National Information & Communication Technology Strategic Plan (NICTSP) 2011–2014: Towards i-Mauritius

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TABLE OF CONTENTS

List of abbreviations

BOI	Board of Investment
BPO	Business Process Outsourcing
CCA	Controller of Certification Authorities
CEH	Certified Ethical Hacker
CERT-MU	Mauritian Computer Security Incident Response Team
CIB	Central Informatics Bureau
CIIP	Critical Information Infrastructure Protection
CISA	Certified Information Systems Auditor
CISD	Central Information Systems Division
CISM	Certified Information Security Manager
COTS	Crime Occurrence Tracking System
CPSE	Competitiveness and Public Sector Efficiency
CRISC	Certified in Risk of Information Systems Control
CSC	Common Service Centre
CSO	Central Statistics Office
DPA	Data Protection Act
DPO	Data Protection Office
EGC	E-Governance Cell
EGMT	E-Governance Mission Team
EGTF	E-Governance Task Force
GOC	Government Online Centre
GoM	Government of Mauritius
HRDC	Human Resource Development Council
IBA	Independent Broadcasting Authority
ICTA	Information Communication Technologies Authority

IIP	Interoperability Interface Protocol
IPLC	International Bandwidth
IRP	Independent Review Panel
ITSU	IT Security Unit
MBC	Mauritius Broadcasting Corporation
MCMC	Malaysian Communications and Multimedia Commission
MICT	Ministry of Information and Communication Technology
MITD	Mauritian Institute for Training and Development
MNIC	Mauritius National Identity Card
MoAC	Ministry of Arts and Culture
MOE	Ministry of Education
MOFED	Ministry of Information and Communication Technology
NCB	National Computer Board
NEF	National Empowerment Foundation
NEGSDG	National E-government Service Delivery Gateway
NICTSP	National ICT Strategic Plan
NISSP	National Information Security Strategy Plan
OTAM	Outsourcing & Telecommunications Association of Mauritius
PIAP	Public Internet Access Points
PKI	Public Key Infrastructure
PMO	Prime Ministers Office
PPP	Public Private Partnerships
SADC	Southern African Development Community
SCA	Service Centre Agency
SDA	State Designated Agency
SDLC	Software Development Life Cycle

SLA	Service Level Agreement
SMP	Significant Market Power
STC	State Trade Corporation
STEP	Skill Training and Employment Placement
TPA	Third Party Audit
VLE	Village Level Entrepreneur
WSIS	World Summit on Information Society

1 Executive Summary

The National ICT Strategic Plan 2007–2011 represents an ambitious five-year programme of action to bring the ICT sector to the forefront of the national economy and for Mauritius to be located as a globally recognised ICT hub. With only a year of the plan yet to run, in the process of the mid-term review a clear picture has emerged of what is contributing to the realisation of this vision and what continue to be the stumbling blocks.

It is important to state at the outset that the plan, with its 15 programmes across 124 projects, represents one of the most ambitious e-strategies of any developing economy – in hindsight possibly too ambitious. Despite the political commitment to the programme, Mauritius, being a small island state, is resource constrained. Several of what have been identified in the NICTSP as 'knowledge economy' targets seems unrealistic in retrospect. On the other hand, being a small and well-connected nation, several of the 'information society' targets of increased ICT penetration in the NICTSP are very achievable with the right policies and regulatory framework in place.

The period under review coincided with the start of one of the worst global recessions ever. This is reflected in reductions in various dimensions of growth for the country and is likely to have impacted on the ICT sector. However, the economy proved remarkably robust. The ICT sector contributed to this, growing at rates well above national growth rates.

The mobile market continued its success, with growing SIM card sales and reductions in prices, resulting in some of the lowest prices in Africa. Wholesale prices however, both for interconnection and facilities leasing, have remained constant over the last few years, but are, as a result, currently under review by the national regulatory agency, ICTA.

Bandwidth prices continue to reflect both the real high costs of connecting the country (due to its remoteness) but also the lack of competition that exists on international bandwidth and effectively on terrestrial facilities.

ISPs have experienced all the difficulties associated in competing downstream with the incumbent, Mauritius Telecom, while needing to secure their facilities from its upstream business. From the inability to offer their preferred services because of technology preferences by the incumbent, to high facilities, interconnection and international bandwidth charges the efforts to render competitive services they believe has become unfeasible. The latest network operator, MTML, is unable to offer competing wholesale facilities and is in fact also dependent on Mauritius Telecom for half of its international circuit, in order to connect

locally, despite paying less for the other half circuit that it receives from its parent company, VSNL, on the SAFE cable.

Despite significant prices cuts over the last five years, international bandwidth in Mauritius is currently relatively high. With the prices on the rest of the continent being driven down by competition these prices are no longer as competitive, with the cost of IPLC having remained the same over the last three years. In comparison, bandwidth costs across the continent have plummeted as competing cables to SAT 3 and SAFE have landed, specifically Seacom and EASSy.

The negative consequences of high costs and consequently constrained bandwidth on competitiveness and innovation was the mantra of all those interviewed for the review from the universities and schools to Government to the IT-enabled services/Business Process Outsourcing (BPO). Until recently, however, with Emtel entering the LION consortium, Mauritius Telecom undertook all undersea cable investment. This, however, does not assist bandwidth-constrained small business, universities and schools. Generally players in the IT/BPO market segment lack the volumes to receive the kinds of discounts other operators received from Mauritius Telecom, and regard the cost of bandwidth as one of their main challenges in becoming globally competitive. This market segment has proved robust nonetheless, growing in a period of international contraction.

1.1 Market review to determine levels of competition and prices

The dramatic cost reductions in cable provisioning associated with developments in data transmission technologies have not been witnessed in Mauritius to the extent they have elsewhere in the world, largely as a result of the absence of competition in this area. Ensuring cost-based access to landing stations and transparent pricing of bandwidth and other facilities is critical to ensuring the domestic and international competitiveness of firms requiring these inputs.

It is proposed that a comprehensive market review be undertaken by ICTA to determine the impact of those areas of operation that are not competitive in the sector, and what policy and regulatory actions might be required to make them so. Although several likely interventions have been identified by ICTA, it is proposed that these be consolidated into a clear programme of action over the next three years to enable competitive markets. It is proposed that the cost of wholesale and data services be properly benchmarked against competitors in order to assess whether the cost of these services is high. The real costs should be determined by a costing study by the regulator, as a central part of a wider review

of the market to determine the impact of the absence of competition in market segments or its ineffectiveness in segments that should be functioning competitively and driving price reductions. Clarity as to the future market structure and certainty about the regulatory framework going forward will provide confidence to investors in the sector. Reductions in the cost of communications as a major input of the services sector, whether offshoring or for the location of regional head-offices, together with the gains already made in easing business entry, is likely to make Mauritius more conducive as an investment destination.

1.2 Open Access

What is referred to as the Mauritian open access policy refers in fact to an essential facility regulation to ensure access to the undersea cable landing stations only. The proposed policy review should require the development of comprehensive open access regulations as a strategy to overcome network bottlenecks and services that are not operating competitively, due to the size of the market and an inability to make the economies of scale attractive to investors or competitors. This should form part of the Ministry work plan for 2011 and be developed through public consultation and with the national regulatory agency, which as the implementing agency for the policy will be responsible for developing the regulations.

1.3 Skills base

Low labour costs in Mauritius, especially in the business process outsourcing (BPO) sector, provide a competitive advantage against global competitors but the limited pool of skills available constrain the scale and scope of jobs that can realistically be brought in. According to the Board of Investment, an estimated pool of 3000 additional posts in the IT enabled-BPO area is required to meet current demands. It is the view of the industry that neither existing tertiary institutions, nor the in-house training offered by BPO operators, are adequately meeting this need.

The Ministry of ICT has proposed the establishment of an ICT Academy in response to skills shortages being experienced in the sector. It intends for this to take the form of a public private partnership model with the active participation of the industry associations. The purpose of the ICT/BPO Academy is not only improve the skill sets and competencies of the Mauritian workforce, but also to help promote Mauritius as a world-class destination in ICT-related businesses offering global talents (MICT 2010:2).

Although its mandate is still to be finalised, it is proposed that it will serve to co-ordinate with existing institutions. This includes vocational training at the IT School in Mauritius Institute for Training and Development (MITD), Human Resource Development Council

(HRDC), National Empowerment Foundation (NEF) and the higher-level university training – which needs greater application to meet the needs of industry. The high-end IT skills produced by universities are currently absorbed by the wider IT industry and economy, where demand outstrips supply, but these have not been optimised and co-ordinated.

The current proposal in the MICT concept paper is that co-ordination would happen under the auspices of the National Computer Board, which is mandated to assist in the framing of appropriate national education, training and research plans in the field of information technology in order to build the necessary expertise base for consolidating the information technology industry in Mauritius.

1.4 Cyber security

A critical dimension of the vision of moving the BPO sector higher up the value chain and for the comprehensive adoption of e-commerce and e-government is the issue of cyber security, which was identified as an area of specific focus for the review. A critical review of the existing National Information Security Strategy Plan (NISS), shows that though information security concerns of the Government, businesses, organisations, and citizens were taken onboard under the NICTSP and a number of activities under various projects were undertaken by CERT-MU, IT Security Unit (ITSU), and ICTA, the overall implementation of an integrated robust National Information Security Strategy is to be further strengthened. ITSU is already providing IT Security measures for all new and existing e-Government projects. ICTA launched its Public Key Infrastructure (PKI) for Mauritius in December 2010 to ensure safe, trusted and secure electronic transactions, thereby establishing Mauritius as a trusted hub for e-commerce by providing a wide range of security products and services.

However, it is felt that due to some systemic weaknesses, like the absence of compliance mechanisms or enforceability, coupled with an acute shortage of funds for recruiting sufficient trained staff and compared to the ambitious roll-out of e-Government and computerisation of civil services plans, NISS is still to achieve a substantial momentum. A number of IT security measures, in line with the World Summit on Information Society (WSIS) Action Line C5, have already been addressed under the existing NISS and Critical Information Infrastructure Protection (CIIP) initiatives. However, the present review exercise considered the progress made so far and tried to re-organise a few 'priority areas' within the broad layout of NISS and CIIP. The 'priority areas' set out in this report neither negate nor dilute the overall plans of NISS or CIIP, but rather highlight some key areas which need immediate

attention. It recommends at this stage only that an operational action plan of IT security should be geared towards six broad priority areas:

- Strategic institutional coordination
- Enforcement mechanism and legal statutes
- Control standards and guidelines
- Universal implementation of ISMS / ISO 27001
- Risk assessment
- Ensuring Third Party Audits

1.5 E-government

The contextual background of NICTSP 2007–2011 clearly indicated that Mauritius required 'comprehensive process re-engineering and coordinated planning to deliver citizen-centric services. It envisaged a systematic marketing of e-Government as a tool for good governance covering aspects of efficiency, accountability and transparency. Progress towards implementation of projects proposed in the NICTSP has been achieved.

While the emphasis has been on networking government offices and primarily on automation and computerisation, various ministries, departments and agencies have also endeavoured to use ICT tools for establishing connectivity, networking, setting up systems for processing information and delivering services.

During the period under review and in accordance with the recommendations of the NICTSP 2007–2011 report, several key e-government projects have been implemented and completed. These include e-Parliament, e-Archive, e-Project Management Solution, and e-Business Plans for Health and Prisons. Furthermore, flagship projects such as the Crime Occurrence Tracking System and the Mauritius National Identity Card project have been initiated. The first phase of the deployment of the COTS system at two of the seven Police Divisions (Port Louis South and Western Divisions) will be completed in March 2011. Advisory services are currently being provided for the design of the smart card based multipurpose Identity Card. It is anticipated that this engagement will be completed in March 2011, prior to the procurement of new card and system.

A number of E-government Master Plans have been concluded (Health, Agriculture - including fisheries -Traffic, Prisons) in the period 2007–2011. These plans have paid particular

attention to redesign of processes with a view to creating effective processes and systems. This approach is being pursued vigorously when designing information plans and systems, as in the case of the MNIC project.

1.5.1 Government ICT services

In knowledge economies the biggest asset to any enterprise is its human capabilities and competencies. The competition for these skills is felt most keenly by Government IT services, which are unable to compete on salary or career prospects. There are over 100 vacancies - around a third of the total staff complement -in the Central Information Systems Division (CISD) which is responsible for installation and maintenance of government IT systems. Of the 186 staff employed by CISD, only 167 are technical staff. There is also competition for these staff from other agencies responsible for IT within Government. This includes the Central Informatics Bureau responsible for planning and technical assistance for government IT projects and e-government services, and the Government Online Centre (GOC), which is housed under the National Computer Board. Insufficient coordination between these entities was identified in the 2007 NICTSP as a priority area to resolve through a proposed review of the various institutions, which has not been undertaken up to now.

Currently Chief Information Officers (CIOs), who are mostly administrative officials that are simply designated as CIOs, are not equipped generally to take of the challenges of e-Services delivery. It is therefore recommended that instead of increasing the number of services and applications offered online under e-Government projects, it is time to take stock of the systems, applications and operational mechanisms that have been put in place so far and for these to be consolidated through a better coordination among the actors (ministries, departments, project managers, data centre and technical support agencies) in future.

The online services as well as the e-Government applications put in place have laid the foundation and provide the impetus for long-term growth of e-Government within the country. The steps that are recommended at this stage are to consolidate the institutional structure for e-Government and to develop integrated online services and other e-Government applications to enhance the development of a citizen-centric and business-centric environment. As previously recommended, this review proposes that the institutional structures are further consolidated, with defined responsibilities and leadership roles at various levels.

Building on the lessons learnt, the following re-prioritized actions are recommended:

- Setting up of an e-Government Apex Body

- e-Government Needs Survey
- National e-Governance Service Delivery Gateway
- Alignment with the MNIC Project
- Capacity building of CIOs
- Development of a communication and branding strategy for e-Government
- Strengthening of PIAPs as CSCs and Development of PPP Model for CSCs.

1.6 Institutional review

The NICTSP emphasised in 2007 that an institutional review of the ICT sector needed to be undertaken to align the institutional arrangements with global trends towards convergence and to conform to international best practices while acknowledging the local context. The institutional review has not been undertaken to date, thus constraining the delivery of several programmes.

1.6.1 Enhanced Policy & Regulatory Environment

This review again proposes that as a central pillar of a broader policy review institutional arrangements are re-aligned to meet the distinct policy, regulatory and operational functions required for the effective governance of the sector. It is proposed that for purposes of providing direction, co-ordination, administrative and technical efficiency to the sector that this be given effect in law and implemented through the realistic allocation of resources in the budget cycle and human resource planning. As part of the institutional re-design it is proposed that in line with international best practice policy functions for this converging sector be consolidated within the Ministry of ICT. Adequate resources need to be allocated to it to acquire the necessary skills to perform this critical function for the long terms development of the sector and to enable the co-ordination of sectoral policy with national policy.

It is also proposed that to prepare for the implementation of this new policy and legal framework and to manage the transition, regulatory functions for the converging telecommunications and broadcasting sectors currently performed by ICTA and IBA, be integrated into a single national regulatory authority responsible for all communication regulation. Its mandate would be the creation of a fair, competitive and secure environment for the delivery of affordable services that conform to international governance practices. This should include the economic regulation of operators and service providers in the public

interest and the promotion of ICTs across the economy and society through specific demand stimulation strategies, to get critical mass of consumers and citizens using e-services.

National cyber security functions currently performed across ICTA (PKI) and NCB (CERT-MU) should also be rationalised and consolidated under a single unit or agency for effective co-ordination of this dynamic and vital national security framework. There may also be synergies in this entity co-locating with the office of the National Privacy Commissioner to co-ordinate and harmonise approaches to security, privacy and surveillance, prompted by developments in these new modes of communication, and once again to save on administrative overheads.

Another characteristic is the significant presence of the state in various market segments be it in broadcasting, telecommunications and software development. It is proposed that the role of the state in these areas be reviewed for anti-competitive impacts or the reduction of consumer welfare.

1.6.2 Enhanced e-Government Environment

Within the Ministry of ICT, consolidation of e-government functions and database services is urgently required to provide a single, integrated entity responsive to the needs of its users. This can be achieved in two stages or alternative scenarios. It is proposed that in the first instance this could take the form of a functional alignment of those entities (CIB, CISD, GOC, ITSU) responsible for planning, procurement, installation, maintenance, and web development, into a directorate which co-ordinates these functions, avoids duplication and pools resources to better meet needs.

1.7 Broadband policy

It is clear that the legislation pertaining to the sector requires a major review to accommodate the significant changes in the industry over the last ten years, particularly the convergence of the historically distinct broadcasting, telecommunications platforms. It is proposed that this policy review include a comprehensive broadband policy, which extends beyond infrastructure to an integrated set of strategies for networks, services, applications and users. The development of such a framework also provides an organising matrix in which to locate proposed interventions, and for incorporating any legacy activities, going forward.

This should include a thorough review of the market by the national regulatory agency to establish the effectiveness of competition, the impact of market dominance on sector development and innovation and the success of mechanisms to achieve universal access in the context of a broadband environment. With the increasing trends towards convergence of

technologies and the introduction of innovative services like triple play and mobile television, the adoption of a more flexible horizontal licensing paradigm is essential for the development of the sector and the creation of an environment conducive to innovation and investment.

1.8 Evidence-based policy

The success of the policy, legal and institutional review to be undertaken is dependent on the information available on the sector. While Mauritius is held up in the international community as an example of compliance with international indicator best practice in Africa, some of the international definitions and assumptions are not valid in certain contexts, or clash with other local definitions. As the ICT sector becomes more dynamic, the collection of the range of information required for decision-making is becoming more diverse and challenging. Valid and appropriate indicators are critical to effective evidence-based policy formulation and monitoring and evaluation.

As recommended by the NICTSP a National Information and Communication Technology Evaluation and Research Network (NICTERN) was established within the National Computer Board, comprising people tasked with the responsibilities of analysing collected data, undertaking research on various aspects of the NICTSP and production, on a biennial basis, of a State of Information Society Development Report which would be an integrated document that would cover not just progress made on the different dimensions of interventions, but also recommend further courses of action. A National ICT Indicator Taskforce, the multi-stakeholder body entrusted with assuming overall responsibility of monitoring NICTSP initiatives on ICT indicators, was also established and chaired by the NCB. Although some progress has been made in collecting and consolidating these indicators from the various agencies that gather them, there are still definitional problems, data gaps and difficulties with gathering the information from the different agencies that need to be resolved. Human resource indicators for the sector for example, especially if the BPO sector is included, seems to be a particularly problematic area in which to get consistent data, as are some of the usage indicators for e-government services, both critical to decision-making within the Ministry and other sector agencies and industry associations.

2 Introduction

The Government endorsed the National ICT Strategic Plan (NICTSP) 2007–2011 in October 2007. Under the NICTSP, Government's vision is to make ICT the fifth pillar of the economy and transform Mauritius into a regional ICT hub. Attaining this vision is dependent on Mauritius being transformed into a knowledge- and information-based economy and society. An information-based economy would require measures that would enable the ICT sector to contribute significantly to the GDP of the nation, increase employability opportunities in the ICT sector, and ensure that there is a sustained availability of skilled manpower for the sector and ICT exports contributing significantly to the exports basket. This would necessitate a range of measures that would enable the expansion of the sector so as to meet the growing ICT needs of business and stimulate demand amongst citizens.

The NICTSP 2007–2011 recommended five strategic thrusts for Mauritius to SCALE up (Support, Catalyze, Accelerate, Lead and Emerge) its activities to realise its ambitious vision of becoming a regional ICT hub and regional gateway to Africa. This would require first that affordable and ubiquitous ICT services are developed domestically and that these can be leveraged for global competitiveness.

