects and marketing of the E-government vision.

A web enabled Electronic Inventory of Government Information Systems (eIGIS) is currently being developed. eIGIS is a decision support system to provide ICT management information to government. The system aims to help co-ordinate government IT projects, gain an understanding of IT spending trends including monitoring and elimination of unnecessary duplication and better management of IT systems' costs. Efficiency will be achieved through economies of scale, providing IT planning support, an assessment of e-readiness status, continuous review of IT security strategies, and determining vital IT skills required.

The eIGIS will be soon be launched, following final testing and staff training. All CIO's will be required to input information on departments, IT systems, application and projects which will assist in improving reporting and compliance with Public Service Regulations.

3.3.1.1.2 Integrated Financial Management System Project (IFMS)

The National Treasury are responsible for the Integrated Financial Management System Project (IFMS), to modernize existing financial, supply chain and human resources systems including BAS, PERSAL and LOGIS. This is a joint initiative with DPSA and SITA. The first phase has been completed, including strategy development, User Requirements and a Master Systems Plan. The second and third phases will be rolled out over the next few years. The IFMS governance model consists of the three government departments listed above and representatives of the Government Information Technology Council (GITOC).

3.3.1.2 Government to Citizen (G2C) Activities

The focus of these projects is on service delivery, access, customer centred and participation.

3.3.1.2.1 Multi-Purpose Community Centres (MPCC)

MPCC can be described as a one-stop, integrated community centre, where there is community participation and relevant services provided to address people's needs. Each centre is expected to provide services related to at least six government departments. They are established at district level, with centres rolled out to the 284 municipalities by 2014. Seventy-four MPCCs are currently in operation, with a pilot rollout phase from 1999 - 2004¹².

Strategic plans for local municipalities from 2004 - 2014 including the use of mobile centres, alignment of programmes such as the e-Gateway government portal, Post Office Public Information Terminals (PITs), community radio stations, arts, culture and youth centres. Alignment with community development workers (CDWs) as local community service-providers and the development of a funding strategy, including a review of the Municipal Infrastructure Grant (MIG) will also be addressed.

- By the end of 2005, 77 MPCCs were operational nationally, with more than 700 services being offered at places that never had services before.

Lessons learned include ensuring skills development programmes are designed to promote multi-skilling, access, maintenance and support of ICTs, which are very costly, particularly in rural areas, and the need to ensure effective partnership that will facilitate costs-sharing mechanisms. Service level agreements (SLAs) need to be legislated through DPSA.

This programme has had a far-reaching impact on previously marginalized communities such as end-users and the beneficiaries of services they themselves identified. The number of families receiving grants has grown tremendously through services offered, for instance by both the departments of Home Affairs and Social Development. To ensure improved, quality service delivery, it is imperative for service-providers and municipalities to sign SLAs. Lease agreements provide resources such as vehicles, furniture, etc, and budget for the MPCC.

3.3.1.2.2 Telecentres

The Universal Service Agency played a leading role in the implementation process of Telecentres to bridge the Digital Divide. There are now 94 Telecentres across South Africa.

3.3.1.2.3 Batho Pele Gateway Portal

This Portal is responsible for providing online access to government information and services via www.gov.za. It is sponsored by DPSA, implemented by SITA and operated by the Government Communication and Information System (GCIS). Service counters are situated at MPCCs co-ordinated by GCIS. The Batho Pele Gateway Portal was launched in 2004 and

¹² <http://www.gcis.gov.za>

provides information on government services, legislation and policies. At present it is undergoing enhancement by translating information on the portal into all 11 languages.

A government common core network (GCCN) architecture was implemented by SITA. The next phase will migrate all departments and create VPNs for each department.

3.3.1.2.4 Integrated Justice System IJS

In 1996, the government launched the National Crime Prevention Strategy (NCPS). A key focus of the NCPS initiative was the development of an Integrated Justice System and it was in response to this initiative that the Departments of Justice and Constitutional Development, Correctional Services, Social Development, Safety and Security, the South African Police Services and the National Prosecuting Authority established an inter-departmental board¹³.

The IJS 2000 Plus Strategy aims to use technology to promote more efficient and effective government; allow greater public access to information; enable the provision of value-added services and make government more accountable to citizens.

Key objectives are to achieve greater efficiency managing cases, persons and exhibits, including shorter case cycle times, a greater throughput of cases, fewer case withdrawals; no lost case files; fewer postponements of cases awaiting trial; a better prioritisation of cases involving young offenders, sexual offences, and priority crimes; and eradicating corruption. The IJS is a business process and not simply technology. Change Management and Business Process Reengineering are essential ingredients to the success of the Programme.

The main achievements to date include a Court Process Project (CPP) focused on the routing and scanning of dockets, biometric identification of criminals, and automated fingerprinting reducing the time required to identify criminals from 8 weeks to only 48 hours. It has also resulted in criminal identifications increasing from 1,000 to 1,800 per day. Due to successful implementation in Durban, the IJS has created a "Centre of Excellence". The Court Process System in Durban has not yet been duplicated elsewhere in the world and no other system has integrated business processes and functions across various government departments.

IJS members have become partners. By working as a team, the various entities within the JCPS cluster have leveraged from the economies of scale, especially in terms of bulk procurement, and making use of systems developed in one cluster. Under the auspices of the IJS, the JCPS cluster is the first within government that is pursuing interoperability. In conclusion the IJS has focused on an ICT procurement strategy and is establishing the framework for interoperability between existing systems.

¹³ SDR Vol 2 No 32003

3.3.1.2.5 Home Affairs National Information System (HANIS)

The Department of Home Affairs promotes re-defining the relationship between government and citizens. A smartcard-ID under development focuses on the automation of fingerprints and the development of an electronic Population Registry. Through its National Information System (HANIS) project, citizens can access birth and death registration forms online

3.3.1.3 Output and Results

The Automated Fingerprint Identification System (AFIS) project has been implemented and is fully functional. The main challenge remains to populate it with enough data to eliminate dual processes, namely manual and digital records identification and verification.

Enabling legislation for electronic transactions and electronic signatures has now been established. Work is currently being undertaken to formulate sound regulations and policies, which will provide guidance for establishing a Government-based Certification Authority (CA), which is critical for the implementation of successful electronic government schemes.

The Department has embarked on various pilot projects, mostly using mobile technologies to enable citizens to access selected services:

- Due to rising fraud around marriages, the Department provided an online service allowing citizens to verify marital status by entering an ID number.
- Currently the Department is issuing smart ID cards to refugees, containing demographic & biometric data, which enables offline biometric verification.
- The Department embarked on several mobile pilots to improve service delivery in the area of passports. Participants can make an appointment to apply for a passport, trace their application status and receive notification to collect their passports once ready.

These pilots and electronic services form part of the bigger vision to enable online transactional services and surmount the identification obstacle by providing reliable, proven electronic identification. The smart ID card is seen as the ideal electronic identification platform for secure electronic transactional services.

3.3.1.4 Lessons and Conclusions

The Department of Home Affairs has a critical role to play in the online identification of applicants for government services. South Africa has a population register and fingerprint identification system to help verify the identity of citizens. The Department aims to make these services available online to enable real electronic government transactions. These projects will contribute to the successful implementation of electronic transactions, which in an e-government environment is not trivial, requiring considerable effort to implement.

3.3.1.5 Mobile-access and m-Government

The Centre for Public Service Innovation and the R&D division of the SITA have partnered with industry to develop public-sector mobile and wireless solutions in support of government's m-government strategy. The Government Communication and Information Service (GCIS) provides a well-developed informational base on South African government services, legislation, projects, speeches and events accessible to the general public making provision for civil participation in policy making.

3.3.1.6 Local and provincial initiatives

Local and provincial government are engaged in the implementation of various ICT projects to provide online services and information delivery to the public. Provincial government initiatives such the Gauteng Online and the Cape Gateway in the Western Cape already provide improved access to information and service delivery. A driver's license booking system is being introduced through the Gauteng Provincial Government (GPG) Contact Centre to make this service more convenient for citizens.

3.3.1.6.1 Smart Cape Project in the Western Cape

Part of the Smart City initiative of local government to IT-enable the population of Cape Town, during 2005, it was rolled out to all 98 libraries in Cape Town with PCs allowing users to type and print documents, surf the web and send and receive e-mails. The Cape Gateway provides citizens with access to government information through channels such as walk-in-centres and a call centre that handles up to 14,000 calls per month.

3.3.1.7 Donor supported initiatives

ICTs initiatives such as Kgautswane is still supported by Non-government Organisations (NGOs) in its operations while Women's Net has set up an internet lab so that it can be accessible for communities to access information and other services.

3.3.1.8 Public Private Partnerships (PPPs)

The corporate sector provides support to community programmes. Community Access initiatives such as Kgautswane has been supported by BP and Old Mutual.

Another example is the partnership between Universal Service Agency (USA) and Microsoft to establish Digital Villages. The Mogalakwena i-Community Project, a flagship project with headquarters at the Mokopane Education Multi-purpose Centre, is a collaboration between Hewlett Packard (HP), the Limpopo Provincial Government and Mogalakwena Municipality.

The Gauteng Online and the HP i-Community initiative is also a notable example. This project has been initiated by the Gauteng Provincial Government and has the stated objective

of installing a network with a minimum of 25 PCs in every public school in the province. This project is a partnership between Gauteng, HP, Sahara, IBM and Sun Microsystems.

3.3.1.3 Government to Business (G2B) Activities

In the G2B domain of e-Government, the South African Revenue Services (SARS) e-filing already provides a means to conduct transactions related to tax returns on the Internet.

3.3.1.3.1 The Independent Electoral Commission (IEC) eProcurement

The Electoral Commission (IEC) implemented an internet-based eProcurement system with which the Commission achieved a number of procurement imperatives to streamline their procurement processes. These imperatives included making the process fair and transparent, optimising SMME and participation by historically disadvantaged individuals (HDIs), creating the broadest possible competition, standardising procurement policies and procedures and creating a cost effective process.

The IEC's eProcurement system contributes to the promotion of SMME development and black economic empowerment (BEE) with 430 of 440 awarded contracts going to BEE companies (approximately R92, 61 million). Approximately 90% of bids awarded through e-Procurement auctions went to BEE companies.

3.3.2 eHealth Initiatives during 2005

The strategies to improve health conditions in South Africa include encouraging remote communities to make sound healthcare management decisions through decentralisation of health services through community centres to local health authorities and local health care staff. It can also increase the scope for community participation as members will not only be service recipients but will also actively monitor and manage services.

Information can be made widely available through the use of radio, especially community radio stations. Many households, especially in rural areas, have access to a radio. Information can cover aspects of prevention of diseases, management of minor ailments, and what health care services are available for particular types of diseases.

Television, in the form of edutainment, is also used to disseminate and empower communities. Many people can be reached through broadcasting. South Africa has already introduced programmes such as Khomanani, Lovelife, Soul City and others to disseminate information through television. It has also developed a closed health broadcast channel that broadcasts to patients visiting clinics. Information, especially in affluent societies, can be disseminated through the Internet or health portals and can also cover topics such as prevention, promotion, use of certain drugs, management of minor ailments and home care.

With regard to eHealth the Provinces have assumed responsibility for the implementation of telemedicine. The Eastern Cape plans to provide connectivity to over 200 clinics during

2006. Other Provinces have similar plans. The Department of Health's partnership with the private sector will see the continued roll-out of the health channel to health facilities countrywide. The Health Channel involved implementing a satellite broadcast channel through which information is disseminated to patients and healthcare workers in health care facilities across the country. The Electronic Patient Record will also soon go to tender.