The Five Strategic Thrust Areas, with their associated goals, aim to:

- Undertake SUPPORT measures by initiating appropriate legal, institutional and infrastructural changes, investing in long-term educational fulfilment, fostering a culture of security and trust in ICT and following these up with effective monitoring and evaluation mechanisms.
- CATALYSE economic activity in critical sectors of the economy by promoting e-Business adoption within and across different sectors of socio-economic activity.
- ACCELERATE ICT adoption in society by embracing electronic means of governance and by taking measures towards democratising ICT.
- Take up LEADERSHIP roles in the region through becoming an ICT hub, while at the same time identifying areas in which to become a regional leader.
- EMERGE as a global point of reference for offshore services both in the IT Services and in the IT-enabled Services domains using, amongst other things, advantages of bilingualism, and becoming an investment nucleus for ICT and a gateway to African markets.

2.1 Review of the NICTSP 2007-2011

The review of the National ICT Strategic Plan (NICTSP) 2007–2011 is one of the three activities undertaken under the Competitiveness and Public Sector Efficiency (CPSE) program, which aims to sustain growth and employment, while helping Mauritius to address the impact of the global recession. The CSPE program aligns with Mauritius' long-term development objectives. These centre on the kind of economic development that will allow it to move away from low-wage, labour-intensive exports to more skilled, high value-added, knowledge-based ones. It seeks to deepen the reforms initiated in 2006, and supports Government's more immediate efforts to help the country ride out the global economic downturn.

According to the NICTSP report, the plan contains within it 15 programmes as the main vehicles to implement the five strategic thrusts, and within these programmes, 124 projects that have been identified as necessary to achieve specific outcomes within pre-defined timeframes. Whereas programmes run in parallel and enjoy equal priority, projects within a programme have a priority associated with them, determined by the twin factors of "criticality" of the project to attaining the objectives associated with the programs, and the "feasibility" of its implementation.

The review aims to assess whether the country is on track to achieve these broader targets and to what degree these projects need to be reprioritised in this fast-moving environment. It will be possible to get a very good sense of whether projects are likely to meet deadlines and, where they are unlikely to, what the reasons for that might be.

Specifically, the purpose and scope of this review is to:

- Assess whether Mauritius is likely to meet the targets set in the NICTSP 2007–2011.
- Assess the progress of the implementation of the various projects in the NICTSP Action Plan and whether their objectives have been attained.
- Recommend a revised strategy for the existing National Information Security Strategy.
- Recommend a strategy for an appropriate open access policy and broadband deployment.

- Review the proposed institutional framework recommended in the NICTSP, and suggests options for its implementation, including likely costs and HR requirements.
- Propose and recommend remedial measures, if any, for projects that need to be reviewed in order to attain their intended objectives.

3 Review of status of NICTSP

The review of the status of the implementation of the National ICT Strategic Plan indicates that some of the targets will be met, but that others have not been met. This is because some of the targets were rather unrealistic while others were constrained due to various factors including the need to restructure the delivery mechanisms within Government, the lack of implementation of some of the proposed institutional reforms and of the coincidence of this programme with the global economic downturn.

3.1 Contribution to GDP

The NICTSP target of a 7% contribution to GDP from the offshore ICT export services in particular seems high considering the whole ICT sector contribution to the GDP in 2009 was 6% - a relatively high contribution in itself, One of the reasons identified by the industry for this was a failure by local businesses to secure or lead major Mauritian contracts, which could have been leveraged elsewhere, particularly in Africa. The other major factor for the inability to expand the IT-enabled services and BPO segments relates to the skills shortage that prevents local firms tendering or securing big local or international projects – at least not without significant foreign partnership, which the industry claimed seldom results in the kind of skills transfer that would allow Mauritian companies to win such contracts in the future. That being said, State Informatics Ltd. has created subsidiaries in Namibia and Zambia and believes that prospects in Africa remain promising.

Table 1 – 2011 target set in 2007 vs. 2010 milestones		
	2011 Targets set in 2007	2010 Milestones
Information Economy	Achieve a 7% contribution to Mauritius GDP from offshore ICT export services Employ at least 29,000 professionals in the ICT sector Employ at least 90% of those who graduate in ICT in the ICT sector Double the number of foreign investors into the ICT sector in Mauritius Complete Memoranda of Understanding for collaborative ventures in the field of ICT with countries of the region	Entire ICT sector contribution to GDP was 6%. Foreign investors increased from 150 to 300 in the ICT sector (Everest 2010) Several Memoranda of Understanding for collaborative ventures in the field of ICT with countries of the region recorded with Foreign Affairs
Information Society	Increased preference for ICT with at least 50% acceptance for services available online. Increase in PC ownership by at least 20,000 households, and 12,000 PCs in primary schools. Attain the target of 150 Public Internet Access Points (PIAPs) across the island. Achieve Internet Connectivity and Networking of all primary and secondary schools. Achieve at least 100% increase in enrolment at tertiary level in ICT courses over a period of five years. Increase in broadband penetration by at least 250,000.	Relatively slow e-government service take-up, but significant successes such e-filing of taxes and application for driver's licences. PC ownership per household stood at 102,500 in 2008 and 5,500 PCs in primary schools, 77 Public Internet Access Point across the island (and another 30 in the process of being setup) and 40 Computer Clubs in Women Centres and Youth Centres serving as access points and an additional 150 computer clubs in Social Welfare, Community Centres and Day-care Centres are being setup. All state owned primary schools are connected and networked through GOC. All private and public owned secondary schools are connected to broadband access. Enrolment at tertiary level in ICT courses has declined since 2007 and the number of graduates was not according to expectations. Broadband penetration increased from 61,000 in 2007 to 175,000 in 2009.

3.2 E-government

Although it is difficult to establish e-government usage without a dedicated survey of users, it is clear from the agencies responsible that uptake is very uneven, with the target of at least 50% acceptance for services available online unlikely to have been reached, even for the most successful services such as online driver's licence applications or tax returns. The reason for the success of such services is partially due to their usage by higher-income users who are well connected or always online.

Even these successful projects are not turnkey solutions. The driver's licence application form is only downloadable and cannot be submitted online. Services involving payment have not been implemented since the implications of this, such as vendor's commission for example, are still being analysed by the Treasury.

3.3 PC ownership

In 2006, household PC penetration stood at 81,070 of the estimated 335,000 households nationally. Although this had increased to 102,497 in 2008 from an estimated 342,800 households, already meeting the target, this target seems low. This figure needs to be further considered in the context of the distribution of domestic Internet connections. While PC ownership can enhance educational and domestic activities at home, the real value lies in the information and services that accrue from connectivity.

3.4 PCs in schools

There is now half of the target number of 12,000 PCs in primary schools (around 5,500). It does appear however, that all schools have PCs and are connected, though the level of networking is unclear. The Ministry of Education indicated that it is already using the network for schools management purposes and that it was available for shared teaching (Stakeholder interviews October 2010).

3.5 Increased tertiary-level enrolment

The target of achieving at least a 100% increase in enrolment at the tertiary level in ICT courses by 2011 is also a target that will not be met. In fact, there has been a decrease in enrolment in ICT courses at the tertiary level since 2007 and in the number of graduates, which has declined overall.

3.6 Public Internet Access Points

There are 77 PIAPs currently operating in Post Offices across the island country and contributing to the 2007 target to set up 150 Public Internet Access Points (PIAPs). There are an additional 16 PIAPs in the pipeline. There are also 40 Computer Clubs that have been set up in Youth and Women Centres to generate content and providing training, which are not yet fulfilling these functions but which do serve as basic access points. It is planned that 150 additional Computer Clubs will be set up in 2011 at various Social Welfare Centres. The supply-side driven establishment of aggregated public access, as part of universal service strategies, has been notoriously unsuccessful across the world, with a few notable exceptions. Where these do work successfully they are deeply imbedded in communities and they are

incorporated into collective activities or privately owned and entrepreneurially driven. Unless they are part of broader demand stimulation initiatives, IT literacy training programmes and in some instances micro lending schemes, they tend not to flourish and remain under utilised.

3.7 Broadband

Perhaps the most realistic target, possibly because it was a relatively new service in 2007 with the associated rapid initial diffusion, was that of broadband, which aimed for 250,000 subscribers by 2011. Broadband penetration has already increased from 61,000 in 2007 to 175,000 in 2009, and is on track to reach 250,000 subscribers by 2011. As this figure approaches the critical mass of 20% believed to pertain to broadband (much lower than the 40% in voice), when the network effects associated with economic growth and business innovation begin to be felt, it may start driving sector development. From a policy perspective in many developing countries however, this is where the broadband market starts to saturate because of high costs and bandwidth capping. If the country envisages the kind of information society and knowledge economy enjoyed by the most successful ICT economies of Asia such as South Korea, Japan and Singapore, the target should be around 40% of individuals (rather than homes – allowing for increased mobile broadband) with always-on connectivity. This is a tough target for Mauritius without the economies of scale and scope enjoyed by those densely populated countries.

3.8 Status of the NICTSP projects

The program was very ambitious, with some mismatch between objectives and the resources available to achieve them. Of the 124 projects, 32 have been completed or are likely to be completed by 2011, 34 have been instituted but are unlikely to be completed by 2011, and 28 were never started or were aborted. About 30 projects remain unaccounted for.

It would appear that many of the projects that were successfully completed were either already underway or planned, irrespective of the National ICT Strategic Plan. Project leaders do not generally perceive the projects as parts of a wider set of projects (unless they are specifically interlinked), but rather as a set of deliverables within their own sector, department or institution. Several projects were not undertaken (for example the creation of the National Technology Test Bed, Regional Anchor and Centre of Excellence) due to funds not being allocated for the projects. In some cases, there was no ownership of the project or buy-in by the implementing agency. Some hover between line Ministries and parastatals or other implementing agencies. Others were actively taken up by the responsible entity but

received no response from the principals, such as the universities, which responded to proposals but never had any feedback from the line Ministry. Likewise, HRDC submitted proposals on meeting ICT sector training needs that were not taken up.

The procurement rules were also identified as another factor contributing to delays in the completion of projects. The process was intended to make government procurement more transparent and fair. In practice, when a tender decision is challenged at the Independent Review Panel, the appellate body could take months to reach a conclusion. The COTS (Crime Occurrence Tracking System) is one such project that had taken more than a year to obtain a procurement decision, despite the legal requirement that the Independent Review Panel (IRP) reach a decision within 30 days.

Furthermore, the decision of the IRP is not binding on the public body. Because the IRP reviews the procurement process it does not have ICT technical expertise in its composition which some departments believed make assessing the merits of a case difficult. Those affected by these delays have proposed that the IRP should be able to draw on ICT expertise in making their decisions to provide a sectoral context that would improve tender decision-making.

One of the challenges in the successful implementation of projects is to strike the right balance between the priorities of the Ministry and budgetary constraints.

3.9 Monitoring and evaluation

The monitoring and evaluation committee set up to oversee the implementation of the NITCSP projects, faced difficulties in addressing some of the structural factors affecting non-delivery. The institutional review is intended to reinforce the overall monitoring and evaluation mechanism of the Ministry. Critical to the monitoring and evaluation exercise, is the regular updates of ICT indicators in a central repository. An ICT Indicators Portal as being developed by NICTERN is only as useful as the latest data on it. If data is absent or miscategorised, this can result in erroneous basis for monitoring and evaluation and ultimately policy formulation. The success of the policy, legal and institutional review to be undertaken is dependent on the information available on the sector. While the Central Statistics Office is recognised in the international community as an example of compliance with international indicator best practice, some of the international definitions and assumptions, developed within the context of the northern hemisphere, may not be applicable in the local ICT landscape. Moreover these definitions are sometimes incompatible with those of other local agencies like the Board of Investment on matters such as the

computation of employment in the BPO sector. In order to address the above challenges effectively, it is important that the Indicators Task Force which includes the CSO resolve some of the definitional conflicts and the gaps in the current reporting of data. This will also contribute to Mauritius meeting its WSIS commitments to the development of universal indicators and measuring the Information Society.

3.10 Approach adopted for the review of the NICTSP

Having reviewed the status of the 124 projects and identified the broad reasons for the non-completion of projects or their delay, the approach adopted has been to revisit the projects contained in the strategy as a whole, instead of revising the projects individually and those that have emerged since the NICTSP 2007-2011 was prepared[1]. Thus the review has focused on the following areas:-e-government, IT security, institutional review, open access and broadband. Instead of trying to reprioritise those projects not completed from the previous action plan to be completed by 2011– many of which have been overtaken by events, or are unlikely to be addressed until some of the fundamental institutional, funding or ownership/capacity issues identified as challenges are addressed, projects that need to be taken forward have been integrated into a new single framework. This is conceptualised in terms of an understanding of the ICT sector and the broadband phase of its development in particular, as an interdependent ecological system – an approach being adopted increasingly by governments with leading ICT sectors to deal with the challenges of this dynamic and critical sector of the economy.

See appendix 1 for status of NICTSP 124 projects.

4 PEST & SWOT

The political economy of Mauritius, like most other small island states, is determined by its remoteness from international markets and centres of trade, a dearth of natural resources. These, together with the small population size and therefore consumer market, and the resultant absence of economies of scale that are particularly pertinent to infrastructure industries, such as telecommunications, require policies and strategies customised to these constraints, and which optimise any benefits associated with smallness – such as realisable change. Despite this Mauritius has successfully undergone the transition from a low-income,

[1]Though the status of each project is reflected in Annexure 1

mono-crop economy (narrow production base at the time of its independence in 1968) to a middle-income country with a more diversified market structure and a focus in the last few years on the services sector.

4.1 Economic performance

Today, Mauritius' economy is largely dependent on four economic pillars. The first economic pillar is manufacturing, in particular textiles, which in 2009 accounted for nearly 19.4% of the country's Gross Domestic Product (GDP), and 43% of its exports (down 14% from 2008). The sector employs around 32% of the total labour force. Growth in the manufacturing sector declined by 0.6% from 3.2% in 2008, as the textiles industry experienced a lower demand from Europe due to the global economic recession (OECD, 2010, US Department of state, 2010, The World Bank, 2010).

The major agricultural export is sugar, which accounts for 25% of total exports. The sugarcane culture represents the second pillar of the Mauritian economy. Other traditional agricultural exports include tea, tobacco, flowers, cattle and fish. Sugar is exported mainly to Europe (France in particular) and the US.

Tourism represents the third pillar of the Mauritian economy. In order to attract tourists going to Singapore and Dubai, Mauritius aims to become a duty-free country. In 2009 the tourist sector contributed 8.7% to the economy. It has taken a decade of prioritisation to reach this level, and currently contributes only two to three percent more than the emerging ICT sector.

The fourth pillar of the economy is the services sector. Government of Mauritius (GoM) has successfully developed a foreign direct investment (FDI) led strategy, in the services industry, with the result, the island attracted more than 9,000 offshore entities, mainly from France and Britain, which have invested in tourism, real estate and the financial services sector. However, with the global recession really taking hold between 2008 and 2009, FDI experienced a decline of 32%, from an FDI net inflow of USD 378 million in 2008 down to USD 257 million in 2009 (The World Bank, 2010). With regard to the banking sector, Mauritius is one of the few African countries whose international reserves remain strong, despite some outflows in late 2009. Its domestic banks are profitable, well capitalised and liquid.

Even prior to the global financial crisis in 2009, the Government of Mauritius (GoM) undertook reforms and diversification of the economy. This has assisted the country in preparing the market for a recovery from the global economic recession. The aim of the

reforms was to make the country less dependent on external factors while increasing its competitiveness in the global market. A key focus of its recovery policy is to boost the deployment of high value-added services industry such as ICT.

Table 2 –Macroeconomic indicators				
	2007	2008	2009	2010
GDP growth	5.5%	5.1%	3.1%	4.2%
GDP Per Capita, PPP (current international $)	11,669	12,441	12,858	
CPI inflation	8.8	9.7	2.5	4.5
GDP composition by sector (2009, Tourism, 8.7%)	Agriculture 5%	Agriculture 4%	Agriculture 4.5%	
	Manufacturing 20%	Manufacturing 20%	Manufacturing 19.4%	
	Services 67%	Services 67%	Services 70.5%	
Exports of goods and services (annual % growth	3.4	2.6	-12.6	
Imports of goods and services (annual % growth)	2.0	2.0	-5.4	
Main export	(2009 est.) $ 2.055 billion f.o.b. Textiles and clothing, sugar, cut flowers, molasses, fish			
Export destinations	UK (35.1%), France (14.4%), USA (7.7%), Madagascar (6.3%), Italy (5.8%)			
Main imports	Manufactured goods, capital equipment, foodstuffs, petroleum products, chemicals			
Import origins	UK (27%), Other (27%), France (16.6%), South Africa (3.3%)			
Source: BMI-T, 2010, CIA, 2010, OECD, 2010, US Department of State, The World Bank, 2010, CSO 2009				

The economic reform programme started in 2006 with the aim of shifting Mauritius from reliance on traditional trade preferences to global competitiveness. The reform programme was aimed at abating weaknesses and facilitating market entry mechanisms in order to improve the investment climate and to attract FDI and expertise. In addition, the GoM actively promoted ICT as a fifth pillar of its economy and aimed to attract foreign investors in the emerging ICT economic sector. The objective of the reform programme was to

diversify its $10 billion economy and to reduce the heavy dependence on tourism, textiles and sugarcane exports.

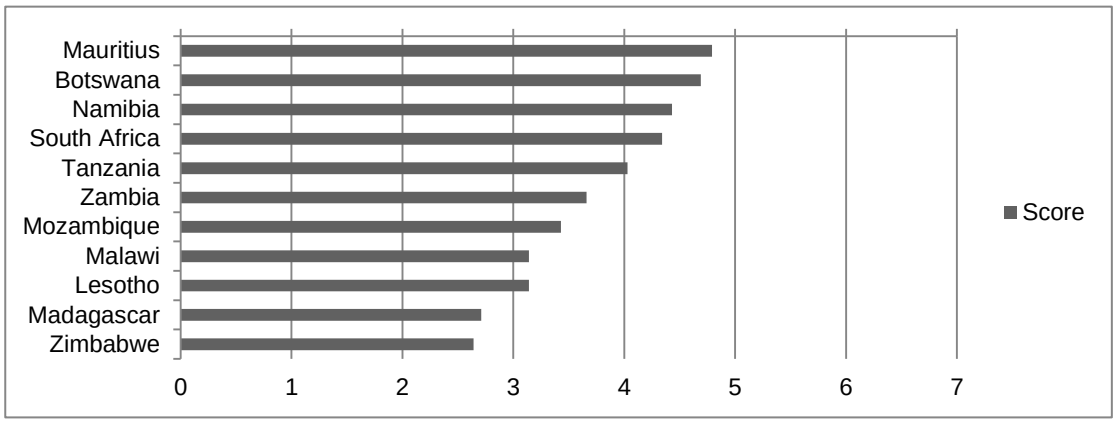
Until 2008, when the effects of the global recession really began to be felt, Mauritius had seen considerable economic growth, averaging rates above 5% in 2007 and 2008. However, Table 2 shows that despite substantial government stimulus packages, GDP growth increased by 3.1% during 2009, well below the previous year's 5.1%. According to the International Monetary Fund (IMF) however, the Mauritian economy is expected to hit 5% again by 2011. Temporary and well-targeted government packages include fast-tracking public expenditure projects such as new infrastructure programmes, accelerating private sector investment and cutting prices of flour, bread and gas.

The ICT sector is seen as a priority in achieving national economic growth as well as wealth and employment creation. While ICT is increasingly seen as a significant sector in itself, it is important for strategic purposes to understand that it is critical to all other sectors, specifically the services sector. With ICTs cross-cutting all the other four pillars of the economy and information infrastructure being a critical part of any modern economy, if this critical pillar performs sub-optimally, the implications for the broader economy and society are severe. Information and communication infrastructure have therefore become essential for the integration of national economies into the global economy, a key aspect of the competitiveness of nations. The commitment to the development of a world-class ICT sector is one of the primary contributing factors to Mauritius' rise in global economic indices.