Phase two of the National Telemedicine system will soon be financed and implemented, developing an effective Telemedicine connection between 75 sites divided into various provincial networks for management purposes and Phase three is in an advanced state of planning. It will comprise additional sites as required and is intended to meet the appropriate remaining rural healthcare needs, which will become apparent after the evaluation of Phase two. This phase will also incorporate the transformation from an advanced pilot stage to a fully clinical and operational stage.

After the first phase had been running for three years, it was evaluated by the Medical Research Council (MRC) in 2002, who found improved access to specialist care and a reduction in the isolation of new doctors performing community service. The evaluation also showed a positive adoption of the system in the Mpumalanga, North West and Free-State Provinces and a consistent level of service.

3.3.2.1 Health Channel

The Health Channel is a partnership between the National Department of Health, Mindset and Sentech, launched in 2003 to 56 sites. Activities included implementing a satellite broadcast channel for dissemination of HIV/AIDS information to patients and healthcare workers in health care facilities across the country. The health channel broadcasts daily to patients/general public and healthcare workers benefiting both urban and rural communities.

The broadcasts and videos are shown in waiting areas of clinics and district hospitals and provide instructive health material for the general public relating to preventative healthcare. A separate part of this project disseminates programmes for professional health care workers in the same institutions, to improve their knowledge and ability to serve their patients.

Data casting (forwarding and storing of data via an IP satellite platform) is used to complement the broadcast into sites, allowing users to view content stored on their local PC "on demand" daily. The technology has empowered health professionals and lay counsellors to access HIV/AIDS and related information via satellite in the health care centres. The channel is entirely developed and produced for the South African population. A reference group team is examining the development of educational messages that are culturally sensitive using South African languages; i.e. isiZulu, Afrikaans, Sotho, isiXhosa and English.

The channel addresses inequalities in economically disadvantaged communities and also targets the public sector and public health sector rather than the private sector. Secondly, with

its broadcasts it supports people living with HIV. It does not only address the medical impact or physical impact of the HIV disease, but also the social and economical impacts.

3.3.2.2 Rural Tele-health Project - Tsilitwa

This project used an innovative communications infrastructure based on satellite (VSAT) and wireless technologies in a rural setting. The 11 Mbps wireless technology provided point-to-multi-point connectivity within the village linking a rural clinic to a community hospital 10 km away. The wireless technology provided voice (VoIP) and video over Internet protocol¹⁴.

An effective application of voice and video communications was demonstrated by the clinic sister at the Tsilitwa clinic, and a doctor at the Sulenkama hospital. A digital camera was incorporated into the wireless link between the clinic (send site) and the hospital (receive site). Basic training was given to both the clinic sister and doctor on system usage.

The sister has an arrangement with the doctor at the community hospital to make contact on specific days and times during the week. The sister identifies beforehand which patients she will select for the tele-consultation. The clinic sister uses the digital camera for sending images to a specialist 400 km away. However, there can be major problems with the electricity supply and frequently the power to the network can be off for days at a time.

This is a pilot site started in 2001 but indications show good “buy-in” from the clinic sister and positive feelings from the community, who no longer have to travel long distances and stand in queues. The doctor is happy that she now has Internet access to training and making contact with other specialists. The doctor is now more willing to work in such a remote location.

3.3.2.3 Pilot Project Using Mobile Phones for Healthcare

The Cape Town Health Directorate has piloted and tested the innovative use of mobile technology to improve the treatment of Tuberculosis (TB) in its clinics. This was possible due to the widespread use of mobile phones by low-income groups. Examining TB treatment is useful because of the impact of the disease and because lessons learned from successful TB treatment adherence could be applied more broadly to other diseases. For example, one of the problems with HIV/AIDS treatment is that it requires lifetime adherence to drug regimes.

Instead of the clinic sister observing the patient taking the medication (current practice) a SMS is sent to the patient via his mobile phone as a reminder to take the medication at pre-determined times, thus encouraging adherence to the necessary drug regimes. Several obstacles limited the effective use of the service including poor administrative procedures, lack of ownership at the clinic and patients not following instructions. City and clinic

¹⁴ C Morris “Tele-health: a case study Tsilitwa, Eastern Cape”, African Renaissance, October 2003. Port Elizabeth, South Africa.

bureaucracy limited add-on functionality that would expand the usefulness of the service. Issues of privacy, data protection, and security will affect adoption in the long term.

3.3.3 eLearning & ICT Skills Initiatives during 2005

The Department of Education's (DoE) report¹⁵ indicates that most attempts to introduce ICTs in general and further education and training institutions are through provision of computer hardware, and sometimes Internet access. However, in most cases, institutions are still responsible for connectivity and recurring costs, maintenance, upgrading and security.

Where there is evidence of teacher development, it varies from basic computer literacy (in most cases) to the integration of ICT into teaching and learning. Support, whether technical or pedagogical, is limited, but very effective in the Western Cape. NGOs, foundations and private companies have been the main sources of ICT in schools to date. According to the Department this trend should continue and must be encouraged within the context of the e-Education Policy and the ICT rollout strategy of the provincial education departments.

Private sources of funding is needed to effectively implement the policy. At the same time private support needs to be within a framework led by DoE. While many private funders have developed good practice in their interventions, there are too many instances of schools receiving ICT equipment but little or no support. Private ICT support must be well managed.

The chances of success are also highly dependent on the extent to which ICTs are integrated into the curriculum. Initiatives, such as the Thutong Educational Portal, which provide online curriculum resources and communication forums, are important support mechanisms that need to be utilised to the fullest. The Further Education and Training (FET) curriculum starting in early 2006 aims to equip learners with appropriate ICT skills. ICT has a major role in the new curriculum, both in IT training and through the use of ICT in all learning areas.

3.3.3.1 Thutong

Thutong is a national education portal run by DoE, providing web-based access to curriculum and support material highly relevant to the lives and learning contexts of South African learners, educators, education managers/administrators and parents, with strict quality assurance by educational experts. Over time, the portal resources will expand and become more representative of users' interests and needs. Materials are provided at no cost.

3.3.3.2 NEPAD e-School Initiative

Run from the NEPAD e-Africa Commission headquarters in South Africa, schools calls for at least 600,000 primary and secondary schools in Africa to be connected via a computer

¹⁵ Draft White Paper on Transforming Learning and Teaching through Information and Communication Technologies (ICTs), Department of Education, 2004

network, with an emphasis on science and technology learning materials. The first phase is focused on 20 countries including South Africa, Mozambique, Ethiopia, Mauritius, Uganda, Mali and Cameroon. The NEPAD e-School Initiative also eventually aims to equip all African schools with radio and television sets, phones, fax machines, and digital cameras. It is hoped that people living in rural areas near the e-Schools will get increased livelihood opportunities via business & entrepreneurial skills learnt through the infrastructure provided.

SchoolNet SA was established in November 1997 as a non-profit educational organisation, to create learning communities of educators and learners who use ICTs to enhance education in South Africa. The organisation arose from the work of non-profit provincial schools networks, who assist each other in gaining access to and using the Internet and computers.

SchoolNet SA manages a variety of projects covering all aspects of the use of ICTs, directed mainly at historically disadvantaged schools in South Africa. Through partnerships with the donor community, public sector, corporate South Africa and civil society, SchoolNet SA contributes to the transformation of the education system in South Africa.

3.3.3.3 Thintana i-Learn Project

The Thintana i-Learn Project, is funded by Thintana, a consortium of Telkom's strategic equity partners - SBC International and Telkom Malaysia. The consortium has provided R21.2 million to set-up computer centres in 200 disadvantaged secondary schools across all nine provinces and to train 10 educators per school. Each school will receive 10 to 20 networked computers with Internet connectivity over a two-year period. Schools will be selected in line with the strategic developmental objectives of the Provincial Education Departments. Equipment has been rolled out in all schools in Gauteng, North West Province, Kwa Zulu Natal, Eastern Cape, Northern Cape, Mpumalanga and Free State Province.

Intel® "Teach to the Future" Teacher Development Programme provides teacher training in ICT integration into teaching and learning. It is a worldwide effort to help educators integrate computers and the Internet (ICT) into teaching that enhances learning. As part of the global Intel® Innovation in Education initiative, a multi-million dollar effort to help realise the possibilities of science and technology in education, this programme is designed to prepare today's educators and learners for tomorrow's demands. Participating educators receive extensive training and resources to plan projects that promote effective use of computers and the Internet (ICT) in the classroom. Intel® Teach to the Future is one of the official professional development programmes of SACE (South African Council for Educators).

A new training model is being applied from 2006. Training will be provided onsite by skilled facilitators for groups of teachers to receive training by SchoolNet SA or a Provincial Education Department's own trained facilitators. Training is funded by the Provincial Education Department or the school, and Intel no longer provides free direct teacher training.

As educators progress through the training modules included in this program, they will have the opportunity to collaborate with other educators and discuss ideas for planning projects and using technology in their classroom. They also have the opportunity to develop a specific project based on learning outcomes they would like to teach in the future. The goal is for educators to have a personal project they can take back to their classrooms, allowing them to raise the level of excellence in their classroom and meet important learning outcomes.

3.3.3.4 Teaching Thinking with Technology

Intel has developed a new project – Teaching Thinking with Technology – to be piloted as from June 2005 in South Africa and Costa Rica, at the same time as in the USA. This involves the use of online thinking tools for learners using reasoning, cause and effect, mind mapping, as well as several other skills and thinking techniques. These interactive tools are designed to promote higher level thinking in any subject. Each tool features an online workspace where students create and save visual representations of their thinking.

These tools and related resources are available from any Internet enabled computer, so learners can access their saved projects anytime, anyplace. There are no subscription fees so as many learners as desired can register. Each learner can set up any number of projects.

The South African pilot was launched in July 2005. Teachers or facilitators from fifteen eligible schools in the Western Cape and KwaZulu Natal were trained 11-15 July 2005.

3.3.3.5 HP i-Communities

HP i-Communities are founded as Public-Private Partnerships (PPPs), with the goal of establishing breakthrough models of sustainable social and economic development that can then be replicated in similar communities around the world.

The intention is to transform Mogalakwena into a thriving community where ICT empowers individuals, families and the community at large - and shapes their future in an economically and environmentally sustainable way. A great deal has been achieved during this three-year project to ensure that communities and surrounding areas have achieved a high-level of sustainability. There has been significant skills transfer, which continues today. Activities include introductory ICT literacy programmes for children and adults, PC refurbishment programme, business resource centre, call centre and help desk and an Open Source centre.

3.3.3.6 The Shuttleworth Foundation tuXlab

A partnership between the Shuttleworth Foundation and South African schools aims to establish Open Source computer centres in schools. Open Source software is installed on computers as a sustainable way to bring the power of computing to the learners. tuXlabs can be found in schools in the Western Cape, Eastern Cape & Limpopo. The tuXlab project has

installed 110 tuXlabs in the Western Cape, 25 labs in the Eastern Cape, 19 labs in the Limpopo and provided over 100,000 learners with access to Open Source Computing.

3.3.3.7 The Ulwazi project

Since its inception in 2003, the Ulwazi project has transformed itself from a technology project into one focused on social transformation in disadvantaged communities through a process of digital inclusion. The students have taken total ownership, to the point where they are actively engaged in the lessons delivered. They have access to top-quality real-time web-based educational content, which is freely available to the schools 24 hours a day at zero-cost.