Mauritius has one of the most competitive economies in Africa. According to the Global Competitiveness Index 2010/2011[2], Mauritius ranked 55th in 2010/2011, up two places from 2009/2010. This made it the second best performing African country after South Africa, which ranks only one position above. Mauritius benefits from stable and reliable institutions and an efficient government, and a sound financial market which is effective in allocating resources. The figure below depicts the effectiveness of law-making bodies. Mauritius attained top position within the SADC region.

[2]An index developed by the World Economic Forum that ranks the competitiveness of countries based on different factors such as investment in physical capital and infrastructure, education, training, and technological progress.

Figure 1: Effectiveness of law-making bodies



How effective is your national parliament/congress as a law-making institution? (1 = very ineffective; 7 = very effective, among the best in the world). 2008/2009 weighted average.

Source: World Economic Forum 2010.

The GoM policy aims at facilitating business while production is largely left in the hands of private entities. The objective of the GoM is to rank among the top ten most investment and business-friendly locations in the world. The World Bank *Doing Business 2011* report ranks Mauritius first in Africa and 20th out of 183 economies analysed, ahead of France, Germany and the Netherlands. Mauritius managed to create a favourable investment environment through the reduction of the corporate income tax rate from 25% to 15%, and the removal of exemptions and industry-specific allowances in 2006. Consequently, corporate income tax revenue grew by 27% in 2007, and in 2008/2009 it increased by 65% (The World Bank, 2010).

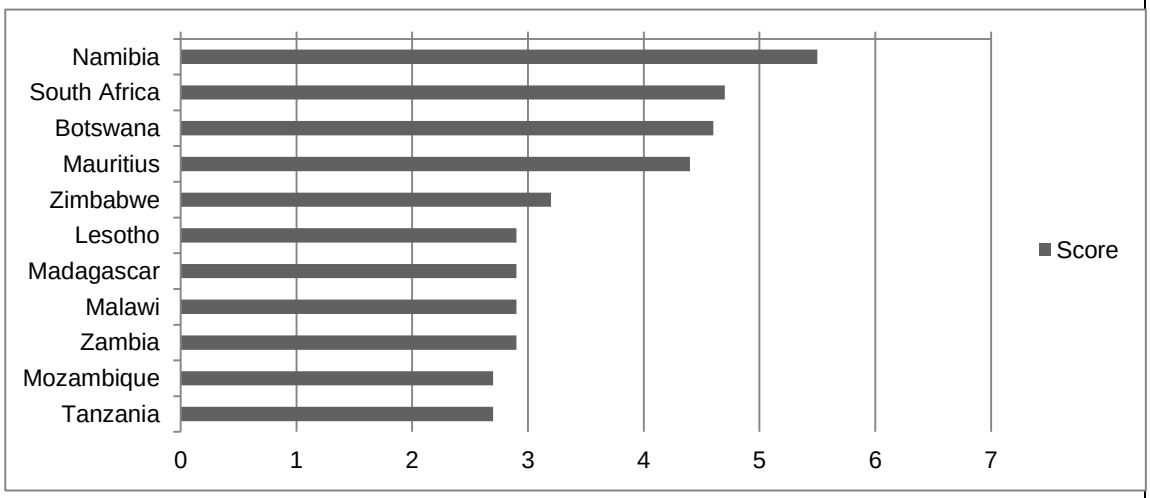
Despite these developments, the state continues to have a major influence in the economic orientation of the country. Other than telecommunications, most public utilities remain state-owned. Furthermore, the State Trading Corporation, a parastatal organisation, controls imports of several products such as rice, flour, petroleum products, and cement. In ICT specifically, the state continues to own 51% of Mauritius Telecom, all free-to-air TV channels through the Mauritius Broadcasting Corporation. According to the Networked Readiness Index[3]2009/2010 (World Economic Forum, 2010), Mauritius is the best performing country in

[3]The NRI is comprised of three components, namely the environment for ICT offered by a given country or community, the readiness of the community's key stakeholders (individuals, businesses, and governments) to use ICT, and finally the usage of ICT amongst these stakeholders

ICT capability and leadership in the sub-Saharan region. The country has a first-class market environment (31st position out of 133 economies analysed) characterised by a non-distortive tax system and ease of starting a new business. To start up an economic activity it takes an average of six days (12th position) and only five procedures (22nd). The political and regulatory environment (ranked 31st) is also assessed as being conducive to ICT development. However, laws relating to ICT need to improve, since in this regard the country ranked 52nd. Its ICT market is however recognized as very competitive (1st position), in particular in the Internet and telephony providers segment.

The GoM is recognised as prioritising ICTs, as it is envisaged as a major pillar of the national economy. However, the infrastructural environment remains a concern since the quality of the overall infrastructure ranks only 84th. Critical factors related to the development of telecommunications infrastructure have a relatively low score. For instance, with regard to the accessibility of digital content, Mauritius ranked 80th, while as regards the availability of scientists and engineers the country achieved only 107th position, and according to tertiary education enrolment, 97th. With regards to the overall quality of infrastructure, Mauritius is positioned fourth, behind Namibia, South Africa and Botswana among SADC countries. These figures not only reduce its overall ranking, but hinder sector performance and global competitiveness.

Figure 2: Quality of overall infrastructure in SADC countries.



How would you assess general infrastructure (e.g., transport, telephony, and energy) in your country? (1=extremely underdeveloped; 7=extensive and efficient by international standards). 2008/2009 weighted average.

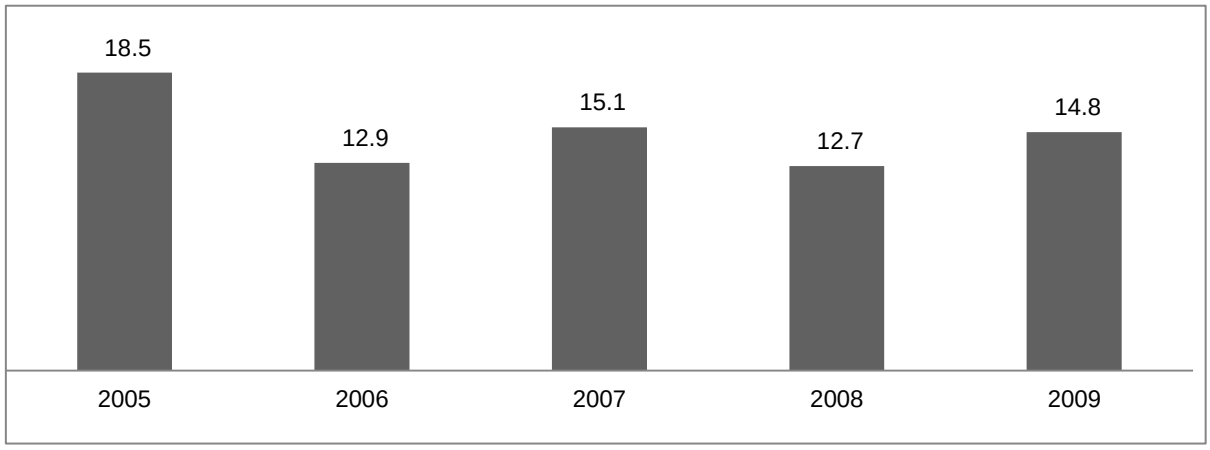
Source: World Economic Forum 2010.

Major policy considerations to stimulate investments in infrastructure and education are therefore critical to supporting the shift towards a more service-oriented economy, especially since the country plans to be a regional ICT hub.

4.2 ICT contribution to GDP

Historically, the ICT sector has not contributed significantly to Mauritius' overall GDP. However, since the entry of new mobile market participants, improved provision of services and the introduction of reform policies and new regulations have stimulated competition. This has produced double-digit growth, though this has declined during the review period with the onset of the global economic crisis in 2008, dropping nearly two points between 2007 and 2008.

Figure 3: ICT Sector Growth Rate (%)



Source: Central Statistics Office gave a 5.3 percent of value added to GDP in 2005, the figure has reached 5.7 percent in 2009, being the highest ever achieved (NCB 2010).

Over the last five years outsourcing to Mauritius has also increased considerably. As a result, the ICT sector has become a strategic sector to ensure Mauritius' success internationally in the business process outsourcing (BPO) market and overall growth of the economy (OECD, 2010). Despite the global economic downturn in 2008, telecommunications revenue as a percentage of GDP increased to 3.6% from 3.4% in 2007 (World Bank) with growth rates outstripping national growth by 200%, suggesting room for expansion within the sector.

It is expected that the contribution to GDP from the ICT sector will exceed 6% in 2010 as the recession begins to turn. As observed in table 4 below, the ICT sector contributed around Rs14, 000 million for the year 2009, which represents a 13% increase over 2008. Recent

forecasts by CSO predict that the value added to GDP from ICT will reach around Rs16, 000 million by the end of 2010; that is, nearly twice the figure in 2005 (NCB 2010).

Besides the general difficulties associated with assessing the value added in this cross cutting sector (and which traditionally just focused on telecommunications), the BPO sector is not included as part of the ICT sector but rather as part of the general services sector. It is difficult therefore to get a disaggregated figure from the statistics to accurately reflect the contribution of the BPO sector to the ICT sector and therefore increased contribution to the economy. A recent study however indicates that the ITES-BPO industry generated revenues of more than Rs8 billion annually (Everest 2009).

Table 3: Growth rate in ICT sector relative to GDP growth rate

	2007	2008
Growth rate in ICT sector	14.9	12.6
GDP growth rate	5.5	5.0

Source: CSO estimates 2004-2008

Table 4 – Value add by ICT sector to GDP

Indicators	2005	2006	2007	2008	2009
Value Added by the ICT sector as a % of GDP	5.3	5.4	5.5	5.3	5.7
Value Added in the ICT sector (Rs Million)	8,600	9,900	11,300	12,400	14,000

Source: Central Statistics Office 2010, NCB Report 2010

4.2.1 Employment

Over the years the number of people employed in the sector has risen, with the increased number of companies operating in the ICT sector having had a direct impact on employment. The CSO indicates that the sector employs about 12,000 workers, but this excludes some employees from some areas of the fast growing BPO sector that do not fall into their definitions of the ICT sector. The Central Statistics Office does not include companies employing less than 10 persons in its survey. These figures are far more conservative than those of OTAM and the Board of Investment. In the latter's latest survey of the IT-BPO sector, by Everest (2009), they estimate such figures for the BPO sector alone and believe the figure is closer to 15,000. The NCB, on consideration of the data from these sources, estimates the number in the entire sector to be between 15,000 and 20,000. This suggests that the target for the sector, of employing 29,000 workers by 2011, may be on track.

The problem is that the various interested entities have different definitions for the ICT sector. An example of this is the BPO sector, in which both figures relating to employment and revenues varies from reporting agencies and the industry.

Thus, in order to provide a realistic estimate of employment in the ICT sector and in order to accurately determine progress towards the 29,000 target set for employment in the ICT sector and so that it can be matched up with an adequate supply of professionals, it is recommended that an "ICT Workforce Survey" be carried out. The results of this survey will provide a single point of reference and reliable source for employment estimates in the ICT sector. The arising report would also recommend, through a proper demand and supply analysis, the pool of skilled labour that the country will require to achieve the targets set for the sector.

National Information Technology Workforce Survey*

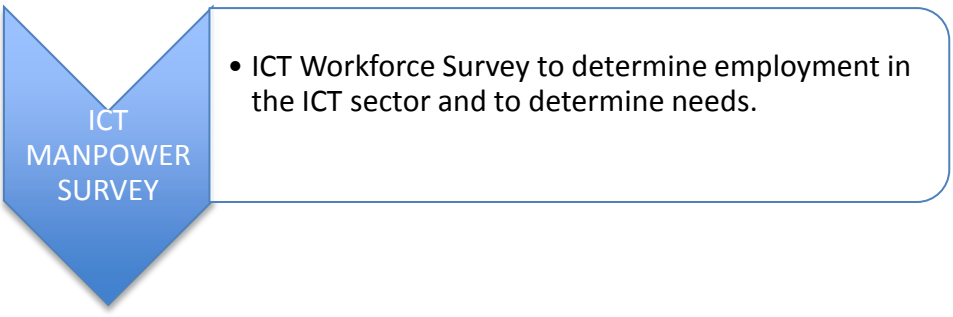
At present the quantity and quality of information about employment prospects as well as the demand-supply scenario in Mauritian ICT industry is, in general, limited and fragmented. This has been identified as a significant barrier to the development of the ICT industry sector. Therefore, it is necessary to take steps to initiate a very specific survey that would deliver a very comprehensive picture of the information technology workforce in the country. The goal of significantly improving the capabilities and skills of ICT professionals in Mauritius and matching them with industry needs will be boosted by this survey, which will, inter alia, enable:

- The IT industry, ICT user organizations and the Government to gain a realistic picture of the overall demand and supply of IT human resources
- Universities and other IT training institutions to improve their offerings
- Students to make better course selections
- Graduates and diploma holders of IT to have a greater probability of employment
- Potential investors to have vital human resource related information that will help them make their investment decisions
- The overall size, geographical distribution and organizational distribution of the IT workforce to be ascertained
- Demand over the coming twelve months as well as the anticipated gap between supply and demand to be predicted

The survey will produce the following information:

- Employment opportunities - by IT skills set
- What types of education and training are needed to obtain IT jobs and how they could be best obtained
- Best methods in use for retaining IT and relevance of knowledge of information security for IT workers
- Survey of all key training organizations including universities to obtain a better understanding of the supply side of IT graduates and diploma holders
- Starting salaries for benchmarked skills

**Based on "Geared for Growth" – National IT Workforce Survey Report of Sri Lanka*



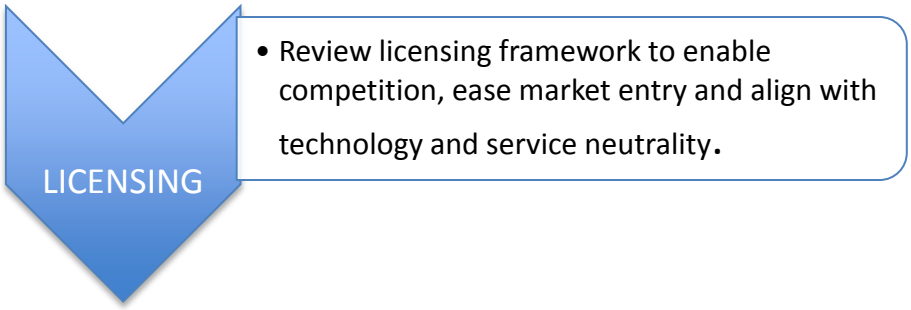
4.3 Regulatory Framework

Despite the lack of an overarching regulatory framework, and unlike most other small island states which lack regulatory capacity, Mauritius has established a strong reputation for effective regulation in the area of telecommunications, as witnessed by its premier position in sub-Saharan Africa on the ITU Development Index. Despite these gains, the Information Communication Technologies Authority of Mauritius (ICTA) was established in terms of the ICT Act of 2001 over a decade ago. This Act, together with the Electronic Transactions Act of 2000, have not, apart from some ad hoc amendments, been comprehensively reviewed or aligned with global developments in this dynamic sector. The institutional arrangements embodied in the Act, may create a conflict of interest in the formulation of policy by the Ministry for the sector as long as it is also the representative of the state in significant shareholdings within the incumbent. Further, the present legal framework can be perceived as a constraint on the part of ICTA from acting autonomously of Government and industry influence in its exercising of its mandate. This includes regulating all ICT related issues, including radio spectrum, numbering, quality of service, infrastructure and services, licensing, competition, interconnection and tariffs, and has recently taken on several Internet governance issues such as the public key infrastructure implementation.

4.3.1 Licensing

The ICT regulatory authority has played an active role in creating a competitive environment since the liberalisation of the sector, when a new licensing regime was established and three categories of activities became subject to licenses. These include infrastructure provider, networking services provider and network application provider. The licensing framework now needs to be modernized into a technology-neutral and service-neutral licensing regime with more class licensing and exemptions to enable market entry and to optimise the consumer and business benefits of converging technologies and technology innovations. This will align Mauritian licensing practices with ICT markets in other parts of the world and with the proposed SADC model policy and law.

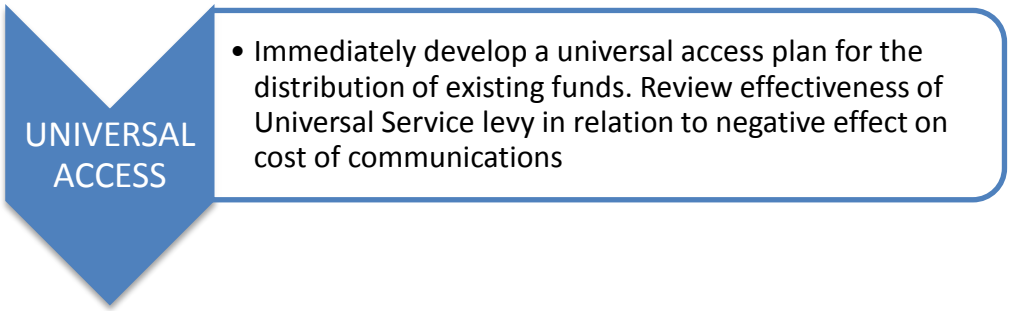
Table 5: Licences in Mauritius	
Public Switched Telephone Network (PSTN)	Mahanagar Telephone (Mauritius) Ltd.
	Mauritius Telecom Ltd.
Network Infrastructure Provider Licence (A)	Multi Carrier (Mauritius) Ltd
	National Computer Board
Public Land Mobile Network (PLMN) Licence	Cellplus Mobile Communications Ltd.
	Emtel Ltd.
	Mahanagar Telephone (Mauritius) Ltd.
International Long Distance (ILD) Network Licence	City Call Ltd.
	Data Communications Ltd.
	Equant (Mauritius) Services Ltd
	Emtel Ltd.
	Hot Link Co. Ltd.
	Mahanagar Telephone (Mauritius) Ltd.
	Mauritius Telecom Ltd.
	T@Media.Com Ltd
	TLC(Mauritius) Ltd.
Internet Service Provider Licence	Africa Digital Bridges Networks Ltd.
	Cellplus Mobile Communications Ltd
	City Call Ltd.
	Data Communications Ltd.
	Enterprise Information Systems
	Emtel Ltd.
	I-Telecom Ltd
	Kaldera
	Mahanagar Telephone (Mauritius) Ltd.
	Mauripost Net Ltd.
	Mauritius Computing Services
	MFDC Ltd.
	Paging Services Ltd.
	Telecom Plus
Value Added Services Licence	Mauritel Services Ltd
	Mauritius Telecom Ltd.
	PlaySMS Ltd.
	Telecom Plus Ltd.
Source: ICTA 2009 Annual Report	



4.3.2 Universal access

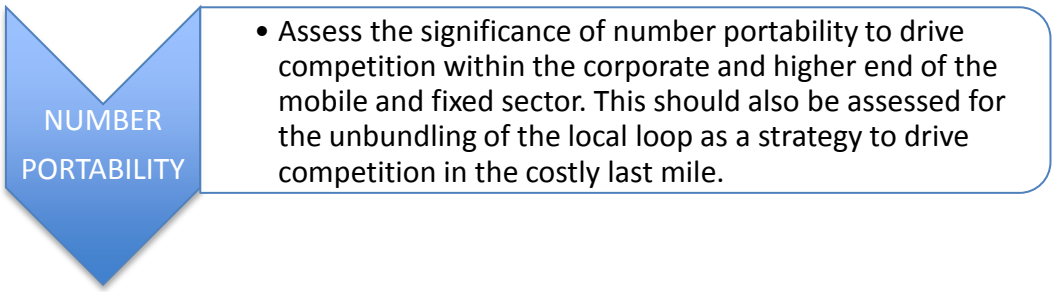
Provision for the establishment of a universal access fund is made under the ICT Act of 2001. Following several consultations with various stakeholders, universal access fund regulations came into effect in September 2008 (CRASA Report, 2009). The fund is aimed at providing access to communication services to citizens in poor regions of the country. Operators are required to pay an annual fee to the fund. In October 2010 the Government amended the Universal Service Fund regulation of 2008 with effect from the 1 November, so that USD0.025 levy is charged of every minute of the duration of an international call, which the public operator terminates in Mauritius. The exact purpose of this seems unclear and although it is a relatively small amount it seems to counter efforts to keep call charges as low as possible for the BPO and call centre sectors.

Further, it has kept the price of incoming international calls artificially high, creating an opportunity for arbitrage by bypassing the local licensed operators who stick to this minimum rate and undermining their business case.



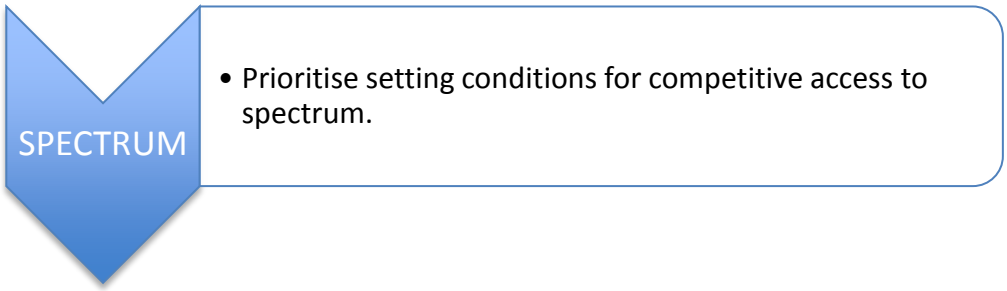
4.3.3 Numbering

In December 2008, the Authority announced a decision to migrate mobile telephone numbers from 7 to 8 digits following a public consultation in September 2008. A committee has been set up to oversee the implementation of the new numbering plan (CRASA Report 2009:13). ICTA drafted national numbering guidelines for the management of numbering within the country, including migration to the 8-digit numbering plan (CRASA Report, 2009) the implementation of which has been budgeted for.



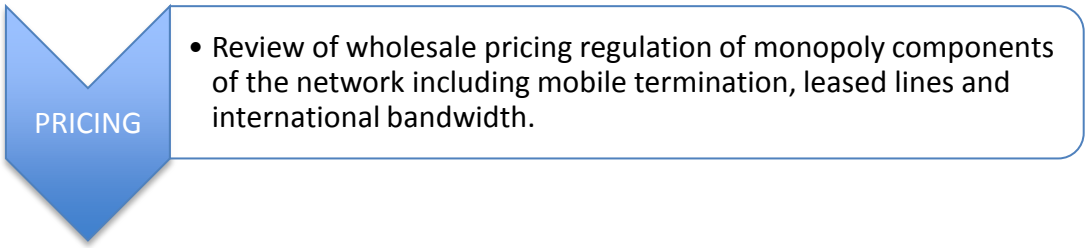
4.3.4 Spectrum Management Reform

In a developing country, access to spectrum is a critical dimension for any broadband extension strategy. ICTA aims to implement a flexible, technologically and service-neutral spectrum regime in line with the trend towards convergence of technologies (CRASA Report, 2009). The authority further aims to enhance spectrum management functions to include newer concepts of spectrum auctioning and trading (ICTA Annual Report, 2009). ICTA has embarked on spectrum audit and plans to improve its spectrum monitoring capabilities.

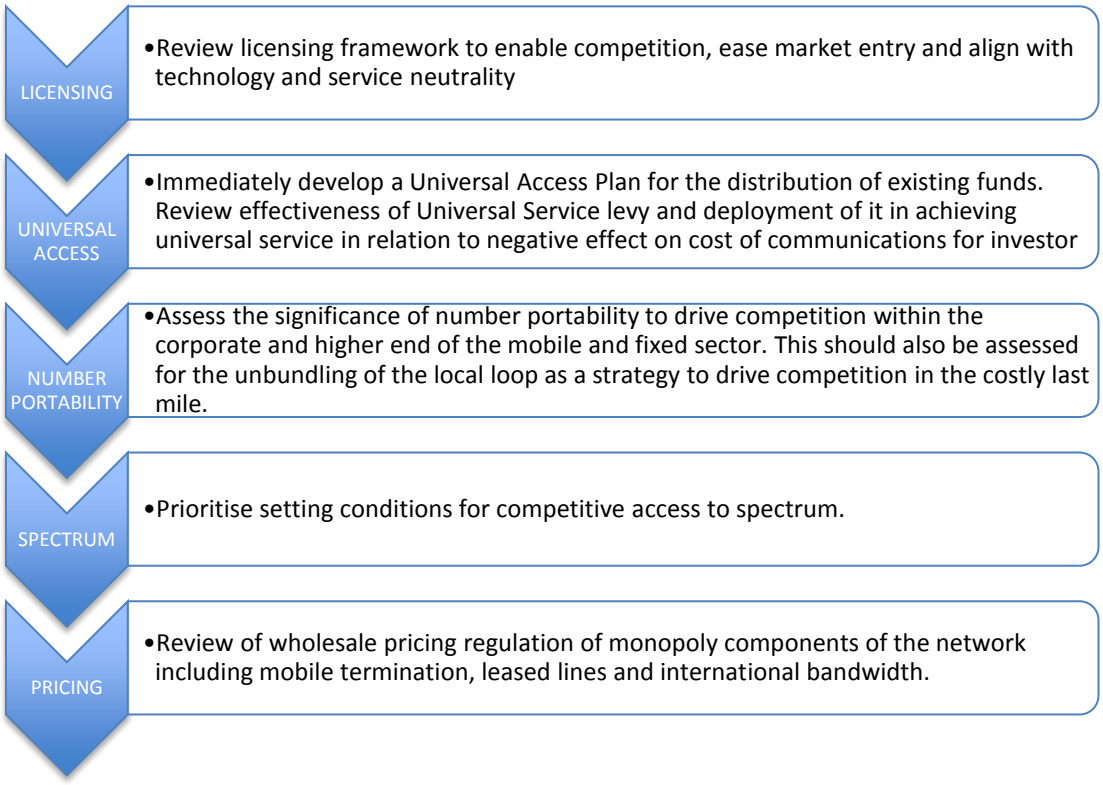


4.3.5 Interconnection

The regulatory authority in Mauritius is responsible for regulating interconnection fees between operators. A number of measures have been introduced since the liberalisation of the telecommunications sector to ensure fair interconnection rates for new market entrants. In 2006, the regulator set a minimum charge for international calls terminated in Mauritius. In 2008 cost-based charges to fixed-line operators were introduced. At present, ICTA is working on a long-run-incremental cost (LRIC) termination model (Stakeholder interviews 2010, CRASA Report, 2009).



4.3.6 *Summary of regulatory interventions*



5 Market analysis

5.1 Market structure

The market is structured around vertically integrated operators despite the horizontal licensing structure. Although the licensing framework is intended to be technologically neutral in order to encourage innovative technology and services, operators are confined to rigid categories in terms of service provision. With the trends towards convergence of technologies and the introduction of innovative services like triple play and mobile television, the regulator has proposed the adoption of a more flexible horizontal licensing paradigm, but this has yet to be put into practice (Stakeholder interviews, ICTA Annual Report, 2009).

5.2 Market operators

There are currently two fixed-line operators in Mauritius. These are Mauritius Telecom and Mahanagar Telephone [Mauritius]). Mauritius Telecom has about 95% of the market share, with around 360,000 lines. Mauritius Telecom was privatised in 2000 after it sold 40% of its shares to France Telecom. The Government of Mauritius, the State Bank of Mauritius, the National Pensions Fund and employees of Mauritius Telecom hold the remaining 60% of the company's shares. There are three mobile operators in the country. Emtel was the first

operator to enter the market in 1989. Orange Mauritius is a subsidiary of the parent company Mauritius Telecom, and entered the market in 1996. The third operator, MTML, is a subsidiary of the Indian international carrier Mahanagar Telecom Nigar Limited, the second fixed-line operator. It was licensed in 2005 and launched its operations in 2007 under the brand name Mahanagar Telecom Mauritius (MTML). The company provides both fixed and mobile services over a CDMA platform (ICTA Annual Report, 2009), but with all the usual problems facing new entrants in a well-established market with dominant players, has yet to make its mark on the market with only a 10% share. This is unlikely to rise significantly without competitive interventions by the regulator to level the playing field such as number portability, cost-based interconnection rates and the unbundling of the local loop.

5.3 Access

While Mauritius excels in the African context in terms of access to services, it does not compete in the broader global environment. Seychelles and South Africa are ahead of Mauritius in two indicators: mobile per 100 inhabitants and Internet bandwidth. However, Mauritius is in a much better position as far as teledensity and the proportion of households having a computer and Internet are concerned (NCB 2010).

Table 6: Access Index 2008

Countries	Telephone Lines Per 100 Inhabitants	Mobile Per 100 Inhabitants	Internet Bandwidth Per Internet User	Proportion of Household with PCs	Proportion of Household with Internet
Australia	44.5	105.0	10'855	74.9	66.6
France	56.4	93.4	65'017	68.4	62.3
Hong Kong	58.7	165.9	817'848	74.6	70.9
India	3.2	29.4	1'485	4.4	3.4
Korea (Rep.)	44.3	94.7	5'975	80.9	94.3
Madagascar	0.9	25.3	490	2.5	1.0
Mauritius	28.9	82.0	1'638	30.0	20.2
Seychelles	26.6	111.5	2'198	25.0	13.0
Singapore	40.2	138.1	66'578	80.0	76.0
South Africa	8.9	90.6	2'380	15.9	5.2
UK	54.2	126.3	77'179	78.0	71.1
USA	49.6	86.8	21'403	72.5	62.5

Source ITU 2010

5.3.1 Fixed

Table 7 – Fixed-Line Coverage		
Fixed Line subscribers (business /residential	361,300	364,500
Fixed line subscribers per 100 inhabitants	28.6	28.9

Source: Economic and Social Indicators: Information and Communication Technologies (ICT) statistics – 2009

Unlike most other fixed-line operators in Africa, fixed-line access has continued to grow in Mauritius, although at a slower rate. The slowdown is due to the substitution effect of mobile phones that have risen in popularity (ICTA Report 2009). Fixed-line penetration in Mauritius remains much higher than the average fixed-line penetration rate in Africa, which stood at less than 3 percent in 2009 (Calandro, Gillwald, Moyo and Stork, 2010). This can be attributed partially to higher levels of GDP per capita, and to the small size of the country and relatively easy geography to service. In addition, Mauritius is located in a strategic position for trade between Africa and Asia. Development of fixed-line infrastructure has been imperative for commercial purposes and Internet access to the rest of the world.

5.3.2 Mobile

Table 8: Mobile Coverage∗			
	2007	2008	2009
Mobile subscribers	928,600	1,033,300	1,086,700
SIMs per 100 inhabitants	73.4	81.2	85

Source: Economic and Social Indicators: Information and Communication Technologies (ICT) statistics-2009

∗Duplicate SIMS should be taken into account assessing the diffusion and progress towards universal access.

The mobile market has experienced significant growth levels since the market opened up to competition. Like most developing countries, Mauritius is characterised by multi-SIM usage, which suggests that the penetration rates, whilst high, are lower than is stated in official statistics, which equate SIMS sold with users. Despite the over-counting resulting from this, it is evident that there has been a rapid growth in the adoption of mobile services, and there has been considerable growth since 2007.

5.3.3 Internet

Table 9: Internet Coverage			
	2007	2008	2009
Internet subscribers	166,000	199,500	286,000
Internet subscribers per 100 inhabitants	13.1	15.7	22.4
Fixed internet subscribers	87,600	94,700	107,000
Fixed internet subscribers per 100 inhabitants	6.9	7.4	8.4
Mobile internet subscribers	78,400	104,800	179,000
Mobile internet subscribers per 100 inhabitants	6.2	8.2	14.0

Source: Economic and Social Indicators: Information and Communication Technologies (ICT) statistics – 2009

Internet penetration has increased significantly with the penetration rate doubling between 2007 and 2009. The mobile Internet rate has been driven by the rapid adoption of mobile Internet services. The number of mobile Internet subscriptions per 100 inhabitants surpassed the fixed-line subscribers per 100 of the population in 2008. By 2009, the mobile Internet penetration rate was almost doubled than that of fixed-line Internet.

5.3.4 Broadband

Table 10: Broadband Access			
	2007	2008	2009
Broadband subscribers (3G and ADSL)	119,000	157,300	254,300
Broadband subscribers per 100 inhabitants	9.4	12.4	19.9

Source: Economic and Social Indicators: Information and Communication Technologies (ICT) statistics-2009

Table 10 above depicts the number of broadband subscribers and the number of broadband subscribers per 100 inhabitants. Broadband Internet penetration is in its developmental stages. According to ICTA, broadband is defined at a speed equal to or greater than 128kbps (and this is the figure used by the statistics office). This is half the speed prescribed by the ITU, which suggests that according to international standards, broadband penetration rates are lower than is accounted for in official statistics. Moreover, broadband penetration is expected to increase with investment aimed at developing the ICT sector in Mauritius.

5.4 Pricing

The OECD basket methodology used in this comparison study is based on the 2006 definitions (OECD 2006). Generally, the basket methodology has strengths and weaknesses. Strengths include the ability to compare operators' products. This allows benchmarking of countries, operators and products. The basket methodology, applied consistently, allows consumers to compare products and operators. The weaknesses include the following:

OECD baskets do not take into account the number of people on each package and actual minutes of use for each package. There is no average consumer and actual consumption patterns of an individual might be reflected poorly. An alternative would be web-based tariff calculators that ask users to input their actual consumption patterns (Calandro et al, 2010).

The same basket is used for all operators while subscribers of smaller operators are likely to have a different off-net/on-net ratio compared to larger operators.

Table 11 below depicts prepaid products of operators in South Africa, Mauritius, Kenya and Namibia. Kenya has the lowest pricing for all operators across the three user baskets because of the competitive retail market and the regulated termination price (CCK 2010).

Table 11: Prepaid products low, medium, high user baskets in USD November 2010 (cheapest by operator)

	Prepaid Mobile	Low User in US$	Medium User in US$	High User in US$
South Africa	Vodacom	11.07	26.15	55.51
	MTN	13.26	31.83	68.43
	8ta	10.55	24.93	52.04
	CellC	11.70	27.77	59.20
	Cheapest in Country	10.55	24.93	52.04
Mauritius	Emtel	3.85	9.42	21.18
	Mauritius Telecom	3.86	9.44	21.24
	MTML	2.30	5.68	12.99
	Cheapest in Country	2.30	5.68	12.99
Namibia	MTC	13.82	33.55	73.19
	Telecom Namibia	4.42	11.18	26.24
	Leo	7.82	19.49	43.18
	Cheapest in Country	4.42	11.18	26.24
Kenya	Airtel	2.09	4.96	10.57
	Safaricom	6.36	14.75	29.88
	Orange	1.90	4.37	9.10
	Yu	2.09	4.96	10.57
	Cheapest in Country	1.90	4.37	9.10

5.4.1 Internet

Mauritius has put in place several of the necessary levers required for the benefits of broadband to be realised in the economy and society. It has sought to identify the necessary conditions for attracting critical investments in infrastructure extension, and the optimal

market structure and institutional arrangements, together with identifying demand stimulation strategies, which are essential to ensuring digital inclusion. However, the size of the market, the dominance of the incumbent, and remaining regulatory risks arising from the institutional arrangements have meant that the second backbone operator could face all the traditional difficulties of market entry and effective competition.

Although Mauritian retail prices are generally very competitive, some of the monopoly elements of the network and therefore the services offered does not reflect strong competitive pressure. After remaining at the same price of Rs. 1360 for three years from 2006 to 2008, the price of Home ADSL 512 was reduced to Rs. 848 in 2009 and Rs. 759 in 2010, which appears to have been accompanied by improved take-up of this service. This is really the lowest real broadband on offer, as ADSL 128 is way off the lowest standard definitions (ITU threshold speed 364).

Table 12: ADSL prices

Internet Services	2003	2004	2005	2006	2007	2008	2009	2010
ADSL 128 – Home	1499	1316	990	750	750	750	750	-
ADSL 128 - Business	2500	2500	1900	1860	1860	1860	-	-
ADSL 512 – Home	2500	2178	1590	1360	1360	1360	848	759
ADSL 512 - Business	5500	5500	3600	3190	3190	3190	2860	2745
ADSL 1 MEGA – Home	-	-	-	-	-	-	1549	1354
ADSL 1 MEGA – Business	-	-	-	-	-	-	5735	5620

Source NCB 2010

Using a common middle level speed of ADSL 512 kbps for comparative purposes, Mauritius scores very well in terms of lowest price offering against both South Africa and Telecom, who were also relatively early adopters of ADSL on the continent.

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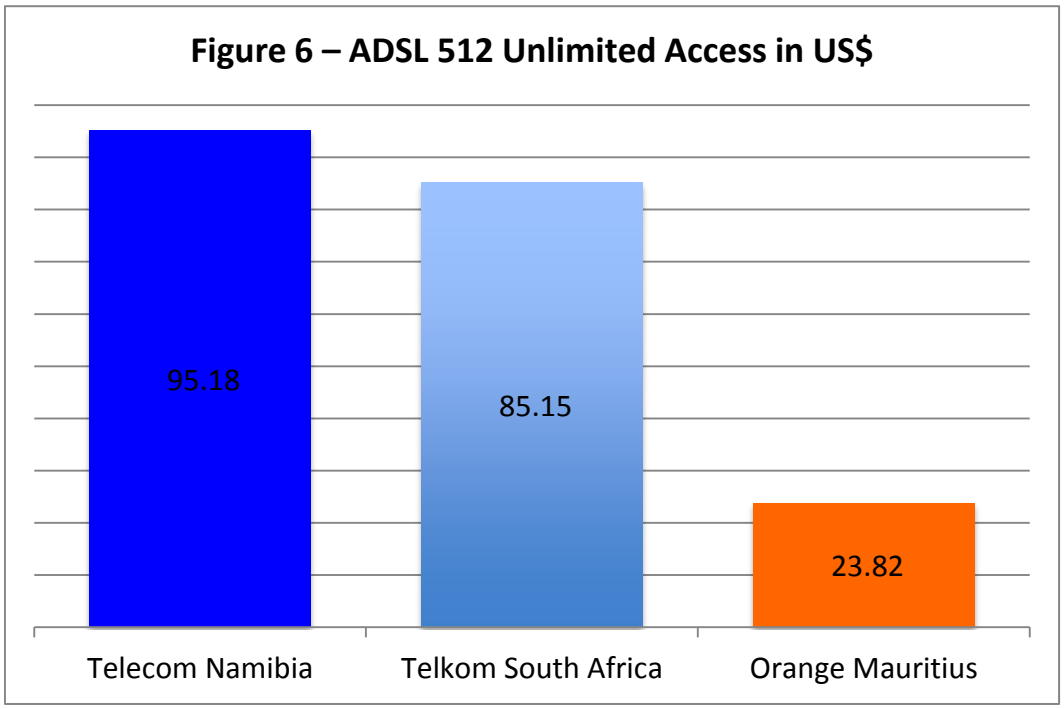


Source: Research ICT Africa 2010

5.4.2 International Bandwidth

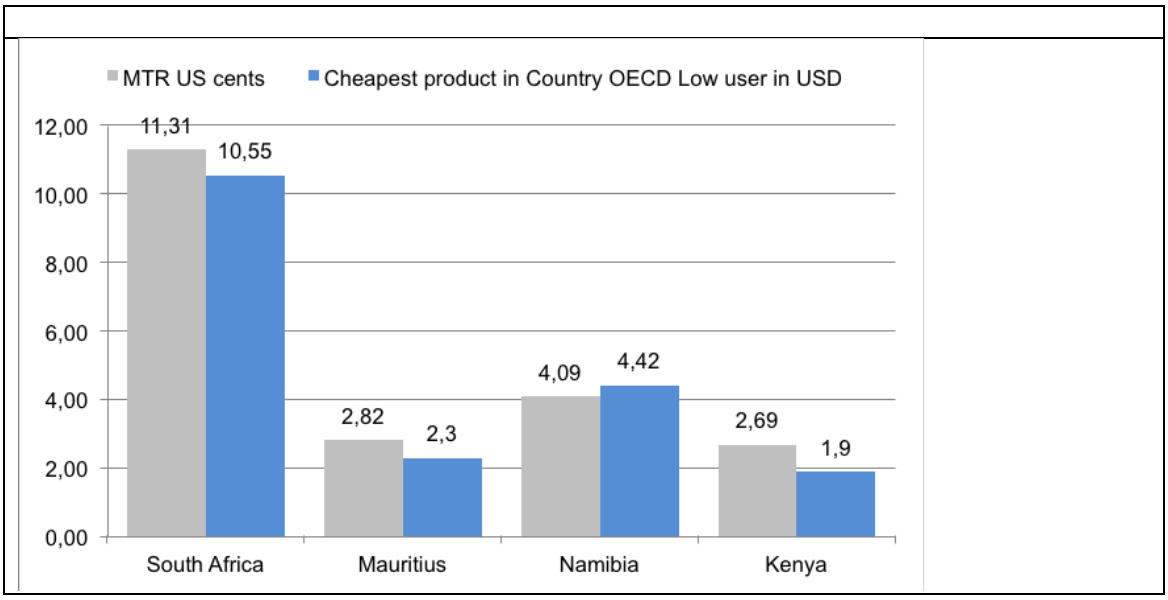
In 2006, Mauritius Telecom was charging as much as US$12,600 for an E1 full circuit (2 mbps). With the commitment of Government to the creation of a cyber island and developing the BPO sector the regulator issued a price determination that gave an overall reduction of around 25%. The new price for an E1 was US$7,900 and there was a five-tier volume discount with a 25% discount on the E1 price for over ten E1s and above. The latter was only likely to be of relevance to two to three customers on the island. The highest level of discount represented a 47% decrease on the original price. It further reduced its tariff in September 2007 to US$6,300 (Southwood, 2008).