Connectivity is achieved through the use of the Motorola Canopy product providing an 11 Meg broadband backbone, which enables virtual and highly collaborative interaction between the schools despite the fact that they are separated by 15km. The curriculum interface is achieved by using interactive whiteboards supplied by SMART. Anything that is displayed or written on the educator's SMART Board is transmitted in real time to the remote classroom.

Using web cams, stills and video clips of experiments are captured and stored in web pages as educational resources to be accessed online by students. Demonstrations over the network to students in remote classrooms have been shown to be possible. To improve the chances of success, it is critical that high-level training be provided in a variety of different sectors.

Discussions to extend the project to other Tshwane Metropolitan area schools are under way:

- Connecting up to 420 schools via fibre optic cables with terabyte broadband capacity at zero running costs. Schools may be charged for full Internet access.
- Five students and five teachers connected to the network from home
- Two universities connected to the network to allow in-service teachers to acquire hands-on training in modern ICT delivery mechanisms
- Access to a university offering part-time degrees so that schools may provide access to undergraduate students who can study on-line
- A variety of government department tapping into the real-time data generated
- Schools accessing an advanced web-based school administration system generating valuable real-time data for local, provincial and national education departments
- Learners participating in a customized Connected Learning Community, with access to powerful educational resources, collaborating on joint projects with other schools
- Learners being provided with modern tools to participate in a knowledge economy

3.4 Comparative National ICT Statistics

The South African Government is providing funding and other stimuli to universities and other research programmes from which most breakthrough innovations arise. Research and development is central to this goal. Public and private sector R&D expenditure has grown from 0,76% of GDP in 2001/02 to 0,81% in 2003/04, according to figures released during 2005¹⁶. While a positive development, this level of R&D investment is still only about a third of the average in OECD countries. The South African Cabinet has set a target of 1% investment by public & private sectors by 2008¹⁷.

The South African telecommunications market is currently the largest in Africa based on customers and revenues totalling \$13 billion in 2003¹⁸. While this may suggest large growth opportunity, the country faces numerous challenges to overcome substantial inequality among its population in terms of geographic, economic and demographic distribution.

In 2002, fixed-line penetration based on population was 10.8%, or 25,1 per 100 households, compared with the average of 49,8 per 100 households for lower-middle-income households internationally. Research by the South Africa Foundation shows that Telkom's fees are up to 400% higher than the cost of similar services in 13 comparable countries. Over 850,000 telephone lines have been disconnected over the last few years. This low penetration has serious consequences not only in terms of voice communication but also for Internet access.

Mobile penetration has risen above the critical 40% threshold and more than 19 million people own a mobile phone. Pre-paid technology developed by South Africa has helped the rapid growth of this market. Despite this, however, both mobile contract and pre-paid costs are high by international standards and impact greatest on the poor.

Although the telecommunications landscape is dominated by the Telco monopoly, the Government is now introducing competition through the Second Network Operator (SNO). A third cellular operator was licensed in 2002. Despite this, broadband access is limited and according to the ITU 2003 Comparative Study, South Africa performs poorly in this vital indicator of preparedness for e-commerce. The market for Asymmetric Digital Subscriber Line (ADSL) and Integrated Services Digital Network (ISDN) fixed lines is growing slowly. New technologies such as iBurst and 3G create new opportunities for broadband connectivity. Satellite connectivity is becoming more commercially available and Very Small Aperture Terminals (VSATs) are used in deep rural areas where fixed lines cannot reach.

¹⁶ <http://www.worldbank.org>

¹⁷ http://www.dst.gov.za/publications/annual_reports/annualreport-05.pdf

¹⁸ Gillwald, A, Esselar S, "South African 2004 ICT Sector Performance Review", December 2004

The African e-Readiness Assessment report¹⁹ published in 2006, places South Africa at number 34 in terms of ICT readiness to participate on a global scale in a networked environment.

3.4.1 Country Background Information

South Africa	2002	2004
Population (millions) (1)	43.6	45.6
Adult literacy rate (% ages 15 and over) (1)	86.0	Not available
Gross National Income (GNI) per capita (1)	2600	3630
Gross Domestic Product (GDP) growth % (1)	2.5	3.7
Scientists and engineers in R&D (2)	26 913	30 703
Expenditure on R&D (% of GDP) (1)	0,76%	0,81%

3.4.2 ICT Infrastructure & Access

South Africa	2002	2004
Telephone mainlines (3)		
Per 1,000 people (2003) (2004 4.821m lines) (3)	107	105
In largest city (per 1,000 people) (3)	Not available	Not available
Mobile phone (per 1,000 people) (2003) (2004, 4)	364	431
Radios (per 1,000 people) (1997-2003) (3)	336	Not available
Television sets (per 1,000 people) (2003) (3)	177	Not available

3.4.3 Computers & Internet

South Africa	2002	2004
Personal Computers (3)		
Per 1,000 people (2003) (2004, 4)	72.6	82.7
Installed in education (thousands) (schools estimate White Paper)	7.4	Not available
Internet		
Users per 1000 people (2003) (2004, 4)	68	78.9
Service provider charge (\$) (5)	Not available	16
Total monthly price 20 hours of use €(3)	Not available	86

3.4.4 ICT Expenditure

South Africa	2003	2004
Total ICT (\$, millions) (3)	13232	Not available
ICT as % of GDP (2003) (3)	8	Not available
ICT per capita (\$) (3)	281	Not available

Sources:

- (1) <http://www.worldbank.org/>
- (2) http://www.hsrc.ac.za/RnDSurvey/downloads/2003/2003_04
- (3) <http://devdata.worldbank.org>
- (4) www.itu.int/ITU-D/ict/publications/wtdr_03/index.htm
- (5) Gillwald – A, Esselar S, South African 2004 ICT Sector Performance Review, December 2004

¹⁹ African e-Readiness Assessment for NEPAD, April 2006

3.5 Challenges and Recommendations

3.5.1 Challenges

3.5.1.1 Coherent Policy and Strategy

Until there is a deliberate, coherent and clearly understood and supported national ICT policy and strategy in Government as a whole, it is unreasonable to expect attainment of durable results. Once the national ICT policy has been adopted this then needs to cascade down to each sector for health, education and government.

3.5.1.2 Co-ordinated Delivery

Current ICT government initiatives remain fragmented, resulting in confusion and at times, conflict about accountability and responsibility that result from actual or perceived overlap of roles between government departments. This lack of collaboration has contributed to the failure to establish an intergovernmental institutional framework for the implementation of e-Government. One of the key challenges is to provide adequate support to DPSA, the line department responsible for driving the e-Government agenda

3.5.1.3 Financial Resource Allocation

No dedicated budget allocation for the specific implementation of e-Government in South Africa. However, while a number of initiatives are still run under separate budgets, recent coordination efforts have helped mitigate this problem to some degree.

3.5.1.4 Human Capital Development

The current state of ICT in government is characterised by a lack of trained ICT staff and poor retention strategies for ICT personnel. Inadequate teacher preparation is a major constraint on integrating ICTs into the school curriculum. Limited ICT awareness and literacy is a constraint to the effective management of ICT rollout. In most schools, computers are entirely under-utilised, often limited to typing letters for example. The ability to manage and cope with changing demands is also a huge challenge among teachers.

3.5.1.5 Infrastructure and Funding

Infrastructure backlogs that include physical buildings, facilities and other resources in schools, and a lack of funding to address these backlogs, have a significant impact on rolling out ICT based learning in schools. There is a low uptake of new, emerging technologies, especially in the case of tele-medicine applications, due their relatively high cost.

3.5.1.6 Community Ownership

Community involvement and encouraging communities to take ownership of neighbourhood school based ICT initiatives are major challenges. Responsibilities in an Information Society require communities to take pride in their assets and use them to the maximum effect.

3.5.1.7 Technical and Pedagogical Support

Only limited technical and pedagogical support is currently available, requiring a significant increase in scale to make a significant impact on quality of ICT based delivery.

3.5.1.8 Standards and Protocols

The challenge is to develop standards and protocols that will ensure interoperability of government systems to facilitate data sharing between government agencies.

3.5.1.9 Monitoring and Evaluation

South Africa lacks a comprehensive, easily accessible evidence base to support strategic policy decision-making and programme design to leverage ICTs for Information Society development. This hampers ICT related international development reporting obligations such as reporting requirements on the Millennium Development Goals and progress made towards implementation of the World Summit on Information Society (WSIS) Plan of Action.

3.5.2 Recommendations

3.5.2.1 Policy and legal frameworks

- Develop and implement an Integrated National ICT Policy Framework
- Expand the government vision to include anti-corruption
- Adopt measures to address the use of digital and electronic signatures
- Develop laws governing Internet crimes to eradicate IT viruses, DoS attacks etc

3.5.2.2 Finances

- Develop appropriate funding models for implementation and budget allocation
- Ensure sustainable operations particularly in rural access projects
- Develop Private Public Partnerships in implementing ICT initiatives

3.5.2.3 HR Development

- Develop a multi stakeholder approach to training
- Scarce ICT skills need to be attracted and retained

3.5.2.4 Technology

- Adopt and implement ICT standards, operability and protocols
- Develop a Government-wide 2014 access strategy for service delivery
- Use the full range of technology available at any given time

3.5.2.5 Monitoring and Evaluation

- Implement a results-based monitoring and evaluation system.

3.6 Research Organisations active in target areas

The key stakeholder responsible for ICT Strategy at a policy level in South Africa is the Presidential National Commission, Ministry of Public Service Administration and Ministry of Communications, and for research development is the Ministry of Science and Technology.

South Africa has an advanced and well-developed research community. There are a number of universities, private sector organisations and research centres active in the areas of eGovernment, eHealth, eLearning & ICT Skills Development in South Africa:

- Council for Science and Industrial Research (CSIR) – most areas of industrial research
- African Advanced Institute for ICT (Meraka Institute of CSIR) – research in ICT
- Cape Peninsula University of Technology
- Centre for Public Service & Innovation – research in eGovernment
- Council for Geoscience (CGS) – research in earth sciences
- Agricultural Research Centre – research in agriculture
- Digital Partnership SA
- French South African Technical Institute in Electronics (F'SATIE)
- Human Science Research Council (HSRC) – research in human science
- LINK Centre – research in ICT policy
- Medical Research Council of South Africa – research in eHealth
- Mintek – research in mining
- Naledi3d Factory
- NamITech
- North-West University
- OSISA
- Provincial Government of the Western Cape
- SAIDE/Mindset – research in Technology Enhanced Learning & ICT Skills
- SITA – R&D Division focuses on research in ICT
- South African National Energy Research Institute (SANERI) – research in energy
- The Innovation Hub
- The University of the Western Cape
- Tshwane University of Technology
- University of Cape Town
- University of Johannesburg
- University of Pretoria

- University of South Africa
- University of Stellenbosch
- UWC / HISP-21
- Walter Sisulu University
- Wits University, South Africa

4. Tanzania

The United Republic of Tanzania is bordered by Burundi, Democratic Republic of the Congo, Kenya, Malawi, Mozambique, Rwanda, Uganda and Zambia. 53.6% of the population of 37,445,392 is aged between 15 and 64 (median 17.7 years). Literacy is 78.2%. Swahili, English (business, government and higher education) and Arabic (spoken in Zanzibar) are national languages. Agriculture accounts for 48.1% of GDP and 80% employment. The EU accounts for 7% of imports and 15% of exports. Tanzania is a very poor country with per capita GDP of \$700.