Although at the time, with only the SAT 3 cable available on the continent, this made Mauritius' price competitive, the price for an E1 circuit remained constant for three years and it was only in 2009 that it was further reduced to US$4900. With the introduction of cable competition to the continent, cable prices have plummeted. Even the proposed reduction to US$4,100 in 2011 is unlikely to reduce prices sufficiently to compete with cable rates offered by the new undersea cable entrants to the previously unserved east coast of Africa; Seacom and EASSy, and which will set the reference price for the new WACS cable, which is meant to be commissioned in 2011.

5.4.3 Interconnection

The success of mobile competition and the low retail prices enjoyed by consumers in Mauritius has been the consequence of enforcement of cost-based interconnection. (Telecommunication Directive 1 of 2008 – Interconnection Usage). As can be seen from the figure below, Mauritius mobile termination charges are amongst the lowest on the continent. This has recently been overtaken by Kenya whose recent price determination which has slashed termination rate. It is to be noted that Senegal has the lowest mobile termination rate, which is set at US$2,25 cents.

Figure 4 – Mobile terminations rates and cheapest product in country



Source: Research ICT Africa 2010

6 BPO – IT enabled services

The ITES-BPO industry generated revenues of more than Rs8 billion annually. This segment of the ICT sector currently employs more than 15,000 people according to industry assessments. It is expected that the sector will contribute significantly to the creation of 29,000 jobs. Its contribution to the overall ICT sector is expected to be 8% of the GDP by 2011–2012 (NCB report 2010). There is also a desire to increase the high value added services to its offering and consideration of the BPO making it available round the clock to improve its competitiveness.

While BPO-IT growth since 2007 has slowed down, with the economic recession affecting all BPO-IT sectors globally, the sector is still experiencing growth at around 15%, more than double of the national growth figures.

There were nearly 600 companies involved in the ICT sector by 2009, of which more than 50% dealt in hardware assembly and sales, networking and other support services. There are more than 300 companies that focus on IT-enabled services, business processing outsourcing, call centres and software development (NCB report 2010).

In terms of employment distribution by language of service delivery, 34% operate in French, 40% are bilingual and 25% operate in English only. While a significant number of employees are operating in the English language market only, pure English work is most non-voice or has limited voice requirements (Everest Global Inc. 2009).

Some of the key cost drivers are the lower salaries, and in some cases, lower telecommunication costs in Mauritius compared to other countries. One of the reasons for this is the employment of school-leavers in Mauritius rather than tertiary graduates as it is the case in other countries. The experience of Outsourcing Telecommunications Association of Mauritius (OTAM) is that well-trained school leavers make ideal entry-level employees, who gain the necessary experience on the job to become supervisors and move up the management chain. More school leavers need to be trained to meet call centre needs. Graduates with more advanced programming, software, business and management skills were more suited to IT services side of the industry. Although the BOI commissioned a study by Everest(2009) which identified Mauritius as having a distinct advantage in its ability to offer bilingual services, there is concern that the quality, particularly of English, may cause Mauritius to lose this market to competitors (Sector interviews November 2010). Although initiatives are in place to neutralize the French accent prevalent amongst call centres, some stakeholders interviewed raised the issue of the quality of spoken English as a problem, and this may be something to reassess considering the importance of this competitive advantage.

Despite the relatively high cost of international bandwidth, Mauritius remains very price competitive as a BPO destination overall, coming in tie-third with Kenya, behind the Philippines and India at between 68% and 74% and below UK costs for English contact centre services. It is first by quite a significant margin, ahead of Senegal and Egypt, for French contact centre services, at around 65% less than France (Everest Global Inc. 2009).

Despite the low costs and the conducive investment environment created both by its political stability and business friendly conditions, Mauritius is viewed as able to support only

moderate scale centres due to a skills shortage, which also constrains the scale of their higher order business undertakings such as software development, accounting and business research (Sector interviews November 2010). It is believed that an additional pool of around 3000 industry-ready recruits is required to meet immediate labour demand in the IT-BPO sector. Government being aware of this obstacle has set up a number of medium- and longer-term strategies to address this problem in the NICTSP, but these have proved to be rather inadequate (Sector interviews November 2010). In the latest effort to address this problem, an ICT Academy has been proposed to co-ordinate the different delivery centres, including the universities.

Realistic about being able ever to operate big call centres, with manpower requirements of about 1000 to 2000, there is support for a parallel strategy aimed at attracting companies providing niche services but with higher margins and there are already positive signal according to the Board of Investment (BOI) that Mauritius is emerging as a key location for software development and accounting and financial activities.

The other main concern of the industry, relates to the high cost of connectivity and the lack of capacity internally to meet growing demand, have also been identified by BOI as one of the major limitations to foreign investment. Moreover, it is also believed that the contribution to the economy from this sector will be enhanced through the increased offering of higher value-added services such as legal, financial, accounting and research and development.

Concerns have also been expressed by the different agencies responsible for promotion of the BPO sector that these efforts need to be better coordinated and require continuity. Participation in international fairs and promotional events need to be better supported and resourced considering the very high presence of other African countries such as Egypt and Tunisia.

It is important that these efforts are also contextualized by broader investment and business incentives in the economy and the reduction of policy and regulatory risk within the sector.

6.1 Skills shortage

The shortage of capacity and skills in the sector was identified by almost everyone interviewed as the biggest challenge to realising the national vision of ICT as a major pillar of the economy. The latest AT Kearney Reports on the Global Location Index have shown that Mauritius has the potential to move up in the rankings as an emerging BPO destination,

provided it improves the human skill competencies. Other high-end skills, such as those of legal and accounting graduates, can increasingly be drawn into the IT-enabled BPO, as the sector moves beyond call centre or first tier offerings and gears up to provide more advanced BPO services.

6.2 Capacity building

In response to these concerns, the Ministry has proposed the establishment of an ICT Academy. This would be a PPP model with the active participation of the Industry Association supporting Government initiatives. The Proposed ICT/BPO Academy will not only improve the skill sets and competencies of the Mauritian workforce, but will also help in promoting Mauritius as a world-class destination in ICT-related businesses having adequate global talents.

It is proposed that the ICT Academy will serve to co-ordinate existing vocational training and tertiary ICT education. This includes vocational training, industry in-house training and upgrading done by the industry itself or through the training incentive programmes of the HRDC and NEF. The high-end IT skills produced by universities are currently absorbed by the wider IT industry and economy, where demand outstrips supply, but these have not been optimised and coordinated.

The current proposal in the MICT concept paper is that co-ordination would happen under the auspices of the National Computer Board, which is mandated to assist in the framing of appropriate national education, training and research plans in the field of information technology in order to build the necessary expertise base for consolidating the information technology industry in Mauritius.

The Mauritius IT Industry Association (MITA), representing the major IT companies, indicated that while it appreciates that it has to mentor and develop graduates, it has also to invest heavily in professional training for them. This is over and above the annual updating of specialised training of existing staff, often overseas, all of which goes far beyond anything offered by tertiary and vocational institutions.

MITIA sees the proposed ICT Academy developing a pool of high-level IT skills in these specialised areas of expertise that could be tapped for national and regional projects where the Mauritian ICT industry could participate. OTAM on the other hand, sees the ICT Academy as serving much the same purpose as the Hotel School of Mauritius: the fast tracking of training of school leavers to fill in the increasing demand in call centres.

The NCB has been proposed as the leading agency, since one of its objectives, as provided for under Section 4 of the National Computer Board Act, is to assist in the framing of appropriate national education, training and research plans in the field of information technology in order to build the necessary expertise base for consolidating the ICT industry in Mauritius.

6.2.1 Training and education

Increasing ICT literacy and excellence in primary and secondary schools is critical to ensuring a good base on which tertiary training and education can be undertaken. Schools are reasonably well equipped with PCs according to the Ministry of Education and Human Resources, and all are connected with broadband Internet Access. However schools and universities have expressed the wish to have higher bandwidth capacity extended. ICT usage in schools is key to stimulating demand for ICT services in homes and small businesses, though driving down costs is critical to this.

At the tertiary level the University of Mauritius and the University of Technology (Mauritius) provide a significant number of graduates in the areas of software development and information systems engineering, and while they are in demand and rapidly absorbed by industry, the view of industry is that they are not "job-ready". The ICT Academy could provide a focus point to align the educational output and requirements of industry.

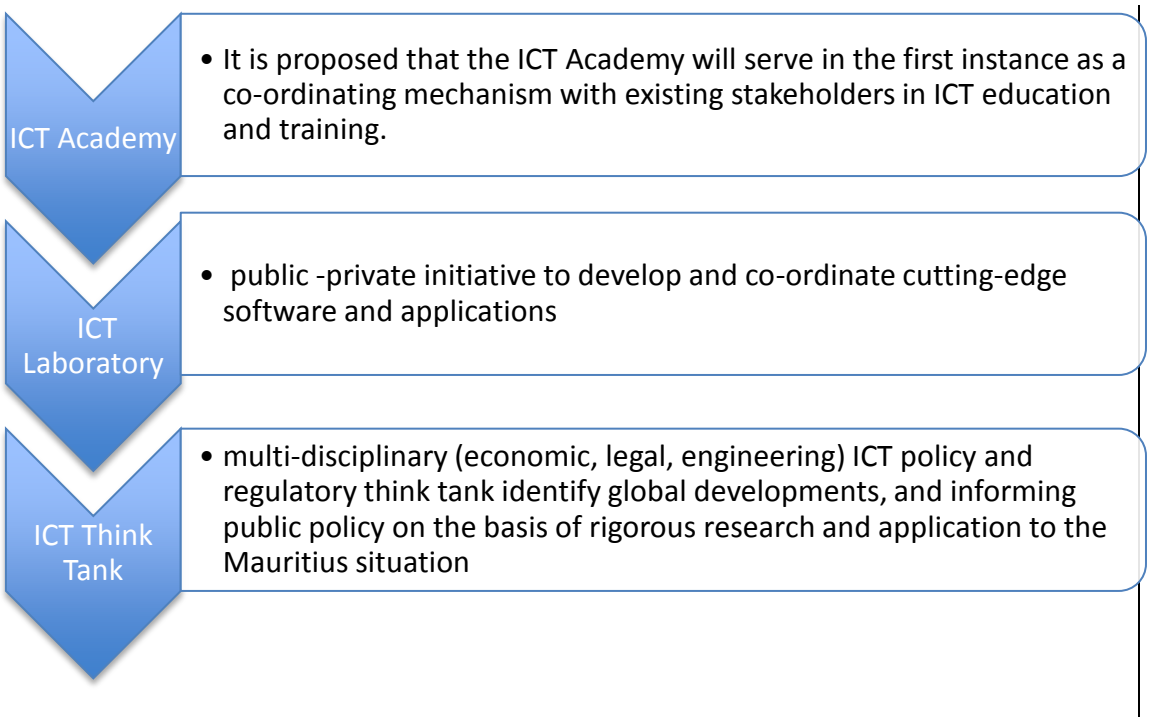
6.3 Research and Development

Any educational programme is incomplete without research and the international best programmes are those underpinned by cutting-edge research. The Network Readiness Index, which measures the propensity of countries to exploit the opportunities offered by ICTs and the impact of ICT on the competitiveness of nations, demonstrates Mauritius' relative weakness in the quality of scientific research institutions, a component of their measurement of the infrastructure environment. While Mauritius is ranked 53 overall in 2010, it is most poorly ranked at 84 in this category, impacting negatively on its overall score. And its ranking is not improving, having dropped two places since the previous year.

Rectifying this is also key to Mauritius' goal of becoming a knowledge hub attracting large numbers of international students. While some research in the traditionally discrete areas of the ICT sector appears to be undertaken, there is little of the multi-disciplinary research required to inform and guide the development of an integrated approach to building an information society and knowledge economy that considers Mauritius' particular challenges.

It is proposed that a multi-disciplinary (economic, legal, engineering) ICT policy and regulatory think tank be established to identify global developments and consider the implications for Mauritius, and inform public policy on the basis of rigorous research and application to the Mauritius situation, possibly located at the University of Mauritius or in a joint university venture.

It is further proposed that software and application research be consolidated through an ICT laboratory, which should ideally be a public-private initiative located at the University of Technology Mauritius and co-ordinated with initiatives of the National Computer Board such as the software test bed project.



6.4 SWOT

From the assessment of the performance of the ICT sector and its delivery on national policy objectives, the following SWOT analysis emerges:

INTERNAL	
Strengths	**Weaknesses**
Political commitment ICT literate nation Vibrant ICT sector Conducive investment/business environment Strong statutory bodies in the ICT sector with strong understanding of their sectors	Relatively high degree of bureaucracy for the fast growing ICT sector Absence of integrated convergence policy framework Inadequate technocratic capacity within the Ministry Outdated institutional arrangements thus increasing regulatory risk, inhibiting regulatory effectiveness and inhibiting sector investment Size and location of the country Skills shortage
Opportunities	**Threats**
Size (easy to roll-out), geographical location(can serve as a regional hub between Africa and Asia) Utilisation of flexible skilled workforce in new areas to meet external demand Increased global outsourcing as part of business downscaling	Improvement in costs/quality of foreign country competitors (especially bandwidth) Institutional resistance to change and bureaucratic lag Global economy and business slowdown Skills shortage due to size of population Lack of budget/financial commitment to institutional and capacity development/projects
EXTERNAL	

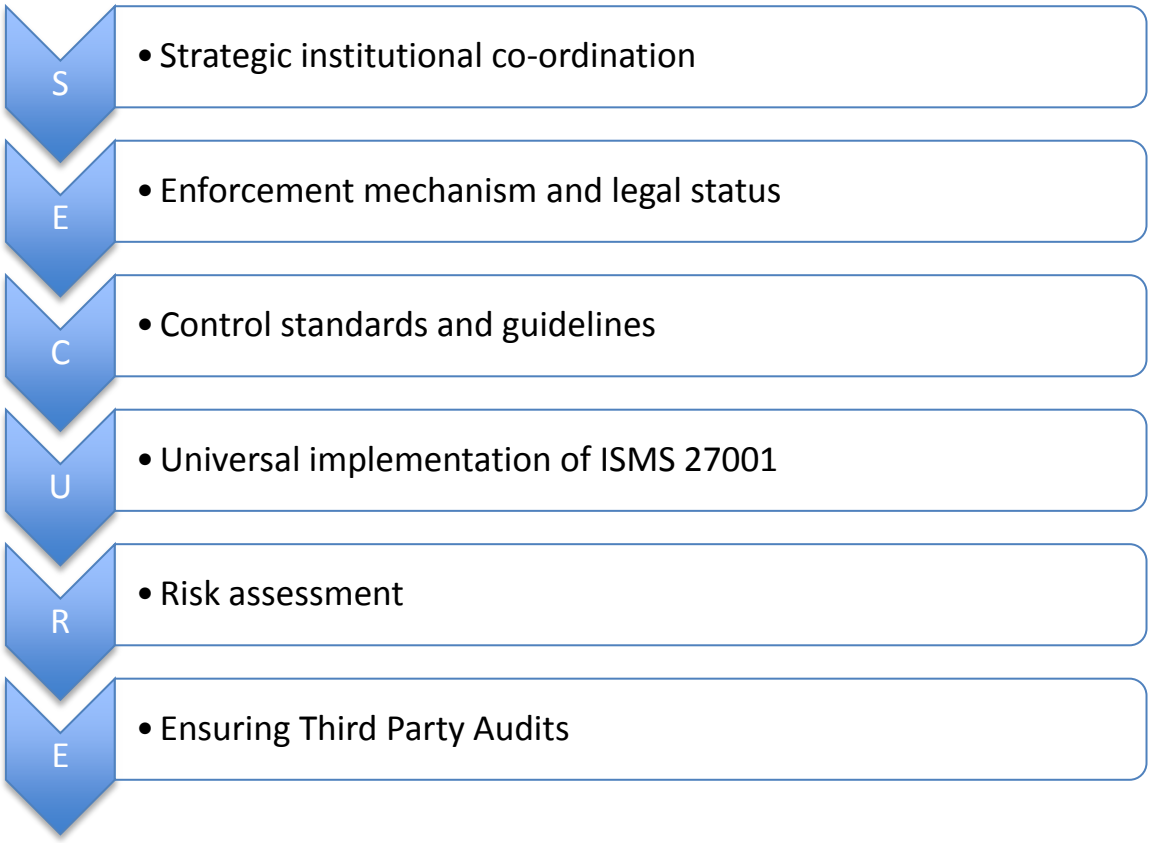
7 National Information Security Strategy

A critical review of the existing National Information Security Strategy (NISS) of Mauritius clearly shows that information security concerns from government, businesses, organisations, and citizens in Mauritius were taken onboard under the NICTSP 2007-2011 and a number of activities under various projects were undertaken by CERT-MU and the IT Security Unit (ITSU). ITSU is already providing IT Security measures for all new and existing e-Government projects.

The Information and Communications Technologies Authority (ICTA) of Mauritius has set up the framework for the adoption of the Public Key Infrastructure. In order to enable a secure electronic transactions operating environment, the Electronic Transactions Act was amended and the Electronic Transactions (Certification Authorities) Regulations 2010 came into effect on 1st December 2010, providing for the licensing framework as well as the regulation of Certification Authorities (CA) activities in Mauritius. Parts of the Electronic Transactions Act have also been proclaimed to enable ICTA to exercise the powers of the Controller of Certification Authorities (CCA) and make the PKI operational. It is an important step in providing for safe, trusted and secure electronic transactions and establishing Mauritius as a trusted hub for e-commerce. The next step will be to ensure the widest adoption of the PKI technology for online transactions with a view to enable secured online transactions. However, the overall implementation of an integrated robust National Information Security Strategy is still in progress. Due to some systemic weaknesses like absence of compliance mechanism or enforceability, coupled with a shortage of funds for recruiting additional manpower, compared to the ambitious roll-out of e-Government and computerization of civil services plans, the NISS still needs to gain substantial momentum within the Government and the private sector. Implementation of managerial controls by the end-user department is a major challenge in this regard.

In order to address these weaknesses and identify all IT assets, their criticalities and associated threats, and implement the recommended controls backed by policies and procedures, and well-defined roles and responsibilities of various actors, it is recommended at this stage that IT security related activities are further augmented in terms of capacity building – technical and financial. It is encouraging to note that the ICTA, CERT-MU and ITSU have already taken a lead in this direction and initiated a number of key activities such as PKI, security audits, and ISO 27001 certification, but the urgent requirement is to streamline those activities and actors under one coordinated IT Security single-window system whereby all the IT security related guidelines, policies, and standards are monitored, coordinated and

synergized. Above all, IT security has to be a pre-emptive action rather than an advisory 'on request' activity in all government departments as well as in private sectors in order to provide the desired degree of confidence within the environment. Taking into account the progress made so far by various agencies under the NICTSP in the area of Information Security, it is recommended that the existing NISS/CIIP be followed although a prioritised operational roadmap may be necessary as a way forward from this stage of NICTSP. Six broad strategic pillars are suggested in this operational plan as follows:



As the existing CIIP and NISS are quite detailed and elaborate plans in line with international standards, they cover all the areas of the SECURE model. The CIIP has already gone through a national consultation process and been reviewed by the International Telecommunications Union (ITU). The SECURE line of priority recommended here is not an altogether new model likely to conflict with existing NISS/CIIP plans. It is a prioritised line of action suggested under this review process which was the mandate of this exercise.

PRIORITY # 1	Strategic institutional co-ordination

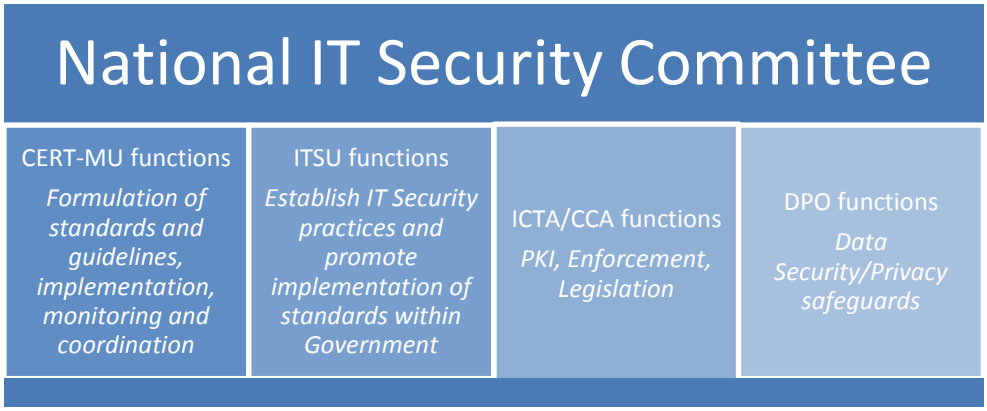
7.1 Setting up a National IT Security Committee

In order to give momentum to IT security related activities, a national coordinating committee should be created as an umbrella body for coordination and implementation of all the IT security related issues in the country. CERT-MU might assume that role with added resources and trained manpower placed at its disposal for speedy implementation of the certification, auditing and enforcing compliance. Other coordinating agencies will be the ICTA (for PKI) and ITSU for the ministries and government departments. It may be noted here that the ITSU is a government unit that provides IT Security services in the government by establishing IT Security practices for the civil service, creating IT security awareness among public officers, facilitating the implementation of the ISO/IEC 27001 standards and security best practices within the civil service, assess the security of critical government-owned IT systems and monitor information security audits.

Therefore, it is recommended that a National IT Security Committee be created that looks after the IT Security aspects at all levels. It is however reiterated that the proposed national agency need not be an altogether new agency, but it can be done through a *strategic* consolidation of the existing CERT-MU along with close collaborators/actors like ICTA and ITSU, operating within their respective mandates, with their resources synergized as well as placing additional trained professionals and IT security experts in lead positions on its key activities, namely, formulation of standard guidelines, implementation, monitoring and coordination of information security at the national level.

The Data Protection Commissioner in Mauritius is responsible for upholding the rights of individuals as they are set out in the Data Protection Act, 2004, so as to ensure that personal data is held, processed and disseminated in accordance with the law. The primary mission of the Data Protection Office (DPO) is to ensure that those who keep personal data comply with the provisions of the Data Protection Act (DPA) in order to safeguard the privacy rights of all individuals. The DPO has a wide range of enforcement powers to ensure that the principles of data protection are observed. These powers include the serving of legal notices compelling data controllers to provide information needed to assist her enquiries and to implement the provisions of the DPA in a particular prescribed manner. DPO may also investigate complaints made by the general public or carry out investigations. DPO has the power to carry out prior security checks, periodical compliance audits and may conduct

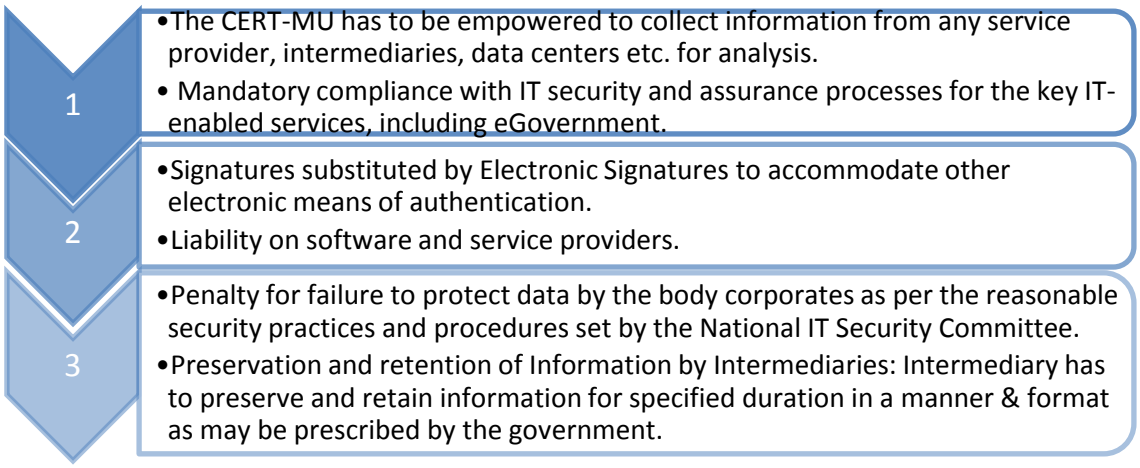
searches on premises for the purpose of gathering evidence upon the production of a warrant.



Proposed Structure and Role of National Information Security Committee

PRIORITY # 2	Enforcement mechanism and legal statutes

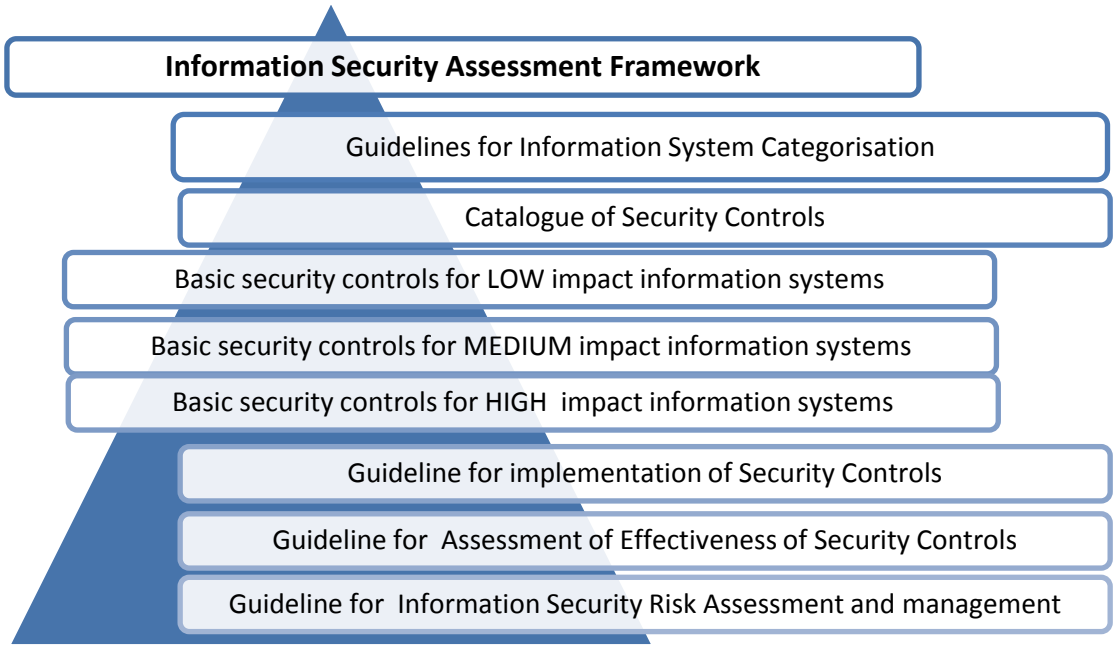
Certification and standardization of Information Security cannot be achieved if information security is placed as an optional choice. To avoid harsh financial burdens on small actors like SMEs, a strict regime of mandatory compliance (as in banks) was not recommended in the NISS. However, it is now time to adopt a stricter adherence policy to IT security standards for government and private sectors, including financial institutions. To enhance the present IT Security situation, appropriate legal provisions have to be incorporated in the relevant laws in force. Keeping in view the lengthy process of legislation from drafting to its entry into statutes, fast track mechanisms such as the issuance of regulations should be explored. In order to identify gaps as well as to adopt a comprehensive IT security law in tandem with international standards, an "IT Security Legal Readiness Survey" should be conducted so as to form the basis of such legislation.



Legal instruments/provisions needed for IT Security compliance

PRIORITY # 3	Control Standards and Guidelines

A number of Information Security Guidelines have already been prepared by the CERT-MU and also by the ITSU (e.g. IT Security Guidelines for the Civil services). However, these instruments need to be consolidated as national standards and backed up by enforcing mechanisms. Moreover, there are a set number of minimum guidelines and standard controls that are to be prepared and put in place as an immediate measure to streamline the activities suggested for the National IT Security Committee. These are as follows:



Control Standard and Guidelines Required at the National Level for IT Security

As indicated above, the immediate activities of the National IT Security Committee as a joint collaboration of MICT-CERT-ICTA-ITSU-DPO should review the guidelines and drafts already prepared and prepare the additional guidelines required for the IT Security environment. Until and unless a set of guidelines is provided to all stakeholders – public and private – the enforcement mechanisms may be ineffective. While doing so, the agency shall not take up the activities as a standalone ministry/department activity upon individual requests, but rather set it as a 'national' handbook for all stakeholders to implement. On the other hand, these guidelines will also form a basis for the training of IT Security personnel at various levels (universities, departments and private organisations). Most of this exercise can be completed within a short time as such guidelines are already in use in various countries and mostly available in the public domain, leaving only a few minor country-specific modifications to be made.

PRIORITY # 4	Universal implementation of ISMS / ISO 27001

The draft framework on the Critical Information Infrastructure Protection (CIIP) and Information Security Assurance should be approved on priority basis by the government. The process of adopting this framework should be accelerated so that the universal adoption of the ISO 27001 and capacity building of the various critical sector operators already identified may be taken up as a national priority programme. The National IT Security Committee will then assist in establishing secure networks and information systems for ministries, governmental departments and parastatals through monitoring of: Penetration Testing, vulnerability analysis for network hardening, risk assessment, business continuity and disaster recovery planning. The whole exercise shall be a joint review and development of guidelines and standards on Security Controls, Risk Analysis Framework, and Certification/Accreditation programme between MICT, CERT-MU and ITSU.

It was pointed out by various stakeholders during the exercise that there is an acute shortage of IT security staff within the government. This lack of staff is reported to be mostly due to lack of funds that were not earmarked by the relevant authorities for the provision of additional IT security posts and/or filling of vacant posts. There is need to build capacity in Government. There is no scarcity of qualified personnel as The University of Technology Mauritius and University of Mauritius have been offering masters courses in Computer

Security/Forensics for the past 3 years. Security certifications in security auditing, management etc. such as CISA, CISM, CRISC[4], CISSP[5], CEH[6]et al have been on offer for some years locally. With the establishment of an Information Systems Audit & Control Association (ISACA) chapter locally affiliated from the United States, the number and expertise levels of security professionals are on the increase.

At present, very few organizations are ISO 27001 certified in Mauritius. There has not been much uptake of ISO 27001 implementation so far apart from a few initiatives. In the Public Sector, Government has ratified formal adoption of ISO/IEC 27001 since 2002. The IT Security Unit of the Ministry of ICT facilitates the implementation of ISO information security standards within the Civil Service. A structured risk assessment methodology had been developed and is used by any Ministry/Department that implements ISO 27001. To date, 10 government institutions have initiated ISO 27001 implementation. The Passport and Immigration Office has been successfully certified, with another site undergoing external certification in December 2010. The other sites, including CERT-MU and Government Online Centre, are undergoing concurrent implementation and are at various stages. It is planned that two to three sites per financial year become ready for certification from FY 2011 to 2013.

PRIORITY # 5	Risk assessment

A large number of information systems have been implemented so far in various ministries and departments. It is therefore incumbent upon any IT security exercise to adopt a standard Risk Assessment Methodology and to set the scope of such assessments across Government where such systems are in place. ITSU has already done some outsourced IT audits activities and this exercise is already a priority for ITSU since 2008. As more and more government offices are networked and computerised, various services are proposed to be delivered online. These audits will need to be further strengthened.

[4] Certifications from ISACA

[5] Certifications from (ISC)[2]

[6] Certifications from EC-Council

The IT risk assessment exercise will make an inventory of IT Assets, study network topology, identify critical assets and security zones and trust boundaries. It will also map the data flow, identifying flow of critical data through different security zones, and above all perform a vulnerability assessment. An effective risk management process is an important component of a successful IT security program. The principal goal of an organization's risk management process should be to protect the concerned organization and its ability to perform its functions through IT systems and applications, and as such it is not just its IT assets or any technical function carried out by the IT experts who operate and manage the IT system, but an essential management function of the organization. Therefore, the risk assessment of the present IT installations, networks and applications across all the identified sectors in Mauritius, government and private, should be a high priority.

It is important to note here that a number of IT systems and applications are already developed and operational in Mauritius in line with the NICTSP. For any new systems that are procured, IT Security Considerations are embedded in the initial tender document. The IT Security Considerations spell out the controls per ISO 27001 that would be required and the security requirements pertaining to the Software Development Life Cycle (SDLC) phases. The Security Considerations also provide for the submission of IT Security policy, risk mitigation plan and an IT Contingency Plan for the new systems. Effective risk assessment must be totally integrated into the systems' development stage itself. Towards this end, IT Security considerations are at present being included in the Software Development Life Cycle (SDLC) phases with IT security reviewed at each stage for Government systems.

However, budget and willingness on the part of the ministries/departments to undertake such measures are major challenges. It is recommended that these issues are resolved at the highest level, say at the proposed Apex Committee on e-Government.

Any IT system goes through five phases in its development: initiation, development or acquisition, implementation, operation or maintenance, and disposal. Risk assessment is a process that can be performed during each of these phases of any IT system.

One model that can be followed to integrate risk assessment into various stages of IT systems is as per the Recommendations of the National Institute of Standards and Technology (USA).[7]

[7]Risk Management Guide for Information Technology Systems. National Institute of Standards and Technology Special Publication, 800-30. Publ., (July 2002)

TABLE 13: List of Risk Assessment Activities Recommended for the IT Systems/Application		
IT System Phase	**Phase Characteristics**	**Risk Assessment Activities Recommended**
Phase 1 Initiation	The need for an IT system or application is expressed and the purpose and scope of the IT system is documented	Identified risks are used to support the development of the system requirements, including security requirements, and a security concept of operations (strategy)
Phase 2 Development or Acquisition	The IT system is designed, purchased, programmed, developed, or otherwise constructed	The risks identified during this phase can be used to support the security analyses of the IT system that may lead to architecture and design tradeoffs during system development
Phase 3 Implementation	The system security features should be configured, enabled, tested, and verified	The risk assessment process supports the assessment of the system implementation against its requirements and within its modeled operational environment. Decisions regarding risks identified must be made prior to system operation
Phase 4 Operation or Maintenance	The system performs its functions. Typically the system is being modified on an ongoing basis through the addition of hardware and software and by changes to organizational processes, policies, and procedures	Risk assessment activities are performed for periodic system reauthorization (or reaccreditation) or whenever major changes are made to an IT system in its operational, production environment (e.g., new system interfaces)
Phase 5 Disposal	This phase may involve the disposition of information, hardware, and software. Activities may include moving, archiving, discarding, or destroying information and sanitizing the hardware and software	Risk assessment activities are performed for system components that will be disposed of or replaced to ensure that the hardware and software are properly disposed of, that residual data is appropriately handled, and that system migration is conducted in a secure and systematic manner

PRIORITY # 6	Ensuring Third Party Audits

Various agencies of the Government of Mauritius like CIB, CISD, and ITSU are at present providing technical support to different ministries and governmental departments and, via NCB/CERT-MU at national level. In implementing different projects, a number of actors, - internal and external - , play crucial roles as consultants, hardware/software suppliers, system installers and IT security auditors. It is recommended that Third Party Audit (TPA) mechanisms are put in place, backed by statutory mandates so that a quarterly Third Party Audit of the implementation and performance of the (critical) network within the provisions of the contracted services level agreement (SLA) be executed. This may be done by appointing an independent TPA agency. TPA may also include timely advice to the concerned ministry, department or organization on the health of the network, bandwidth upgrade, optimal utilization, future enhancement and augmentation of the capacity etc. When necessary, the payment to a private network operator may also be linked with the quarterly report of the TPA agency. At present, audits are performed on critical government systems. The audit covers an application audit, physical audit, and network audit.

Considering the above-mentioned scope of the TPA, it is imperative that the appointed auditors should have a high level of credibility, audit experience and background with adequate domain expertise in the areas of Information Technology, networking experience, security audits and SLA monitoring. As regards Third Party Audits, a Panel of TPA Agencies could be constituted.

8 E-Government and Civil Service Computerisation

The contextual background of NICTSP 2007-2011 clearly indicated that Mauritius required some "comprehensive process re-engineering and coordinated planning" to deliver citizen-centric services. It envisaged a systematic marketing of e-Governance as a tool for good governance, covering aspects of efficiency, accountability and transparency. In fact, the first few key recommendations include delivery of good governance through electronic means, supported by comprehensive back-office process re-engineering including clear accountability structures and implementation by a high-powered national body exclusively responsible for e-Governance in the country. A quick review of the projects taken up under the strategic thrust area of 'ACCELERATE' shows that while a number of these projects were taken up that were aimed at e-Government and service delivery to the citizens, they were more sporadic and did not systematically follow the flow chain and priorities set by the NICTSP. The computerization process of civil service or government offices is sometimes perceived as more of a procurement and installation than a means to deliver some pre-planned 'need-based' services to the citizens. To give an example, while almost all offices are equipped with basic ICT infrastructure, citizens cannot always send an application or request electronically through email or any single-window portal acknowledgements and tracking reference numbers whereby the office and officers identified will act on that request. Somewhere in the haze of computerization zeal, which will in any way facilitate the roll-out of any e-Government plan, the basic institutional modalities recommended for a focused e-Governance Task Force (EGTF) or e-Governance Cell (EGC) were not implemented as desired. This led to isolated but encouraging progress made by individual departments/ministries in areas of citizen-centric services like Driving License application and the Crime Occurrence Tracking System (COTS), but a number of actors have felt a lack of coordination among various agencies implementing and supporting these applications. Moreover, due to the absence of online payment attached to these applications (like Driving Licence), citizens are again compelled to carry a hard copy and visit offices for physical submission, which again discourages the users.