4.1 National ICT Strategy

Tanzania has made considerable progress in the planning and deployment of ICTs and in March 2003, a national ICT policy was adopted. The policy focuses on addressing ten (10) priority areas namely: strategic ICT leadership, ICT infrastructure; ICT Industry and Human Capital. Other key areas include institutional arrangements, legal and regulatory framework, productive sectors, service sectors, public services, local content and universal access.

In the process of preparing this policy, key stakeholders at all levels were involved, the main purpose being, to make them own and manage the implementation of the subsequent program activities. The Ministry responsible for e-Government is the President's Office-Public Service Management while eHealth is under the auspice of the Ministry of Health. The Ministry of Science, Higher Education is responsible for e-Learning and ICT skills.

As part of the ICT Strategy, the government is reviewing existing laws and regulations to ensure the healthy growth of the ICT industry and enactment of new legislation necessary to address issues associated with the Internet Governance of telecommunication, broadcasting and information systems. To realize the goals the government revisits all legal instruments to speed up the process of ICT diffusion, creates a mechanism for continuous update of domestic consumer protection laws to respond to the new requirements of the information society, removes all hindrances through establishment of a supportive, transparent, pro-competitive and predictable policy by establishing legal and regulatory framework. Above all it forms procedures to set up protection laws (government, public providers/producer and customer) and formulates laws and regulation to safeguard ICT Industry.

The current funding strategy relies on public and private sectors to explore various means of funding, including loan finance, equity finance, incubation finance facilities, hire purchase and grant finance for ICT development. Strategically the government develops different mechanism of funding including universal access fund, allow sufficient funding from GDP allocation and creates awareness of financial opportunities- existing in ICT activities.

The Government of Tanzania has worked out its implementation strategies and actions for the National Information and Communication Technologies (ICT) Policy as summarized below:

1) Strategic ICT Leadership

In relation to strategic ICT Leadership, the Government will address the following:

1. Since ICT is a powerful development facilitator, the government will embrace ICT as a tool and an integral part of its development strategy and empower all citizens to use it to fight poverty, ignorance and disease so as to improve the quality of their lives.
2. The Government shall create the necessary enabling environment to facilitate the deployment, utilization and exploitation of ICT in all sectors of life
3. The Government will annually allocate funds equivalent to a reasonable proportion of GDP for ICT deployment, diffusion and universal access in partnership with the private sector and civil society.
4. The government shall promote the creation of bilateral relations and cooperation with regional and international organizations that generate, process, and store and disseminate ICT driven information in order to expand and strengthen local ICT capacity.
5. The Government will promote the development and/or acquisition of flexible standards information processing methods and facilities and oversee their utilization by all users of ICT in the national network in order to effect or ensure compatibility.
6. The Government will encourage public, private and community sector partnerships jointly invest in ICT development and application in all sectors and daily human activity

2) ICT Infrastructure

In relation to ongoing development of the ICT Infrastructure, the Government will:

1. Ensure that reliable state-of-the-art ICT Infrastructure with adequate capacity, high speed and countrywide coverage is developed;
2. Support, through incentive and directives, bonafide institutions actively involved in the development and application of ICT;
3. Set up national IXPs (Internet Exchange Points) and hierarchical IXPs, in collaboration with countries as well as regional information and communications infrastructure;
4. Encourage appropriate lending mechanisms that foster a dynamic climate for entrepreneurs to venture into ICT and related sectors;
5. Encourage public and private sectors to explore various means of funding;
6. Seek to ensure that all installed ICT infrastructure is utilized effectively, and is synchronized to contribute to resilience and redundancy on a national basis in the implementation of strategic goals.

3) ICT Industry

In relation to supporting the development of the ICT Industry, the Government will:

1. Promote, encourage and support RTD activities in the areas of ICT and strengthen the national capability to develop research programs and projects in the ICT field;
2. Nurture the emerging culture of innovation and entrepreneurship as an enabling environment for the growth and success of the ICT industry;
3. Foster the growth and sophistication of the ICT industry to support the extensive and innovative application of ICT and export of competitive ICT products and services; and
4. Encourage and support local institutions, in partnership with foreign owned multinational companies to establish production facilities, conduct research, and design as well as manufacture specialized ICT equipment locally.

4) Human Capital

In relation to the development of Human Capital, the Government will:

1. Promote and support the development of qualified personnel for efficient policy-making, regulation and management of information resources and services including the education, training and retraining of ICT managers, professionals and other operatives;
2. Require the teaching of ICT at all levels of the national system of public and private education and training to increase the size & quality of ICT-skilled human resource base;
3. Encourage and support formal and informal sectors to adhere to acceptable standards of examination and certification of ICT training programmes;
4. The Government in collaboration with the private sector will develop and put in place appropriately designed schemes of service for different cadres of ICT personnel in order to secure their retention and encourage innovative behaviour; and
5. ICT deployment is to be especially inclusive and to proactively take into account gender and disadvantaged groups

5) Legal and Regulatory Frameworks

In relation to the development of the Legal & Regulatory Frameworks, the Government will:

1. Review existing laws and regulations to repeal or adjust those not conducive to healthy growth of the ICT industry and enact new ones that take account of issues associated with Internet Governance of telecommunication, broadcasting and information system;
2. Have a compelling interest in shielding contents inappropriate for minors or those that promote behaviour that might endanger minors and society;
3. Promote business in electronic form in a secure environment and put in place a legal framework to provide the guiding principles, rules and legislation; and

4. Regularly carry out a review of policies and/or legislation in order to foster introduction of new services and technological innovation that will add value to the providers and end-customer of ICT enabled services.

6) Productive Sector

In relation to the evolution of the productive sector, the Government will:

1. Encourage all productive sectors to incorporate ICT in their development plans;
2. Encourage, promote and support the implementation of Nation-wide ICT systems for rural development activities, agricultural, horticultural and livestock extension for farmers, career guidance for youth, technology guidance for rural enterprises, micro-level planning etc. Communities and user groups or beneficiaries shall be actively encouraged to participate in all such activities; and
3. Take steps to move Tanzania's economy into line with the new global economy while minimizing the adverse effects of globalisation on the local economy and tax revenues.

7) Service Sectors

In relation to the evolution of the service sectors, the Government will:

1. Promote the use of ICT to enhance efficiency, effectiveness and sustainability in the provision of services and basic utilities by supporting the development and deployment of nationwide e-Health, e-Tourism, e-Education and e-Commerce transactions;
2. Promote, stimulate and encourage the use of ICT to improve the provision of safe, comfortable and seamless national and international transport infrastructure and services;
3. Use both formal and non-formal channels to disseminate information about the application and advantages to communities of the use of ICT; and
4. Work with the private sector, organizations of civil society and other partners to promote stimulate and encourage the use of ICT, in combination with traditional methods, to preserve and add value to national artistic and cultural patrimony.

8) Public Services

In relation to the evolution of the public services, the Government will:

1. Be a model user of ICT by deploying ICT systems within public administration to improve efficiency, enhance planning, raise service quality and access global resources;
2. Support the application of ICT to promote good governance, transparency and accountability, awareness of the implications of long-term ICT investment and TCO;
3. Deploy ICT to strengthen law enforcement, security & national defence capability;
4. Deploy ICT to monitor and respond to environmental disasters; and

5. Review processes & structures to make them amenable to ICT application & deployment.

9) Local Content

In relation to the evolution of the local content, the Government will:

1. Promote the use of the ICT for preserving and dissemination of indigenous knowledge and traditional cultures;
2. Allow appropriate access to its archives and other information sources as a basis for developing local content;
3. Encourage the wider use of Kiswahili in developing local content in order to promote local culture, attract local end users as well as the Tanzanian Diaspora; and
4. Seek to discourage inappropriate use of ICT that is detrimental to our cultural values, ethics, mores, and morality such as viewing pornography.

10) Universal Access

In relation to ensuring universal access for all, the Government will:

1. Strive to reduce the ICT access gap between the rural and the urban areas by activating the Rural Telecommunication Development Fund, offering special incentives to investors in rural ICT provisions, supporting the construction of rural telecentres and involving local government authorities in ICT utilization and promotion;
2. Continue to look into ways of reducing taxes on ICT related goods and services to make them affordable and accessible to more citizens;
3. Encourage financial institutions to support investors in rural ICT services;
4. Encourage and facilitate the optimal use of existing ICT Capacity and infrastructure to extend affordable access nationally, especially in rural and disadvantaged communities;
5. Encourage allocation of extra capacity in telecommunication infrastructure to be used efficiently and economically for the National development of ICT.

4.1.1 eGovernment Objectives

Since the mid-1990's, the public service of Tanzania has initiated a series of measures for transforming itself into becoming a more efficient, effective and customer-oriented service. At the same time measures are being implemented by the government to recognize and promote the use of ICT. The Government, like its counterparts elsewhere, collects and holds vast amounts of locally relevant information that may be converted into electronic media for better preservation and cheaper accessibility by the public. Such information includes legislation, regulations, procedures, forms, maps, research papers and numerous statistics. The Government's own policy-making, monitoring and decision-support processes can be

greatly enhanced as access to authoritative, timely and accurate data becomes more widespread, and is coupled to enhance knowledge-sharing within the public service.

As the country's leading employer the public service activities adopting eGovernment will necessarily influence many aspects of the nation's life. It will affect standards set in the labour market and the curricular of education and training institutions. The Cabinet decision made in April 2004 to fast-track eGovernment in the country was intended to tie up scattered efforts made in various sectors such as finance, health, education, local government and, to some extent, agriculture. In order to help achieve its challenges in meeting people's needs and expectations, the Government has set itself the following eGovernment objectives:

- Help increase the productivity of both the public and private sectors by attaining the status of the Government as a model user of ICTs;
- Empower the public through an eGovernment platform that facilitates relationships and interactions with the Government and enhances the delivery of more effective services at both central and local levels, while also generating accurate and timely information to better shape policies, strategic plans and tactical decisions for developing and enhancing the delivery of affordable public services;
- Promote good corporate and public governance by furthering information sharing, transparency and accountability;
- Enable public services to contribute in achieving poverty reduction targets in accordance with priorities defined in Tanzania's Poverty Reduction Strategy Paper;
- Enhance public participation

In addition to the above broad eGovernment objectives it was found necessary to formulate very specific objectives in response to specific challenges. These included the following:

- Increasing productivity (efficiency, effectiveness and continuity) of the public service;
- Creating an e-governance environment responsive to the needs of the citizens;
- Improving accessibility and affordability of the public service to all citizens;
- Building efficient communications and knowledge sharing with the public service;
- Setting up harmonized information banks with uniform, consistent up to date and secure data and management systems;
- Increasing ICT awareness, knowledge and skills of public servants;
- Introducing operational processes and institutional structures amenable to ICT application and deployment;
- Capturing, preserving and disseminating of relevant government records and archives, and their potential use in multi-media content; and

- Establishing safeguards on data systems to protect the privacy of individuals whose personal data are held and confidentiality of information about entities and activities.

4.1.2 eHealth Objectives

In the Government's drive to adopt ICTs in its operations, the Ministry of Health and Social Welfare has been appointed to be in the first-phase list of Ministries and Executive Agencies earmarked for early adoption of e-governance. Consequently the Public Service Management Division of the President's Office has seconded one of its ICT experts to the Ministry of Health and Social Welfare to champion ICT adoption. He is charged with the responsibility to assess the e-readiness study existing manual information systems and recommended appropriate ICT adoption strategies in this Ministry.

The Ministry of Health and Social Welfare has expressed its readiness to adopt Information and Communication Technologies (ICT) in the provision of health services. Speaking recently at a national roundtable workshop on the application of ICTs in the country's health sector (02 March 2006), the Permanent Secretary confirmed that: "The Government supports ICT application in the health sector", and disclosed plans to study how ICTs could facilitate the delivery and management of health services from the national level down to the grassroots level. The following objectives were identified in the quest for introducing ICT in the health sector:

- Look for ways of moving forward emphasizing how ICTs would facilitate plans and actions for delivering of a affordable health services;
- Conduct public awareness campaigns on ICTs in health;
- Seek collaboration with industry and academia in order to join forces in addressing ways of adopting ICTs in the delivery health services for the people;
- Seek to adopt e-health while paying adequate attention to security issues surrounding information technologies in the delivery of health-care; and
- Seek to tame the prevalence of HIV/AIDS and other infections and communicable diseases by the deployment of ICTs
- Promote the use of ICTs to enhance efficiency, effectiveness and sustainability in the provision of services by deploying e-health services.

4.1.3 eLearning & ICT Skills Objectives

Tanzania has recognized, like the rest of the world, that ICTs can play an important role in the quest for improved education. The Tanzania National Vision 2025 explicitly refers to ICTs as "the new opportunities that (are being) opened up which can be harnessed to meet the goals of the Vision" (p21). Among the targets for the Millennium Development Goals for 2015 as presented by Tanzania to the World Summit on Information Society (WSIS) held in

Geneva in 2003 included a commitment to deploy ICTs in the educational sector. Similar statements and objectives can be found in the long-term plans for the educational sector.

At the operational level, introduction of ICT into secondary schools in Tanzania started in the 1990s, particularly in the urban private schools with the help of sponsors. Parents who became aware of the benefits of computer literacy encouraged training for their children.

At the national level, the responsibility to introduce ICTs in schools and colleges for learning purposes was given to the Ministry of Education and Vocational Training, and the Ministry of Higher Education, Science and Technology (MSTHE). Owing to its own responsibilities, the newly established Tanzania Educational Authority (TEA) has embraced ICTs in schools to the level of making it a priority in its operations. Thus TEA, together with other institutions responsible for the educational sector, has identified the following objectives:

1. To establish an educational network (Edunet) for all higher learning institutions in the country. This will act as the national ICT infrastructure responsible to increase access and reduce cost among the institutions;
2. To develop contextually defined eLearning and ICT curriculum materials, and avoid negative impacts of foreign developed e-learning materials to Tanzanian schools;
3. To establish eLearning centres throughout the country in phases. The idea is to connect all educational institutions for data sharing through Internet services;
4. To train eLearning and ICT trainers including tutors and administrators in teacher training colleges from different zones. These individuals will be responsible for training the other institutional staff and students in their respective colleges;
5. To integrate ICT in the normal classroom teaching and learning processes for all teacher training colleges;
6. Ensure constructive and effective utilization of the national infrastructure (Edunet) among the institutions, both public and private;
7. To provide broadband ICT infrastructure to 2000 secondary schools by 2010;
8. To provide technical resources for the implementation of ICT in schools;
9. To develop curriculum for integrating ICT in secondary schools. The curriculum will be revised to incorporate ICTs for the support of teaching and learning, allowing for flexibility of defined minimum to maximum e-readiness status of schools; and
10. To develop appropriate e-content to support teaching and learning in secondary schools. Emphasis will be placed on developing e-content for ICTs, sciences, mathematics, English and Kiswahili in accordance with the revised curriculum.
11. To sensitise all key stakeholders of secondary education on the use and benefits of eLearning as tool in the educational sector.

4.2 Existing eAdoption Initiatives

Tanzania's initiatives in applying information and communication technologies to development takes its inspiration from its national vision, Tanzania Development Vision 2025. The Vision recognizes that advanced micro-electronic information and communication technologies are quite central to competitive social and economic transformation in society. It also recognizes that ICT costs are continuing to fall while their capabilities and resultant profitability are increasing. Clearly ICTs make a major driving force for the realization of the national vision. Thus plans are being put into action in all sectors of the economy to tap this technological resource.

It is in this overall spirit of harnessing ICTs that the Tanzania has embarked upon a major legislative agenda seeking to update various laws relevant to ICT in order to be better positioned to utilize these technologies. This included updating laws and policies in telecommunications, broadcasting services, science and technology. The telecommunication sector and its associated institutional framework was partially and gradually liberalized leading to the creation of regulatory agency, the Tanzania Communication Regulatory Authority by the year 2004. All these developments were captured and articulated in the Tanzania National Information and Communication Technologies Policy adopted in 2003. The broad objectives of the policy include providing a national framework that will enable ICTs to contribute towards achieving national development goals. The second broad objective is to transform Tanzania into a knowledge-based society through the application of ICTs. The policy articulates ten focus areas as drawn from the aspirations of Tanzania Development Vision 2025. These focus areas cover the following: strategic ICT leadership, ICT infrastructure, ICT industry, human capital, legal and regulatory framework, productive sectors, service sectors, public service, local content and universal access.

Aside from various private sector initiatives attempted in the deployment of ICTs such as installation of patient information systems in some hospitals, the teaching of ICT in some private schools, the Government remains the major player when it comes to ICT deployment. Thus the Government of Tanzania has already installed ICT facilities in most central and local government offices. It has announced plans in 2004 to go for e-Government. Tanzania has initiated and continues to implement various programmes as part of the process of building an information society. These programmes are in the following areas: local content development e-health, e-agriculture, e-post, e-business, e-commerce, e-government and e-education. The e-education programmes linking secondary schools, universities and teacher training colleges is in advanced stage of planning. It should have been operational by 2006 but has been delayed in order to broaden consultations among stakeholders.

Within the government itself which had pioneered utilization of ICTs in financial management particularly payroll administration, Tanzania has reached the level of having an Integrated Financial Management and Accounting System and a Centralized Human Resource/Payroll Management System that links all Ministries and local governments and the Ministry of Finance.

Tanzania is also spearheading the localization of key open source applications and operating systems into the national language, Kiswahili. This has resulted in what are referred to as the Jambo Open Office and Linux for word processing and web-surfing, respectively. These efforts should lead to inclusive access and enhancement of the cultural and linguistic diversity of information. The University of Dar es Salaam and COSTECH have collaborated in one project to not only translate but also localize web browsers in order to make the World Wide Web friendly to the local user. The project has translated and coined into the national language many ICT terminologies which are not yet familiar to the local user.

Arrangements were being finalized to shift management of Tanzania's country code top-level domain (ccTLD) to a neutral entity under the umbrella of the Tanzania Communication Regulatory Authority (TCRA). Currently ccTLD management is under the University Computing Centre (UCC) of the University of Dar es Salaam (who register academic and governmental domain names) and a private individual (who registers organizational and commercial domain names). The management shift was to have occurred in early 2006 but it has been delayed to give room for the creation of the new entity under public-private partnership.

At the sub-regional level Tanzania has signed on the East African Submarine Cable System (EASSy) - a network which will improve connectivity in countries of Eastern, Central and Southern Africa. EASSy is a submarine cable project that aims at establishing a fibre optic telecommunication facilities network linking the eastern side of Africa to the rest of the world to international gateways. Tanzania will have several landing points linking the country to the rest of the world. At the national level an association of private ICT players have established the Tanzania Internet Exchange Point (IXP) and plans are afoot to install four more IXPs. The exchange point is expected to lower costs and increase speed of local-to-local Internet traffic in Tanzania.

Tanzania also embarked on the establishment of a national ICT optic fibre backbone network. Support for this project is expected from bilateral donors. The starting point is the rationalization and full utilization of excess transmission capacities of our transport, electricity and natural gas companies and water supply projects. The project is a feasibility study stage. COSTECH for its part has launched a project to utilize the access fibre optic capacity available in one area to the west of Dar es Salaam where there is a telecentre project with full Internet connectivity. The COSTECH project called ICT for Rural Development

has received technical and financial support from the Swedish International Development Agency (SIDA).

The responsibility to initiate and implement projects on eAdoption has been left mainly to the Ministry of Infrastructure Development., the University Computing Centre, COSTECH, Ministry of Education and Vocational Training and the Ministry of Health and Social Welfare. The Ministry of Infrastructure Development and COSTECH, between them, have championed several telecentre projects.

It should be noted that COSSTECH had taken upon itself the responsibility of promoting eAdoption and application of ICT for development as a priority are in its role of applying science and technology for development since the early 1990s.

Thus COSTECH has pioneered provision of Internet services including broadband access to public institutions and individuals involved in research. It has established portals and content management systems to facilitate Web based information sharing and promote eLearning. COSTECH has been organizing seminars to showcase ICT projects and workshops to discuss key issues related to the exploitation of ICT and provides ICT training to women scientists and other focus groups.

During 2005-2006 COSTECH has continued to promote broadband access at the local rural level. Having established several telecentres in partnerships with donor agencies in rural areas in the first phase of Internet connectivity and ICT adoption in general, the emphasis is now shifting to making the telecentres sustainable so that they can owned and operated by the local communities. Thus studies are being carried out to determine the best business models for the telecentres. In some areas the local communities are being encouraged to establish cooperatives to manage the telecentres. The best known telecentre, the Sengerema Multipurpose Community Telecentre, which cost more than US\$ 1million to build and operate in a period of four years is now fully handed over to a local community group. This telecentre is situated on the south-western shores of Lake Victoria in North West Tanzania.

An important addition to the telecentres has been the FM community radio stations, which have been used to good effect in promoting developmental information to the rural communities. The Sengerema Telecentre radio has been used health information such as the information to control schistosomiasis, a common affliction in the lake region of the country. In another telecentre, Kilosa, close to the centre of the country, the radio in being used in the control of HIV/AIDS.

The latest of COSTECH'S telecentre project was launched late in 2005 in one of the island small town of Wete in Pemba. The town is in Zanzibar Island and is a constituent part of the United Republic of Tanzania. This town has no Internet connectivity. Thanks to the support received from the International Telecommunication Union, the Zanzibar government and

local authority in Wete two telecentres were established in a local secondary school (Utaani) and teacher training College (Ben William Mkapa) in Wete Pemba. The telecentres provide a wide range of ICT services (ICT training, consultancy, Internet surfing, email services) during school hours for students. Thereafter the telecentres are open to the community.

4.3 National Activities during 2005

The Tanzania National ICT Policy adopted in 2003 provided the basis for strategizing on ICT applications in government and rationalizing existing ICT projects. Thus 2005 saw efforts being made to consolidate platform application such as Integrated Human Resources and Payroll as well as Financial Management System. Central to this were efforts to develop the backbone infrastructure to support eAdoption programmes as projects. This would lead to the coming into existence of the Independent Telecommunication Network. At the project level major efforts were undertaken to revamp existing ones such as the Tanzania National Website, the Parliamentary Website. In the health sector, the health management information system (MTUHA) established since the early 1990's was consolidated in this year.

The educational sector was still at the strategizing stage, finding ways of adopting ICTs schools, colleges and universities. Indeed in late 2005 the Government had decided that ICTs would be an elective subject in primary schools. One significant event in the year was the future search workshop held by the Ministry of Education and Culture and other stakeholders which led to several task forces to look into various aspects of ICT for learning, teaching and management. At a higher level the ministry responsible for higher education delegated its duties to the Tanzania Education Authority who are spearheading the establishment of the educational network, Edunet.