In order to improve the administrative processes of government, to incorporate the technologies deployed and used in offices and to assess the user needs, it is also necessary to conduct research into citizens' responses to the online services offered so far. The results of such research can then be used in updating strategies to achieve a standardised use of technology in government administration. To accomplish this objective, the future action plan for e-Government in Mauritius should include more vigorous diffusion and training of

civil servants in the use of technologies currently used in government and the promotion of the migration process. Furthermore, in the coming years Mobile government sometimes referred to as m-government, will be an extension of e-government to mobile platforms. It will also include strategic use of e-government services which are only possible using mobile telephones, laptop computers, personal digital assistants (PDAs) and wireless Internet infrastructure. An immediate step towards these long-term changes will be to extend transactional services through the use of mobile technology, whereby the citizens can pay fees associated with various online services through their mobile phones.

Mauritius progressed towards the implementation of e-government with a focus on networking government offices and developing applications in several areas and the deployment of IT to manage data intensive functions. The effort of the CIB, GOC, ITSU and CISD to connect all their offices through GINS is a significant development. While the emphasis has been primarily on automation and computerization, various ministries, departments and agencies have also endeavoured to use ICT tools to establish connectivity, networking, setting up systems for processing information and delivering services. At a micro level, this has ranged from IT automation in individual departments, electronic file handling and workflow systems, to service delivery applications like online request for Specific Registration Mark, application for Women Courses, and online filing of environment-related complaints by citizens.

As highlighted already in the earlier sections, ITSU is actively involved in ICT projects in the Civil Service. It has collaborated actively in setting up GINS, the Government Online Centre (GOC), with which it collaborates closely. In addition, the IT Security Unit (ITSU) has set up a collaborative platform for incidents handling in government with all the key stakeholders: CIB, CISD, GOC, CERT-MU, e-Government IT Unit of the Ministry of Education and Human Resources.

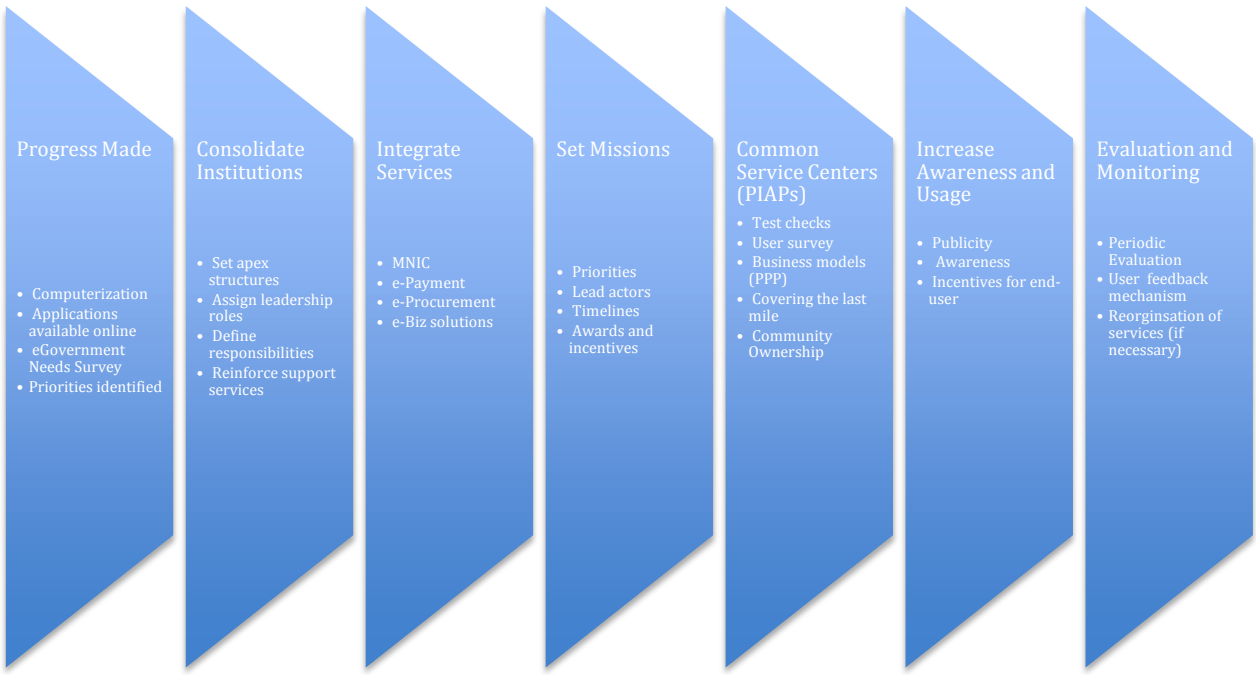
The applications put in place so far have laid the foundation for e-Government within the country. There is strong commitment expressed by various implementing agencies to creating the right governance and institutional mechanisms, set up the core infrastructure and policies, and implement a number of projects enlisted under the NICTSP. The next steps that are recommended at this stage are to consolidate the institutional structure for e-Government at the national level, and develop integrated online services focusing on user needs, demands, and satisfaction. There should be a strategic shift in e-Government initiatives so as not to focus on the tools and service delivery channels but rather to adopt a

citizen-centric approach to public service development and delivery in order to ensure that user needs and demands are met by government.

E-government services tend to be supply driven and tend not to assess the actual needs and expectations of the different target groups. In order to consolidate its e-Government operations, Mauritius should undertake more than a (re)organisation of technological platforms. It has to be founded on the relationship between a government and its different target groups: government, private sector, and citizens. The best way to map out this relationship is a well-balanced survey that looks at digital services and information from both a demand and a supply perspective. Such a survey should:

- identify the use, needs, and areas of interest and priorities of the different target groups regarding e-government;
- carry out an inventory and analyse existing online services;
- evaluate supply and demand, with regard to priorities in digital development; and
- be broad enough to count as a zero base measurement, in order to be able to realise relevant succession surveys.

The institutional mechanisms (EGTF, EGC) that were envisaged under A1 projects in NICTSP could not be effectively materialized. Therefore, activities were jump-started on the A2 line of projects under the NICTSP. It is therefore recommended that the institutional structures be consolidated with defined responsibilities and leadership roles at various levels (national and departmental/sectoral). Building on the lessons learnt so far, the following flow chart is recommended as a way forward for the e-Government in Mauritius.



The Way Forward for the e-Government in Mauritius

8.1 Priority Projects

It is very encouraging to note that a substantial number of applications have been developed and launched so far and these are available at the Mauritius Government Web Portal, which is the main point of entry for users to access Government information and online services. It comprises the following four sub-portals: Citizen, Business, Government and Non-citizen. The 53 e-Services to enable the submission of online applications, acknowledgement receipts and tracking of the status of applications submitted, amongst others. All online transactions are encrypted and secured. However, a number of them are simply downloadable forms, which the user has to print and take physically to the offices concerned. In the absence of online payment of fees facility, these services are only partially helpful to the users. Online payment facility for Credit/Debit cards is available since January 2011, and it is reported that by March 2011 the full online payment via Internet banking will be functional.

A survey conducted by NCB indicates that the GOC, operational since 2005, has been a crucial achievement for the E-Government vision. The GOC is hosting some 175 websites including Ministries, Departments and Parastatal bodies -an increase from only 86 websites in 2005. Applications submitted online for e-services (some even prior to the NICTSP) like Learner's Driving Licenses have increased from 1,868 in 2005 to 32,149 in 2009. Likewise,

applications for public vacancies at the Public Service Commission through e-forms have also increased, from only 448 applications in 2005 to 3,159 in 2009. Further, electronic submission of tax returns (both individual and business) has also increased considerably. Market research showed that more than 70% of the companies access government websites.[8]

In spite of the encouraging progress made so far, a number of challenges have been identified during this review, such as human resources, fund constraints, technical back up support and above all an absence of ownership of these projects at departmental levels. The designated CIOs, who are mostly administrative officials of their respective ministries/departments, have failed to take up e-Services delivery as their top priority. It is therefore recommended that instead of increasing the number of services and applications offered online under e-Government projects, it is time to take stock of the systems, applications and operational mechanisms that have been put in place and consolidate them with all interoperability and interactive features through a better coordination among the various stakeholders (ministries, departments, project managers, data centre and technical support agencies). A roadmap for the next five years shall include some strategic thrust areas. Emanating from the interaction with a number of key stakeholders as well as major government implementing agencies like CIB, GOC, CISD, NCB, a few key observations can be made on the lessons learnt from NICTSP so far.

The E-Government framework would include all the components: *Back-ends* (databases of the different government agencies, service providers, government offices etc.), *Middleware* and the *Front-end* delivery channels (home PCs, mobile phones, PIAPs as integrated citizen service centres etc.) for citizens and businesses. The Middleware comprises communication and security infrastructure, gateways and integrated services facilitating integration of inter-departmental services.

Adequate weight must be given to quality and speed of implementation in procurement procedures for IT equipment/services

- Incorporation of suitable system of incentives and awards to encourage e-Government adoption.
- Trend of delivery of services through PIAPs should be encouraged and promoted.
- Wherever possible services should be outsourced, preceded by a cost-benefit analysis.

[8]Study to Assess ICT Usage among Businesses in Mauritius, DCDM Marketing Research

- Full potential for private sector investment should be exploited.

Based on the above observations, a re-orientation of the present e-Government initiatives of Mauritius is recommended, keeping in mind some established global standards, as follows:

- Centralized Initiative, Decentralized Implementation
- Identify services to be targeted
- Prioritize Services (Mission), Identify measurable service goals (Outcomes)
- Identify, Appoint & Empower Mission Leaders
- Increase Private Sector participation
- Put in place a common Infrastructure, Policies, Standards and Framework
- Service delivery through Common Service Centres
- Think Big, Start Small and Scale Fast

All services supported by three infrastructure pillars that have already made significant progress in the last few years to facilitate web-enabled Anytime, Anywhere access:

- **Connectivity: State Wide Area Networks (GINS/SKY-GOV)**
- **National Data Centre(GOC)**
- **Public Internet Access Points** (PIAPs) as primary mode of delivery

It may be noted that these new directions for the e-Government projects are suggested to keep in view the existing financial and human resources constraints and lessons learnt from the progress made so far in implementing the projects. In recommending these areas as future priorities, a conscious effort was made to reinforce the previously launched applications and to make them a core set of fully operational online services rather than to increase the burden of the project basket with limited resources, which will perhaps decrease the chances of their success in the long run.

Recommended Way forward for enhancing e-Government Services

8.2 Brief overview of the thrust areas

E-Government Apex Body: As a part of this NICTSP review exercise, an institutional framework is being suggested to address coordination as identified by many stakeholders. The following sections provide a conceptual overview of the proposed National e-Government Apex Body in tandem with what was originally suggested as e-Gov Task Force and e-Gov Cell.

A National e-Government Apex Committee should be set up, ideally under the Chairmanship of the Prime Minister. To achieve the policy goals and objectives as determined by the Apex Committee, a high level e-Government Program Steering Council be also set up at the ministry level, headed by the ICT Minister, to oversee the e-Governance program and ensure intra-departmental co-ordination. Exact composition of the Council and the Committees shall

be determined in consultation with the government line ministries/departments/agencies and major private stakeholders.

8.3 Program Level

An e-Governance Mission Team (EGMT) comprising major actors like CIB, CISD, NCB, GOC, CERT-MU, ITSU, ICTA etc. needs to be set up to support the Program Steering Council and Apex Committee. The EGMT would function as the secretariat and full time internal advisory body in undertaking e-Governance projects or enhancing the performance of the existing programs. This team would be responsible for undertaking the groundwork for providing an overall direction, standardization and consistency through program management of the e-Governance initiatives. All interdependencies, overlaps, conflicts, standards, overarching architecture, security, legal aspects etc. across projects as well as core and support infrastructure shared across several projects would fall under the purview of this group. It is expected that the EGMT would typically consist of core people like CIOs who shall be involved in the development and operations of the projects as well as the initial actors who have led the various existing projects so far. The actual size would depend on the scale and maturity of the e-Governance program.

8.3.1 E-Government Needs Survey

A major concern that was noted during this review exercise is that the usage of e-Government services is relatively low. It indicates either that these services are not useful to the majority of citizens or that their utility is minimal. Therefore, in order to understand citizens' expectations from the government, as well as to re-check their actual usage and usefulness for the users, an e-Government needs survey should be conducted at the earliest covering people from different groups (citizens, businesses and government), locations, income groups, education levels, age, and gender. The survey should be a qualitative survey. Based on the results of the survey, the e-Governance areas shall be categorized as High, Medium and Low Priority areas. The applications shall be further categorized into Services, Information and Grievances. The results, when analysed, will give a clear mandate about the services that the citizen wants e-Governance to focus on. Considering that these services are already 'online' and looking back at it, it may sound like a retrospective exercise, however it is crucial to analyse the current focus and re-prioritize the services/applications planned in the NICTSP.

8.4 National e-Government Service Delivery Gateway

One of the immediate requirements for an e-Government program in Mauritius is a platform to cooperate, collaborate and integrate information across different departments offering the services. Government systems characterized by islands of legacy systems using heterogeneous platforms and technologies and spread across diverse geographical locations, in varying state of automation, make this task very challenging. Placing the GOC as a National e-Government Service Delivery Gateway (NEGSDG) can simplify this task by acting as a standards-based messaging switch and providing seamless interoperability and exchange of data.[9] E-government applications for different departments to provide online services to citizens, businesses and government would require increasing interactions amongst departments and with external agencies.

Departments would need to develop connectors/adaptors for point-to-point connections between departments, creating a mesh and also tight coupling between applications. Otherwise this would lead to applications difficult to maintain and upgrade in case of version change and change in government policies and business rules. NEGSDG is a 'middleware based' attempt to reduce such point-to-point connections between departments and provide a standardised interfacing, messaging and routing switch through which various players such as departments, front-end service access providers and back-end service providers can make their applications and data interoperable. The NEGSDG will aim to achieve a high order of interoperability among autonomous and heterogeneous entities of the Government (in the Ministries, Departments, Agencies and statutory bodies), based on a common framework of e-Government standards. The proposed NEGSDG will act as a core infrastructure for achieving standards-based interoperability between various e-Government applications implemented at various levels and geographically dispersed locations.

Suggested roles of the NEGSDG will include:

- Enabling the Gateway to perform as the middleware to ensure interoperability
- Enabling integration across various actors by enabling Integrated Service Delivery and a Service Oriented Architecture (SOA) leading to joined up government
- Help protect the legacy investments in software and hardware by easily integrating them with other technology platforms and software implementations

[9]This suggested structure is based on Indian models as presented in *Transforming Government – e-Government Initiatives in India*, Editors: R K Bagga and Piyush Gupta Published by: The ICFAI University Press, 2009.

- De-link the back-end departments/Service Providers (SP) from the front-end Service Access Providers, thereby ensuring separation of concerns of service access from the service implementation i.e. separate the Portal, CSC, Kiosks etc. from the government services which reside in the backend departments.
- Encouraging competition at the front-end by allowing independent service access providers e.g. Cyber Café to provide services with varying levels of complexity, cost and service quality levels.
- Shared services that can be added on to the core services as and when required, as special common services of the Gateway without affecting the core functionality of the Gateway, thereby providing flexibility and modularity.
- Encouraging back-end services to be plugged into the infrastructure as and when they are ready, thereby reducing the cost of e-Government Projects by rationalizing, distributing and optimizing the services framework.
- Use of PKI infrastructure for secure transactions. Provision exists for encryption of department payload to ensure confidentiality of department data. The gateway provides digital signature and certificates to all stakeholders interacting with the gateway for identification, authentication and authorization. Transaction and audit logs help track government data.
- Enabling transaction logging and time stamping for tracking of transactions and centralized control.
- Helping the Departments backend workflow evolve gradually as the Gateway acts as middleware de-linking the backend from the frontend.

This means that even the Departments that do not have complete automation or workflow at the backend can still deliver e-Service to the citizens in a limited manner through the Gateway. The Gateway specifications developed for the Gateway messaging and support/common services are: (i) Interoperability Interface Specification (IIS), (ii) Interoperability Interface Protocol (IIP), (iii) Inter Gateway Interconnect Specification (IGIS), and (iv) Gateway Common Services Specification (GCSS).

It shall, however, be clear that the NEGSDG will not be a super-structure in hierarchy; rather it will be a joint operational/functional mechanism with support from all the implementers, managers, and support service providers at various levels.

The Mauritius National ID Card project is a major initiative and it is envisaged that in the long run the ID will act as key identification document with digital data that will save keying time for the users. Once the ID No/Key is typed, the basic information will be auto-fed into various service portals. It is, therefore, important for the upcoming MNIC project to be compatible with the existing e-Government application/database. It is recommended that the interoperability issues with the MNIC project are taken up right from the beginning and the solutions are incorporated in the MNIC plans through a special component in the MNIC planning/designing process.

8.5 Capacity building of CIOs as e-Government Champions

Like most countries, specialised technology departments in Mauritius (like CIB, CISD and GOC) are responsible for IT and e-Government projects. However, as e-Government and large scale deployment of ICT in offices will drastically change public sector operations and service delivery, it is high time to appreciate the need for policy and strategic leadership that goes beyond technology itself and focuses instead on issues of change management and business process reengineering. On par with international standards, it is recommended that the CIO positions in Ministries and Departments be reinforced with clear roles and responsibilities to assume sectoral leadership at a pan-governmental level. South Korea, Singapore and Hong Kong have reaped considerable benefits from this institutionalisation of the role of CIOs. 'Leadership first, IT second' has been one of the factors in government IT success in countries like South Korea.

It is further recommended that the CIOs presently designated in ministries be entrusted with a leadership role in e-Government as prime movers of information and communication technology (ICT). In order to prepare them for their new roles, Chief Information Officer (CIO) Councils must be set up to interact, support and guide them. CIOs must have enough authority to plan budgets, manage staffing, and proceed with the business reengineering process aggressively within their jurisdiction. In determining the responsibilities of the government CIO position, a study must be undertaken to examine the functioning of their counterparts in the private sector in countries like Singapore, Korea, Canada and the United States.

During the review, it was found that 'ownership' of e-Government services is a major issue across the departments/sectors. While a number of individual champions were found to be spearheading the e-drive in their respective workplaces, the whole ICT exercise *per se* is still

seen as an ICT issue. It is therefore, recommended that a dedicated project be launched immediately to reinforce the role of CIOs as sectoral leaders who will be encouraged to take up leadership roles within the line ministries/departments. The scheme of Awards and Incentives for the successful CIOs, through national ceremonies, will go a long way to increase ICT leadership within the departments. It is also recommended that suitable service rules and promotional criteria are developed and enacted by law to incorporate ICT as a major benchmark for career advancement within the Civil Service. In doing so, a consultative process shall be launched to define these criteria and how to incorporate them within the performance appraisal mechanism of the government personnel (e.g. ACR).

In addition to the consolidation of the CIOs, a dedicated HRD/Capacity Building/Training project shall be launched for other actors, keeping in view the HR gaps, to fully operationalize the e-Government applications at the back-end (i.e., at the department level). This project shall specifically address several areas/skills, including training for:

- e-Governance policy makers, PSs, Parliamentarians, Ministers
- Chief Information Officers
- Project specific training
- General IT Skills and Competencies
- Special training programmes for subject specialists (eg. Agriculture, Police)
- IT Security
- Use of local language contents and applications
- Equipping tertiary level institutions of Public Administration for e-Governance courses, training etc.

As e-Government applications will invariably cut across a number of departments, it is recommended that the line ministries at the highest levels shall provide leadership, direction and vision for e-Governance within their sectors, resulting in a broad roadmap and prioritization of the projects. Personnel with appropriate background and aptitude shall be identified through a search mechanism within the areas of expertise identified as being necessary for handling programme/project level issues, namely:

- Business Process Reengineering
- Change Management
- Financial Management

- Technology

Building on the progress made so far in implementing the NICTSP, it is strongly felt that by sourcing suitable personnel with the required background and experience from government, parastatals or any government agency or central agency, and upgrading their skills, encouraging their efforts, awarding their successes and utilizing the personnel from the private sector to handhold them during the project operations, the country can in fact produce a set of excellent sectoral champions who will provide leadership in different areas of knowledge and skill requirements at various levels in coming years. To achieve this, Mauritius will need a well-coordinated effort from the National Apex Committee to CIOs, line ministries, ICT ministry and training institutions.