The prospects for ICT in Tanzania during 2006/2007 look good. The new Government which came into office late in 2005 has already signed a memorandum of understanding (MOU) with Microsoft. The MoU provides for a framework which will allow Microsoft to support efforts of the national government in ICT promotion among public and educational organizations as well as the business community.

One area of cooperation that has already developed concrete plans is tourism. Thus the Government and Microsoft have already announced plans under which the two parties will collaborate in the use of ICT in tourism. The projects, which will take off soon, aims at developing a National Tourism Portal (NTP), an electronic Destination Marketing System (DMS), Central Reservation System and capacity building. It is these four activities that will enable Tanzania to compete more effectively in the global market

4.3.1 eGovernment Initiatives during 2005

In adopting ICTs as outlined in the National Information and Communications Technologies Policy, various arms of government have made significant progress in deploying eGovernment related solutions. These solutions can be categorized into both eGovernment and eGovernance. In the category of e-government, several departments are transforming their operations by deploying ICTs. However, a significant challenge persists in coordinating the major initiatives taken by the Government. The goal of providing eGovernance services

depends on the progress made in creating an effective eGovernment infrastructure through which the public service can communicate internally and with the intended beneficiaries of its services including the corporate world, civil society and the general public.

According to David Sawe, the Director of Public Service Management of the President's Office, the ICT for Development concept is not about distributing personal computers to the poor, ignorant and disenfranchised. Rather, it is about a systematic campaign for government departments to adopt ICT. In institutional terms, there are plans to establish an eGovernment Executive Agency, which will spearhead adoption of ICT in the public service. This is in line with recent developments in which executive agencies have been established in various sectors of the economy to provide services in their respective services, often at a fee. Before the eGovernment Executive Agency is established, the Public Service Management Department is deploying IT experts in various ministries and departments to assess e-readiness and advise what to be done to deploy ICT in those departments. So far fifteen IT experts have been deployed in the following departments: Ministry of Health, Foreign Affairs and International Cooperation; Ministry of Education and Vocational Training, Prime Minister's Office, Registration of Insolvent and Trustee Agency (RITA), Public Service Commission, Ministry of Science and Technology and Ministry of Home Affairs.

Efforts were made during 2005 to consolidate the establishment of a national WAN to carry voice, data and video communication known as the Independent Telecommunication Network (ITN). This network was initiated by the Ministry of Defence in 1998. This year's main activity was the continuation of negotiations with donors in order to upgrade and extent the network with VSATs/fibre/WiMax. Other efforts aimed network upgrading included:

- Platform applications inaugurated in 2000 for integrated Human Resource and Payroll System and for intergraded Financial Management System, both covering entire public service (300,000) and being up graded to be web-based;
- An additional platform application is in the feasibility study system, aimed at enabling the tying together of different systems, standardise interactions and facilitate access to information at all levels; and
- Ministries, Agencies and Local Authorities being assisted to build internal strategies/resources ahead of the rollouts of the ITN

The second major activity during 2005 included the establishment of focal points to reinforce existing, fragmented and isolated e-government initiatives. This included the following:

- Continuation of negotiation with donor organisations to upgrade and extend an Independent Telecoms Network, with VSATs/FIBRE/WIMAX;
- Installing microwave plants to coordinate several departments within a holistic strategic government plan. When adopting e-Government, Sawe, (2006) argues there

is a shift from the paternalistic model which favours long service and seniority to toleration of poor performance and rigid career path; to the employee-centric model which is characterized by self-directed learning opportunities to keep skills market ready, fast track career paths and providing a challenging career. This reflects the government's determination in establishing an effective e-Government infrastructure.

- Strengthening the existing Public Service Management Department by splitting policy-oversight issues from operational matters of eGovernment development. This arrangement will hold until an Executive Agency for eGovernment is established.

The third major activity during the year was the revamping of the Tanzania National Website ([www.tanzania/go.tz](http://www.tanzania.go.tz)) and doubling of its Internet bandwidth from 128 to 256 kbps to improve access. By developing the Tanzania National Website (TNW), the government created a mechanism by which information from authoritative sources in Tanzania is easily accessible. The TNW is an umbrella website for all websites on Tanzania, allowing TNW users to access a comprehensive overview of information available on other websites. After some initial problems, the parliamentary website (www.parliament.go.tz) was enhanced with a powerful database, which has greatly increased easy access to Tanzania's legislature.

4.3.2 eHealth Initiatives during 2005

The health sector has been one of the early adopters of ICTs in the public sector. In the early 1990's, with generous technical and financial support from donors, the Ministry of Health and Social Welfare developed Tanzania's Health Management Information System, more popularly known in Kiswahili as MTUHA. The information system covers all health programmes and health care systems in the public and private sector.

During 2005, consolidation of the reporting system of MTUHA was completed. MTUHA brought together several vertical information systems operating under various programmes for the control of such diseases as TB, malaria and AIDS.

The Ministry of Health and Social Welfare undertook two notable initiatives during 2005:

1. Wide Area Network Connectivity Project

This was the first WAN connectivity project, focused on linking all regional medical officers to the Ministry Headquarters in Dar es Salaam by the end of 2007. The project will cover only 21 regions, excluding Zanzibar and Pemba in three phases.

Phase one started in 2005, focusing on establishing a LAN between the Ministry of Health Headquarters, National Aids Control Project (NACP) and Prevention of Mother to Child Transmission (PMTCT). When completed this phase is expected to lay down Internet services for seven regions. The project is expected to end by September 2006. Phase three is expected to take place in 2007, covering the remaining fourteen regions.

2. The Malaria Wide Area Network Project

This project is expected to cover 60 districts in the country. It started in 2005 and expected to finish in 2006.

4.3.3 eLearning & ICT Skills Initiatives during 2005

According to Dr. F. Tilya of the University of Dar es Salaam, notwithstanding the late adoption of ICTs in Tanzania, “computers are showing up in many aspects of life: they are at check-out counters in groceries, petrol stations and other places; they dispense money at the automated letter machine (ATM); they turn the air-conditioners on and off. If ICTs are permeating many aspects of life their use in the educational sector is inevitable”.

In January 2005, there was a future search workshop, which brought together prominent internal and external education stakeholders. These included UNDP and UNESCO representatives, University of Dar es Salaam dons, Ministry of Education and Vocational Training representatives, and others from various NGOs. Among other things, the workshop addressed the issue of eLearning and ICT in the educational institutions.

In the same workshop a number of task forces were established to deal with various aspects of eLearning. They included the following:

1. Task force on Curriculum Design and Development

It has the task of developing a contextually oriented curriculum design to enable learners to defend national integrity & standards and meet overall goals of education in Tanzania.

2. Task Force on Teacher Education

The idea was to investigate all possibilities in the National Teachers Training College for eLearning and ICT use. Currently Morogoro Teachers College has been established as the centre for the training of trainers i.e. it is the hub for other teacher training colleges.

3. Task Force on infrastructure

This has the role of assessing the availability of equipment, suppliers and services of computers, telecommunications, multimedia, broadcasting (radio and television). The same task force was assigned to investigate other related sources of power like bio-gas, solar energy, diesel and generators particularly in remotely located colleges.

4. Task force on Finance

This was assigned the duty to come upon with budget of the entire project so the issue of preparing a project proposal was the key concern of the particular task force.

5. Task Force on Content Multimedia Information Development.

The unit was assigned to consider relevance, objective and aims of eLearning and ICT skills development within Tanzanian sociological and political context.

During 2005, the Ministry of Education and Culture established another committee with the responsibility of preparing a strategic framework at the ministerial level. The main idea was to indicate responsible sections and time frame for each assignment within the Ministry.

The African Virtual University (AVU) at the University of Dar es Salaam was established, focused on information exchange with other member countries.

The Tanzania Educational Authority (TEA) was given the go-ahead during 2005 to spearhead the establishment of one mega entity; the Tanzania Educational Network (Edunet) covering the entire range of educational levels from primary to tertiary. It is a comprehensive online educational information service system, which allows students, teachers and the general public to gain access to valuable education information.

The overall objectives of Edunet are to optimise the connectivity costs for Tanzanian educational institutions through economies of scale of aggregating different education sub-sectors through a single National Network. The specific objectives of Edunet are:

- To mainstream use of ICT in education delivery;
- To facilitate access to education to more Tanzanians; and
- To pull together databases of different education institutions.

Edunet was launched in June 2005. By June 2006 the first phase of the network was expected to be launched. But this did not happen because the complexity of the network necessitated doing further analysis of the situation and learning from the experiences of other countries notably India which provided the conceptual model. This delay did not prevent the Edunet project from seeking to provide benefits to teachers, lecturers and students including multi-media educational contents (images, sounds, dynamic, images, animations) and Internet reference sites (URLs) of various subjects as per the Tanzania Education Curriculum. In these services, teachers will be allowed to revise content supplied to meet specific needs in teaching. Edunet will also provide more teaching software using ICT. Efforts will be made to popularise the use of freeware (open source software) in order to minimize reliance on proprietary software. For students Edunet will provide diverse educational content and services. The Ministry of Higher Education, Science and Technology continues to provide the overall leadership in creating Edunet.

2005 was the fifth year of operation of the Distance Learning and Education Services project (www.distancelearning-tz.org). The project has been promoted and funded by the International Institute for communication and Development (IICD) and the Royal Dutch Embassy in Dar es Salaam. It focuses on providing class notes for students of secondary schools. The material on the project website was developed by local teachers. It is constantly undergoing improvement and being edited for content and language. The contents of the website are available offline as photocopies sold at a subsidized rate of Tshs.25/= (equivalent

to less than US\$ 0.02). The service covers the main subjects offered at the ordinary level of secondary school (commerce, geography, English, history, book-keeping, mathematics, biology, chemistry, civics, computers, Kiswahili and physics). It also covers advanced level subjects of general studies, chemistry, advanced mathematics, accounts, and biology).

4.4 Comparative National ICT Statistics

The main organisation that collects national statistics is the National Bureau of Statistics based in Dar es Salaam, Its population census work is better known than other statistics gathering efforts. Thus for many statistics about Tanzania there is more than the average reliance on foreign sources such as the World Bank and others. This makes the nation's statistics of mixed quality and in some instances, as the table indicates, it is hard to obtain any statistics on some issues not just ICT statistics. The ICT sector is now under the Ministry of Infrastructure Development, which should have been collecting ICT statistics. But the Ministry still has some way to go before it can be relied upon to be collect ICT statistics extensively.

4.4.1 Country Background Information

Tanzania	2002	2004
Population (millions)	33.6	36.049
	36.8	36.6
Adult literacy rate (% ages 15 and over)	77	78
Gross National Income (GNI) per capita	280	330
Gross Domestic Product (GDP) growth %	6.3	6.8
Scientists and engineers in R&D (per million people)	Not available	Not available
Expenditure on R&D (% of GDP)	Not available	Not available

4.4.2 ICT Infrastructure & Access

Tanzania	2002	2004
Telephone mainlines	234,640	236,589
Per 1,000 people	6.9	6.5
In largest city (per 1,000 people)	Not available	Not available
Mobile phone (per 1,000 people)	20.8	106.9
Radios (per 1,000 people)	Not available	Not available
Television sets (per 1,000 people)	Not available	Not available

4.4.3 Computers & Internet

Tanzania	2002	2004
Personal Computers		
Per 1,000 people	3	6
Installed in education (thousands)	Not available	Not available
Internet		
Users (thousands)	1	7
Service provider charge (\$)	Not available	Not available

4.4.4 ICT Expenditure

Tanzania	2002	2004
Total ICT (\$, millions)	Not available	Not available
ICT as % of GDP	Not available	Not available
ICT per capita (\$)	Not available	Not available

Source: 1. Minister's Speech: 2004/2005 Budgetary Speech for the Ministry of Communication and Transport, Dar es Salaam.

2. Tanzania Communication Regulatory Authority, www.tcra.go.tz

4.5 Challenges and Recommendations

The major ICT adoption challenges in Tanzania are related to implementation issues associated with the national ICT Strategy and its projects and the establishment and enactment of effective structures for the coordination of implementation in the areas of eGovernment, eHealth, and eLearning & ICT Skills Development.

4.5.1 eGovernment

The major challenges in eAdoption are in the lack of financial resources. While there is general awareness of the potential of ICT in improving governance, there is inadequate knowledge of the technology which makes eAdoption somewhat hesitant and slow. The main recommendation is to increase training among civil servants. Fortunately the Civil Service Training College has already started providing the appropriate training. But more of this is required.

4.5.2 eHealth

Despite all the initiatives outlined, the Ministry of Health and Social Welfare is facing challenges in the following areas:

- a) Limited resources - both fiscal and human resources. All projects are heavily donor funded. This limits the government commitment in the area. Again, human resources are not adequate in relation to the associated technical requirements of the projects operation.
- b) Negative people's culture towards ICT operations. Most health sector workers are not well disposed to new initiatives. This is due to a lack of necessary knowledge, ignorance and a mindset that the use of ICT will not solve national problems. There are others who fear for their positions in the public service when ICT is widely adopted.
- c) Lack of commitment among the politicians.

The recommendations and opportunities ahead for the Tanzanian health sector include:

- a) The Ministry through its many training colleges of health can train its staff in all related issues of ICT and its potentials in the field of health services, i.e. the existing training curriculum can be modified to accommodate this new reality;
- b) ICT as a strategic tool can be used to prescribe drugs and other related services. Thus periodically the Ministry can organize staff seminars and invite other key stakeholders to share general understanding on issues of ICT; and
- c) The Ministry can work closely with other faith-based and other private hospitals to facilitate ICT adoption in health services. Many private or faith-based hospitals are already implementing various ICT projects for improving health care. It is only a matter of liaising with the hospitals to take advantage of their e-readiness.

4.5.3 eLearning & ICT Skills Development

The major challenge in eLearning is the vastness of the sector which makes any planning towards adopting this technology to appear to be a daunting task. It is worth noting that there was a time in the past acquisition of the technology was restricted. It was as late as in the mid-1990s that most restrictions in the acquisition of ICT were discontinued. This translates into lack of widespread knowledge of the technology. The current power problems facing the country hardly makes it easy to initiate a big push in this sector. Just like in other sectors, commitment of more financial resources for training would seem to help. Fortunately as a nation recognition of the significance of ICT is already there as it is shown in the National Vision 2025. In addition, development partners have shown willingness to assist in raising awareness and providing training in the sector. It is recommended that more internal resources be committed to ICTs in order to overcome the late adoption of the technology.

4.6 Research Organisations active in target areas

The key stakeholder responsible for ICT Strategy at a policy level in Tanzania is the Ministry of Infrastructure Development and for research development is the Tanzania Commission for Science and Technology.

There are a number of universities and research centres active in the areas of eGovernment, eHealth, eLearning & ICT Skills Development in Tanzania:

- University of Dar es Salaam
- Sokoine University of Agriculture
- University College of Lands and Architectural Studies

5. Conclusion

5.1 Comparative Statistics for Mozambique, South Africa & Tanzania

A comparison of South African indicators with those of other African countries, including Tanzania and Mozambique, might indicate that South Africa is well developed in terms of ICT infrastructure and resources. However, the reality is that there are some provinces in South Africa are equally under-developed as many other parts of Sub-Saharan Africa.

If comparisons are made with OECD countries, then Mozambique, South Africa and Tanzania do not rate so highly, particularly in providing fixed-line telecommunications, Internet access and associated costs of these services. It is interesting that mobile phone penetration is rapidly increasing in each country, and clearly for many communities, has replaced previous demand for fixed line infrastructure, which is often just not available, whether at an economic cost or not. Broadband penetration is still relatively low in all three countries, which is seen as a vital indicator of preparedness for e-commerce. However, rapid adoption of mobile technologies augurs well for delivering services, particularly in the rural areas, in sectors such as government, health and education, especially as costs start to drop with increased competition and the deployment of faster mobile networks.

5.2 Challenges Identified

The challenges faced by countries in Sub-Saharan Africa in general are to lower the cost of communication, increase universal access including access to broadband, modernising broadcasting signal distribution infrastructure, the development of local content and effecting targeted interventions to address the challenges of national & the wider regional economy.

It is clear that the governments of Mozambique, South Africa and Tanzania recognise the strategic importance of adopting ICT in key sectors including government, health and education. Each government also places a strong emphasis on the development of an indigenous software industry, with increased investment planned for wider adoption of ICT and associated training. Such aspirations require both national and international research cooperation activity.

Framework Programme 6²⁰ (FP6) of the IST Programme of the European Commission and FP7²¹, which is currently being prepared for the period 2007 – 2013, are both fully open to International Co-operation. Under FP6, there are currently four projects funded under DG Information Society & Media, which include African partners (EPOCH²², BEANISH²³,

²⁰ <http://cordis.europa.eu/fp6/>

²¹ <http://cordis.europa.eu/fp7/faq.htm>

²² www.epoch-net.org/

²³ www.hisp.info/confluence/display/BEANISH/Home

FLOSSWorld²⁴ and IST-Africa²⁵). South Africa is involved as a partner in all four projects while Mozambique and Tanzania are involved in BEANISH and IST-Africa. All of these projects are either funded as Networks of Excellence in the case of EPOCH or Specific Support Actions in the case of BEANISH, FLOSSWorld and IST-Africa.

The European - South African Science and Technology Advancement Programme (ESASTAP)²⁶ is funded under FP6 by DG Research and implemented by the South African Department of Science and Technology. It seeks to promote science and technology cooperation between South Africa and the European Union.

Apart from leveraging opportunities for exploitation and necessary adaptation of current European research results for eGovernment, eHealth and Technology Enhanced Learning & ICT Skills, the challenge for FP7 is the integration of relevant African research organisations as partners in research focused projects in specific thematic areas. This requires the building of a network through which European and African partners can identify each other when preparing a project proposal. There needs to be a greater awareness of the skills that are available in Sub-Saharan Africa and the research activities currently being undertaken in particular thematic areas. The IST-Africa Conference Series²⁷ provides a platform for African and European researchers from public administration, research/academia and industry organisations to share results to date, publish scientific papers and meet each other to discuss potential areas of co-operation over a three-day period.

Currently South Africa is recognised as having a critical mass in terms of research and development (RTD) activities, reflecting available resources, state of economic development and current national priorities. However, this does not mean that other Southern African Development Community (SADC) Countries including Mozambique and Tanzania do not have the necessary capacity to engage in research cooperation with European organisations in European co-funded FP7 research projects. All that may be different is the scale of the current national research community. This report provides an overview of some of the research organisations active in South Africa, Mozambique and Tanzania.

It is clear however, that in the areas of eGovernment, eHealth and eLearning and ICT Skills being examined in this report, that there are significant capacity challenges particularly at the district and local government level and a need for stronger awareness and capacity building initiatives particularly in rural areas of the potential benefits of ICT adoption. A key challenge in this regard, is the relatively strong dependency, particularly in Mozambique and

²⁴ www.flossworld.org/

²⁵ www.ist-africa.org

²⁶ www.esastap.org.za

²⁷ www.ist-africa.org/Conference2006 and www.ist-africa.org/Conference2007

Tanzania, on donor funds to address these issues. It also seems clear in Tanzania that there may be cultural issues at play that must be addressed in the eHealth sector to reduce potential resistance to widespread ICT adoption in hospitals and other health care facilities.

Compared to other developing nations, African countries are at comparatively low levels of e-readiness as a result of a number of factors including inadequate telecommunications infrastructure, high telecommunication costs, low literacy levels, and lack of enabling policy and legal frameworks. However, clearly much progress is being made in Mozambique, South Africa and Tanzania in acknowledging these issues and addressing them, particularly in relation to necessary policy and legal frameworks, a key enabler for success.

The policy and legal frameworks reflect the differences in ICT infrastructure between the three countries. South Africa has an established telecommunications infrastructure but an outdated ICT policy that is under pressure from new market entrants and new technologies. Mozambique and Tanzania have implemented national ICT policies in relatively “greenfields” environments characterised by low levels of infrastructure and competition.

South Africa faces challenges in reforming its ICT policies that currently favour the Telco monopoly and established telecommunication technologies. The South African government is currently reforming policy to increase affordable access and manage radio spectrum to accommodate these new technologies but these objectives have not yet been met. This is causing regulatory confusion and delaying necessary infrastructure investment in the country.

The main emphasis of policy in Mozambique and Tanzania is on establishing a firm legal enabling environment, allowing the development of a national Internet user base, and use this technical environment to establish and disseminate online public services (for government, health and education) to users in major cities, in the provinces, districts and rural areas.

It seems clear that continued investment in mobile telephony in Africa has greater short and medium term potential for impact than fixed line services, because of the often diffuse population centres and the often long distances to be addressed. Increased competition, and the widespread adoption of new wireless technologies offer the potential to increase lower cost access to infrastructure required to leverage ICT, thus achieving wider societal impact.

The exploitation and expansion of existing technologies such as mobile handsets, community radio and digital broadcast television offer significant potential. However, strategies to improve Internet penetration levels and broadband deployment are urgently required. The high costs of telecommunications severely inhibit Internet penetration in all three countries. Increased co-operation to achieve inter-connectivity among regional Internet Exchange Points (IXPs), can support lowering internet costs outside of the continent.

Continuing to increase literacy levels, mobile phone penetration and access to PCs and cost effective Internet access are serious medium to long-term challenges, which must continue to

be addressed. Accessibility, content related challenges – and associated cost implications are clearly all created by the common challenge of multiple official languages in each country.

Public Private Partnerships in ICTs for development clearly offer scope for more rapid technology adoption, with corporate and donor support often playing an important role in providing support to community programmes as well as in health and education programmes. This is particularly the case in addressing the often significant capacity challenges at the district and local government level. There is clearly a general need for stronger awareness and capacity building particularly in rural areas in Mozambique, South Africa and Tanzania. That having been said, it is also clear that each country has developed a clear vision of where they need to go and the steps that must be taken to create the Information Society at a national level in their countries. The challenge is primarily economic, not related to vision.

Infrastructure backlogs that include physical buildings, electricity, facilities and other resources in rural areas have a significant impact on the ability of schools and health clinics in Mozambique, South Africa and Tanzania to roll out learning and healthcare using ICTs. There is also a lack of funding to address these backlogs, and the low uptake of new and emerging technologies, especially in the areas of telemedicine application is often related to their relatively high cost. The wider potential for societal impact of leveraging PCs and Internet access in Schools at a community level has already been raised and is significant.

The state of ICT in each countries' governments is characterised by a general lack of trained ICT staff and lack of adequate retention strategies for ICT personnel. The "brain drain" in Africa is nothing new, but has not been resolved. Inadequate preparation for teachers is often a major constraint that impacts negatively on their ability to integrate ICTs into the curriculum. Limited ICT awareness and literacy is a constraint to the effective management of ICT rollout at the institutional level. In most schools computers are used as information processing machines, such as typing letters, and as such are grossly under-utilised. The ability to manage and cope with changing demands is also a huge challenge among teachers.

In Mozambique, South Africa and Tanzania ICT government initiatives are relatively fragmented. A major negative consequence of this is confusion and at times, conflict about accountability and responsibility that result from actual or perceived overlap of roles. In some respects, the problem is more acute in South Africa, with competition between departments.

In general, progress in eGovernment, eHealth and eLearning is more advanced in South Africa whilst Mozambique and Tanzania have focused more on planning and implementing major infrastructure plans to support these initiatives. Mozambique, South Africa and Mozambique share another problem, lack of a comprehensive and easily accessible evidence base to support strategic policy decision-making and programme design to leverage ICTs for development. This hampers international development reporting obligations on ICTs such as

reporting requirements on Millennium Development Goals and progress made towards implementation of the World Summit on Information Society (WSIS) Plan of Action.

5.3 Conclusions

The status of eAdoption in Mozambique, South Africa and Tanzania has been reviewed and it is clear that all three countries face many similar challenges. Building ICT infrastructure and capacity is not only crucial in improving communications but is also recognised as a key enabler for development in both countries in achieving the Millennium Development Goals.

The biggest challenges in relation to building international research projects funded under FP7 is to raise awareness of the funding mechanisms available and the risks associated with participation in such research projects; building a network of European and African research organisations who are interested in co-operating and the identification of partners from Africa who have both the capacity and skills to actively participate.

The IST-Africa 2006 Conference & Exhibition, which was held in Pretoria, 03 – 05 May 2006 set the initial building blocks for the development of such a network. Over 300 delegates from 38 countries including 14 African and 21 European countries came together to share knowledge and experience in the Scientific Programme of IST-Africa 2006, with just over 100 papers accepted by a double blind peer review process for inclusion in the Conference Proceedings, which was published on CD-ROM and distributed to all delegates. There was an interesting mix of research papers from European and African organisations. Most of the European presentations were co-funded under the IST Programme of FP6. A list of European and African organisations that actively participated as presenters, delegates or exhibitors at IST-Africa 2006 is provided in Appendix 1. This provides an overview of the organisations that have demonstrated their clear interest in research co-operation and ICT related knowledge sharing between Europe and Africa.

To ensure that the wider community who were not able to attend IST-Africa 2006 still have access to the research results shared, the IST-Africa Paper Repository²⁸ provides access to all papers published in association with IST-Africa 2006 Conference & Exhibition (03 - 05 May, Pretoria) and are identical to those published in the Conference Proceedings CD-ROM. All authors retain the copyright for their paper. The general public can search for relevant papers by thematic area or author. When they click on a link to access the PDF paper, they require a login to download the paper. If an individual is interested in reading a specific paper, but is not already a member of the IST-Africa Community, they can register via the Mailing List and receive their log in details. Existing members just use their log in details, which can be retrieved via Password reminder, when accessing any paper.

²⁸ www.ist-africa.org/2005/default.asp?page=paper-repository

The IST-Africa Delegate Showcase is another very useful way to identify relevant peers whether in Africa or Europe. All conference delegates who choose to do so could publish a profile about themselves, including their research interests. Showcase functionality allowed delegates to contact one another without disclosing e-mail addresses, thus facilitating easy contact between peers. As the IST-Africa Community develops this will become an increasing useful way to identify relevant contacts by country as well as by individual profile.

The high cost of telecommunications remains one of the major barriers to achieving critical mass for telecommunications to impact positively on economic growth. This is partly due to infrastructure limitations as well as the lack of effective liberalisation and regulation of the telecommunications sector. Some progress is now starting to be made in this regard. While there are some examples of Public Private Partnerships, more private sector participation, such as Build Own Operate Transfer models, could help “fast-track” infrastructure backlogs.

A key challenge is to provide the necessary training and support for ICT in government, healthcare and education outside the major metropolitan areas in each country, to allow technology to be adequately leveraged to have social and economic impact.

One of the key potential benefits of sharing experiences and lessons learnt between African States and between Africa and Europe, is to avoid potentially expensive mistakes made elsewhere, thus positively influencing national policy and legislative changes to support wider eAdoption (particularly in the areas of eGovernment, eHealth and Technology Enhanced Learning and ICT Skills) and maximising the impact of available investment.

Another key potential benefit is to identify common challenges or opportunities to adapt existing European research results to meet circumstances in particular African countries. Equally valuable is the opportunity to identify common research and implementation challenges which would benefit from European and African collaboration under FP7.

Appendix 1 – African and European organisations who participated in IST-Africa 2006

African Organisations

Cape Peninsula University of Technology, South Africa
Cell-Life, South Africa
Centre for Public Service & Innovation, South Africa
Centre for Scientific and Industrial Research (CSIR), South Africa
City of Tshwane, South Africa
DataVision International, Ethiopia
Delegation of the European Commission, South Africa
Department of Communications, South Africa
Department of Public Service and Administration, South Africa
Department of Science and Technology, South Africa
Digital Partnership SA, South Africa
Durban Institute of Technology, South Africa
Economic Development, Environment and Tourism, South Africa
Embassy of Finland, Mozambique
Embassy of Finland, South Africa
Embassy of France, South Africa
Escola Portuguesa de Moçambique, Mozambique
French South African Technical Institute in Electronics (F'SATIE), South Africa
Government of Botswana Botswana
Hewlett Packard SA (Pty) Ltd, South Africa
High Commission of Tanzania, South Africa
ICT Policy Implementation Technical Unit (UTICT), Mozambique
IESC/Geekcorps, Mali
Imo State University, Owerri, Nigeria, Nigeria
ITOCA, Zimbabwe
LINK Centre, South Africa
Manobi, Senegal
Medical Research Council of South Africa, South Africa
Meraka Institute, CSIR South Africa

Microsoft, South Africa
MICTI - Mozambique Information and Communication Technology, Mozambique
Ministry of Science & Technology, Mozambique
Ministry of Communications, Lesotho
Ministry of Communications, Science and Technology, Government of Botswana
Ministry of Livestock Development, United Republic of Tanzania
MOCCA ThinkTank, United Republic of Tanzania
Naledi3d Factory, South Africa
NamITech, South Africa
National Artificial Insemination Centre, United Republic of Tanzania
National Department of Health, South Africa
National Pharmaceutical Company Limited, Zimbabwe
National University of Lesotho, Lesotho
NEPAD, South Africa
NHLS & University of Pretoria, South Africa
North-West University, South Africa
OKN- Radios Jamana, Mali
OSISA, South Africa
Pinsoft Management Consultants (Pvt) Limited, Zimbabwe
Provincial Government of the Western Cape, South Africa
RAKAI DATIC, Uganda
SAIDE/Mindset, South Africa
SAP Research, South Africa
SAP Research AG, Germany
Shadi Systems, Egypt
SITA/MRC, South Africa
Sokoine University of Agriculture (SUA), United Republic of Tanzania
Stellenbosch University, South Africa
Tanzania Commission for Science and Technology, United Republic of Tanzania
The American University in Cairo, Egypt
The Innovation Hub, South Africa
The University of the Western Cape, South Africa
Trigrammic, South Africa

Tshwane University of Technology, South Africa
Uganda National Academy of Sciences, Uganda
UNDESA, Kenya
UNDP, Mozambique
UNDP, South Africa
UNDP-SACI, South Africa
Ungana-Afrika, South Africa
UNISA, South Africa
United Nations, South Africa
University of Botswana, Botswana
University of Cape Town, South Africa
University of Dar es Salaam, United Republic of Tanzania
University of Johannesburg, South Africa
University of Pretoria, South Africa
University of South Africa
University of Stellenbosch, South Africa
University of Technology, Mauritius
UWC / HISP-21, South Africa
Walter Sisulu University, South Africa
Wits University, South Africa
World ORT, South Africa

European Organisations

Anadolu University, Turkey
Athens University of Economics and Business, Greece
Atos Origin sae, Spain
British Telecom, United Kindom
C2k, United Kingdom
Centre for Social Innovation, Austria
Centre for Technological Research of Crete, Greece
City of Tampere, Finland
CNRS/IN2P3, France
COMNET-IT, Malta

Consiglio Nazionale delle Ricerche, Italy
Creative Industries Management, Finland
DANTE, United Kingdom
Department of Foreign Affairs, Finland
DFKI GmbH, Germany
DISC, Belgium
Dublin Institute for Advanced Studies, Ireland
EPFL, Switzerland
ETSI, France
Eurexcel - European Association of Innovating SMEs, Belgium
European Commission, Belgium
European Commission, Luxembourg
European Organization for Nuclear Research (CERN), Switzerland
FC/UL - Universidade de Lisboa, Portugal
FernUniversitaet in Hagen, Germany
FIR at Aachen University of Technology, Germany
FORTHnet, Greece
Fraunhofer FIT, Germany
Freie Universität Berlin, Germany
German Research Center for Artificial Intelligence (DFKI), Germany
Greek Research and Technology Network, Greece
Helsinki University of Technology, Finland
Hewlett-Packard Europe, Germany
Hewlett-Packard European Laboratories, United Kingdom
ICNM - International Center for New Media, Austria
ICTP & CNR/INFM Democritos, Italy
IIMC Ltd, Ireland
InfoConsult GmbH, Germany
INSIEL SpA, Italy
Institut National des Télécommunications (INT/GET), France
Institute for Informatics and Telematics – Italian National Research Council (IIT-CNR), Italy
Institute of Communication and Information Technologies, Poland
International Centre for Theoretical Physics ICTP, Italy

Kajaani University Consortium/University of Oulu, Finland
Kanki International, Finland
Laafi - Initiative for Development, Austria
Lappeenranta University of Technology, Finland
Martel, Switzerland
Modirum, Finland
NCSR DEMOKRITOS, Greece
Poznan Supercomputing and Networking Center, Poland
Queen's University, United Kingdom
Royal Tropical Institute, Netherlands
SAP Research AG, Germany
Siemens AG Medical Solutions, Germany
SIVCO Romania, Romania
Stockholm University/Royal Institute of Technology (KTH)
Synergetics nv, Belgium
Technical Centre for Agricultural and Rural Cooperation (CTA), Netherlands
Teleport Sachsen Anhalt GmbH, Germany
The International Development Law Organization, Italy
Trinity College Dublin, Ireland
TUDelft, Netherlands
UK Resource Centre for Women in Science, Engineering and Technology, United Kingdom
University Joseph Fourier Grenoble 1, France
University Maastricht, Netherlands
University of Aveiro, Portugal
University of Bologna, Italy
University of Glasgow, United Kingdom
University of Joensuu, Finland
University of Lausanne, Switzerland
University of Modena and Reggio Emilia, Italy
University of Oulu, Finland
University of Patras, Greece
University of Porto, Portugal
University of Surrey, United Kingdom

University of Warwick, United Kingdom

UPC, Spain

Vivici BV/ZorgGemak, Netherlands

Vrije Universiteit Brussels, Belgium

VTT, Finland

Waterford Institute of Technology, Ireland

Wirelessinfo, Czech Republic

Work Research Institute, Norway

Organisations from other countries

Brigham Young University, United States

RMTG, United States

University of California, Berkeley, United States

Global Knowledge Partnership, Malaysia