8.6 Nationwide Campaign on e-Government

During the review it was found that while a number of e-services are popular (e.g. Driving License application, Public Service Commission job application submission etc.), the overall usage of e-Government services by the average citizens is low. One major reason might be the non-availability of online payment facilities, and as that is expected to be resolved soon by the time this exercise is completed, it is expected that the usage will increase after that. However, it should be understood that, wherever e-Government initiatives were successful across the world, *marketing and publicity* were an integral part of the exercise. It is suggested that with the help of media and various civil society platforms and academia, a dedicated e-Government popularisation campaign be launched. Towards this end, the immediate task for the government will be to develop a Media Strategy for the e-Government applications.

Marketing efforts shall focus on creating brand awareness of the online presence. Using traditional media methods and outlets to create the right image for this new delivery channel can accomplish this kind of 'branding'. One suggested branding strategy is to use an advertising agency. The customer would learn to identify a particular slogan or message with e-Government activities. A recommended plan for such a campaign may be the South Korea Model. Korea has taken up the challenge of low user take-up and adopted a four-year national plan to increase user take-up. One of the key elements of the plan is the marketing and promotion of e-Government services (See box below). Other OECD countries, such as Germany and the United States, have prioritised the marketing of their portals and e-government services with the aim of increasing the use and adoption of those services. The United Kingdom has targeted the promotion of e-government services delivered by local

authorities and managed to raise awareness and user take-up during a 'Connect to your council' take-up campaign.[10]

Model Awareness Campaign for e-Government

This is a four-year national plan to increase user take-up of e-government services in Mauritius. The action plan takes a phased approach to increase the usage rate of e-government services, through the increase of public awareness, user take-up, and level of public satisfaction.

- **Phase I** (2011) will focus on increasing the public awareness of e-government services (with the aim of reaching 86% of user awareness), and on establishing a legislative framework for promoting e-government services. All e-government services are to be branded by a "Mauritian e-Government" brand as a means to raise public awareness and strengthen advertisement efforts through co-operation with private Internet portals.

- **Phase II** (2012) will focus on customising e-government services to meet user needs; the provision of "My e-gov" services and the identification of administrative services that could be useful to the public as e-government services; the national ID card system will be aligned to the online services to strengthen ICT security and single user ID/Password based system.

- **Phase III** (2013) will focus on creating a quality management system in order to increase user satisfaction levels; and it will focus on applying professional service quality assessment agencies for quality assessment of e-government services.

- **Phase IV** (2014) will focus on reaching the targeted rates for public awareness (90%), user take-up (60%), and service satisfaction (80%).

* Based on Korean Model. *Source*: Korean Ministry of Public Administration and Security, 2008.

Another important strategy is for governmental organisations involved in e-Government service delivery to adopt a unified platform. All materials sent to 'customers should stipulate

10 OECD e-Government Studies: Rethinking e-Government Services - User-Centred Approaches. OECD Publishing, 2009

the source and location of the alternative electronic way of doing business. For example, on a tax form there shall be the location of its source such as a website address. Agencies should encourage front-line employees to promote going online next time customers wish to transact business. Community outreach programs, including seminars, educational programs and speakers' bureaus, offer other potential channels to reach the public. Above all, a very big group of users/customers are Government employees. Unless they are convinced, they will not communicate the message to citizens. Therefore they shall be specifically targeted for such campaign. In association with the Business Associations, e-Commerce/ e-Business can be specifically targeted.

Another recommended strategy is to provide a financial incentive for the applications/returns filed online. For example, a 1–5% discount on fees paid may be a very encouraging factor in increasing the usage of the online services.

All these strategies and many more can be developed into a specific e-Government campaign over and above the regular government ICT awareness campaign. For this purpose, an e-Government Communication/Media strategy development exercise shall be undertaken once the e-services are fully functional, and a basket of seamless applications together with payment facilities are available.

Strengthening the Role of PIAPs as multi-purpose *Common Service Centres (CSCs)* is aimed at creating a low-cost vehicle for Government institutions so that easy, direct and cost-effective delivery of e-Governance services to the citizen is possible. The aim is to upgrade the role of PIAPs as CSCs across the country. A suitable PPP Model will also be developed to create scope for small entrepreneurs to open CSCs as small businesses to deliver online services. As the e-Government aims to provide government services in an integrated manner at the doorstep of the citizen at an affordable cost, the PIAPs can act as the front-end delivery points for citizens. To sustain the services centres financially as well as to provide the employability to the entrepreneurs setting up such public access centres or common services centres, a number of other revenue generating services should also be accommodated in the proposed PPP model. A viable business plan may be developed drawing from such e-Government initiatives in other countries like India (see Box). The objective is to develop a platform that can enable Government, private and social sector organisations to align their social and commercial goals for the benefit of the rural population in the remotest corners of the country through a combination of IT-based as well as non-IT-based services.

Village Level PPP Model for e-Government Services Access Centres: SreiSahaj e-Village (India)

SreiSahaj e-Village Ltd, a subsidiary of Srei Infrastructure Finance Limited, has taken up the task of eliminating the undemocratic digital split between rural and urban India, under the NeGP of the Government of India. SreiSahaj has a unique business model. A CSC is operated by a Village Level Entrepreneur (VLE). This ensures that all the villagers obtain all services that their urban counterparts are already familiar with. It is also an employment-generation arrangement that gives a full-time job to the VLE. In this process the unemployment problem of the country also gets addressed to a large extent.

The core idea is to develop a podium that would enable Government, private and social sector organizations to assimilate their social and commercial goals for the advantage of the rural population in the furthest areas of the country through a blend of IT and non-IT services. In other words, SreiSahaj's mission is to roll-out one of the largest digital networks not only in this country but also catering to the expanding base of customers living in the remotest corners of the world by bringing efficient financial and humanitarian services and products to all of them.

Products: e-Learning in collaboration with Indira Gandhi Open University), Financial Services (in collaboration with State Bank of India),

Source: www.sahajcorporate.com

Thus, the role of PIAPs shall be upgraded from access provider or service delivery points to that of a 'Change Agent' that would promote small entrepreneurship, build rural capacities and livelihoods, enable community participation and collective action for social change through a bottom-up model focussing on the rural citizens. Undertaking such a challenging task calls for active participation and close interaction between various stakeholders such as Government departments, media, civil society and academia. Various Public Private Partnership (PPP) models are used in different parts of the world and a dedicated in-depth study should be undertaken to examine the existing roles of PIAPs and what model should be adopted to convert them into CSCs and suggest a suitable Business Plan for PPP in establishing more CSCs in uncovered areas/locations. A successful PPP Model is in operation in India, which adopts a CSC Scheme with a 3-tier implementation framework as follows:

- At the first (CSC) level would be the local Village Level Entrepreneur (VLE –loosely analogous to a franchisee), to service the rural consumers in a cluster of 5-6 villages.
- At the second/middle level would be an entity termed the Service Centre Agency (SCA – loosely analogous to a franchiser), which would operate, manage and build

the VLE network and business. An SCA would be identified for one or more districts (one district would cover 100–200 CSCs).

- At the third level would be the agency designated by the State –the State Designated Agency (SDA) –which would facilitate implementation of the scheme within the state and to provide requisite policy, content and other support to the SCAs.

If, after a specific study conducted for this purpose, the Indian model is found suitable; it may be adopted to roll-out the CSCs in Mauritius.

9 Broadband and open access

There is increasing evidence of linkages between telecommunications infrastructure investment and secondary improvements in the economy through information and transaction efficiencies. There is also overwhelming evidence that effectively regulated competitive markets result in price decreases, improvements in service quality, faster roll-out of infrastructure, new technologies implemented, and more choice for consumers (see OECD AFDB, 2007). Trying to address issues of broadband and competition and open access strategies to achieve these, when legacy bottlenecks to the achievement of effectively regulated competitive markets remain, will be counter-productive. That being said, while there was initially some debate about the need for a dedicated broadband policy over and above general ICT policy, the countries that have been the most successful in broadband deployment have been those which have adopted dedicated broadband policies, including Denmark, Sweden, Norway, Korea and much later, after discovering their lagging global positions, the UK and US.

Latest studies by the World Bank (2009) demonstrate that a 10% increase in broadband penetration accelerates economic growth by 1% in developed economies and by 1.38% points in developing economies. The evidence that has been emerging over the last few years has captured the imagination of policy makers at a time of global recession. As a result of a series of economic impact studies that have demonstrated the positive effects of improved broadband penetration on economic growth and job creation, multi-million dollar broadband strategies have become central to economic recovery and economic growth strategies around the world, including the US, Australia, England, France and Germany.

Recently, Koutroumpis (2009) demonstrates, through econometric modeling, the existence of several levels of return from broadband infrastructure, based on the level of penetration. He asserts that there is evidence of a critical mass phenomenon in broadband infrastructure

investments, and the penetration level that he identifies is a critical mass of 20 percent of the population connected to the network. His study refers to OECD countries, but it can be extended to the African context since he uses standard parameters to calculate it such as GDP, level of education, broadband penetration and prices, etc. According to him, this percentage creates a vision for countries to capitalise the beneficial effects that the network can provide and it implies a 0.89% aggregate growth rate due to broadband externalities.

As a result several emerging and developing countries are starting to pursue 'stimulus packages' to boost sector growth or in which the broadband development is a component.

Table 14: Examples of countries that have adopted a 'stimulus' approach to broadband

	Date	Stimulus Plan Approach	ICT Contribution	Total Contribution (2008 – 2010)
Malaysia	March 2009	• National operator is to establish a subsidiary to facilitate and improve broadband infrastructure. • MCMC to facilitate broadband community centers and provide basic telephony services in rural areas. • The plan also encourages companies to employ retrenched workers by giving them double tax incentives. • It also forms a special task force to monitor the impact of the financial crisis.[15]	3 billion ringgit (USD 813 million) Additional 2.4 billion ringgit (USD 651 million) directly to MCMC	60 billion ringgit (USD 16.2 billion)
Singapore	Jan 2009	• Homes and offices to be connected to NGN (broadband) by 2013. • Structural separation of network infrastructure from operating company. Government allocated SGD 750 million to the existing company that will manage passive infrastructure on the FTH network • A separate private sector company has received a SGD 250 million (maximum) loan to support infrastructure deployment.	SGD 1 billion (USD 650 million) Additional part of SGD 183 million for funding Intelligent Nation Masterplan[16]	SGD 20.5 billion (USD 14.5 billion)
United States	February 2009	• Provision of grants, loans and loan guarantees based on guidelines to be developed. • The funding is to be used for Rural Utilities Service (USD 2.5 billion) to provide and improve service in unserved and underserved areas and Broadband Technologies Opportunities (USD 4.7 billion) for stimulating demand for broadband, improving service, and providing support for public interest schemes facilitating access, and improve broadband uptake by public safety agencies.	USD 7.2 billion	USD 789 billion

Source: extracted from table 1 in Msimang, M. GSR Discussion Paper 2009:8

9.1 Competition and deployment of public funds for backbones

In principle, backbones should only be financed with public funds when there are infrastructural bottlenecks. Some larger markets in Africa like Nigeria, South Africa and Kenya are able to sustain backbone competition – though the legacy monopoly issues continue to make entry difficult, as one can see in the case of Mauritius. Even though it may be difficult

for new entrants to compete in these environments, other service providers benefit from outsourcing and the lowering of both capital and operating costs (OECD AU 2010). Deployment of public utility communications networks such as power and rail are also ways of securing backbone competition, if there is no fresh investment appetite.

As in the case of South Africa, the use of public funds to support the utility communications networks backbone development initially lead to a halt in private investment in networks which had just been opened to competition, and in which private investment had only just started. Initially networks supported the initiative happy for the state capitalise the extension of the costly trunking networks, to which they would then have regulated low cost access. When lack of state co-ordination required to bring the operator to market resulted in delays to the licensing of the state owned broadband company, Infraco, competitive private operators could not afford to wait around while the government tried to sort out the policy and regulatory hurdles to licensing. After waiting about a year and a half, private investment in their own networks resumed. But this of course diminished the initially strong business case for the state operator, as its proposed clients (other network operators) once again become its competitors utilising the capacity on their own networks and reselling the excess capacity in competition with the state owned company which was only allowed to sell services to other operators, not directly to the public (Gillwald 2009).

In Rwanda and even larger markets such as Nigeria, public funds have been used to roll-out dark fibre. In South Africa, where dark fibre roll-out occurred outside of the licensing framework, it has cost effectively been rolled-out in most metropolitan areas and even some rural routes and municipalities. In several countries such as Cameroon, Tanzania and Sudan however, it is still not possible for operators other than the state owned company to operate wholesale services, which has severely constrained competition and innovation (OECD AFDB2010).

Box 2: EC Rules for State Aid for Broadband

In principle, infrastructure support must be given only to bridge the digital divide. Support should, therefore, be limited to areas where it is not commercially viable for private sector operators to establish adequate facilities. The European Commission distinguishes in this context between white, grey and black areas.

1. White areas are sparsely populated rural zones, where no broadband access except via satellite or leased lines is available. In such areas, state aid is in general allowed (rural broadband in Greece, optical fibre and rural internet access in Lithuania).
2. Grey areas are areas where broadband is already provided. Here, permission for state aid demands a more detailed assessment (optical fibre infrastructure for wholesale provision in urban Ireland through a publically owned network).
3. Black areas are those where at least two competing infrastructures exist, and where there will be a high risk for market distortion if state funding is allowed -in such areas state aid is generally not allowed.

Source: Investment Dimensions in a Universal Service Perspective: Next Generation Networks, Alternative Funding Mechanisms And Public-Private Partnerships, Morten Falch and Anders Henten

Source: Msimang, M. GSR Discussion Paper 2009:5

While this has proved true with telecommunications services and even wireless networks, the high sunk-costs associated with backbone network and new broadband infrastructure makes the risk of investment high. Broadband, like other public infrastructure before it, has suffered from market failures in terms of competitive markets serving uneconomic areas, but likewise the legacy effects of entrenched monopolies in emerging broadband markets have created problems for the development of the service. The most common form of market failure is the persistence of monopoly – the dominance of incumbent public telecommunications operators arising from their historical monopoly position has been one of the key obstacles to the development of effective economies of scale. Difficulties in obtaining legal permission to operate, and inefficient allocation of radio competition in the broadband market have also stifled development (Kelly et al 2009).

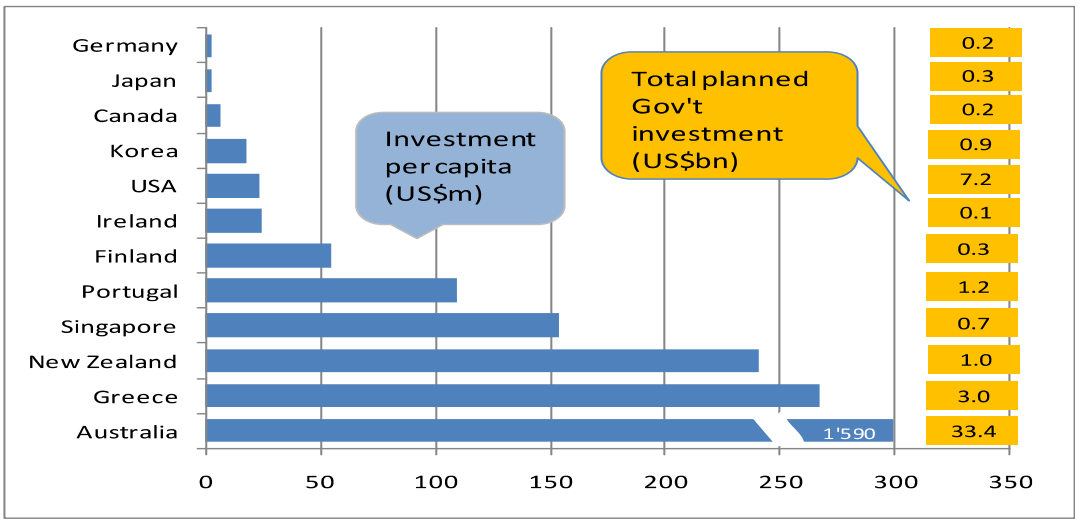


Figure 8: Government planned spending on broadband as a component of economic stimulus packages

Source: World Bank, based on data from ITU, Booz and Co and OECD.

While the role of government in broadband markets continues to be the same as ICT more generally – making markets more efficient and ensuring equitable access to services – the best way to achieve this in a broadband environment, especially in a small island state, may be different. From a broad policy perspective the ideal way of optimising the provisioning of services is through the opening of markets and creation of a fair competitive environment for the efficient allocation of resources on the basis of supply and demand within a market. All evidence suggests that competition drives down prices and extends the range of services, generally creating efficiency to enhance consumer welfare. But policy tensions exist between preserving a favourable investment climate for operators who may seek exclusivity and restrictions on market entry, and increasing competition that is known to drive service extension and uptake.

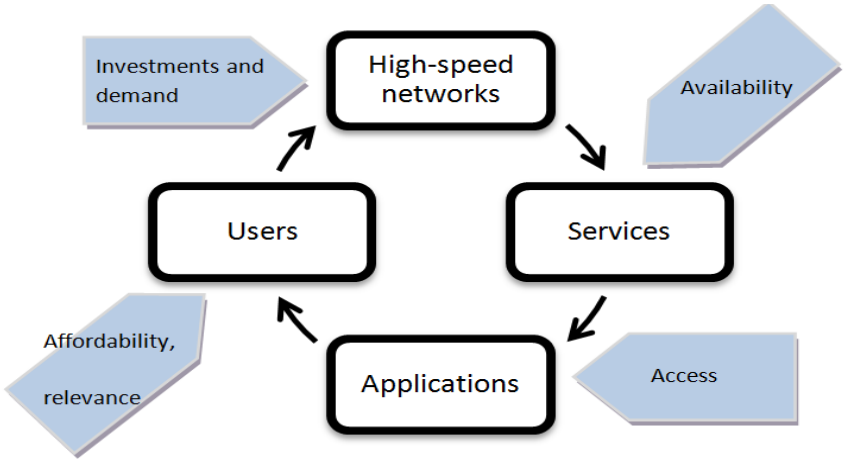


Figure: The broadband ecosystem

Source: Kim, Kelly, Raja (2010)

9.2 An ecological approach to broadband policy

Broadband is increasingly viewed as being necessary to create equity in access to information. Information is a public good, access to which allows for more informed decisions by individuals, companies and governments enabling efficiency in markets and public delivery. Broadband is typically defined as a "high-speed communications network" that connects end users at data transfer speeds that are greater than some minimum (e.g.256 kbit/s). But others (Fransman 2010, Kelly et al. 2009) argue that it should be viewed as an ecosystem rather than simply as a new network. Envisaging it as such broadens the scope and role of government beyond ensuring infrastructure to enable its optimization by industry, to deploying it for more effective governance to stimulating the demand and usage to create the critical mass required for the network effect and multipliers associated with increased penetration and usage to kick-in.

The table below assesses the progress Mauritius has made to implementation of the more comprehensive broadband strategy being proposed above and where it may need to focus moving ahead.

TABLE 15 - Assessment of Mauritius with regards to the implementation of standard broadband strategy			
	Early stage: promote	**Mass market: Oversee**	**Universal service**
Goals	Promotional supply side policies and demand side stimulation	Facilitate competition through consistent but flexible regulation Co-ordinate access to rights of way	Universal access for full range of enhanced services necessary for effective and participation in the economy
Networks	Enabling environment for investment and market entry Reduce administrative burden & incentive for network roll-out, marketing innovation and R&D Allocate and assign spectrum for broadband	Infrastructure sharing, Ensure spectrum available for wireless	Deployment of open access to broadband networks where no competition, build-out networks in uneconomic areas
Services	Broadband networks to schools, government agencies Set quality of Service level and monitor	Encourage intermodal competition, resale Non-discriminatory access for services applications and content providers	Local loop unbundling
Applications	Government agencies as early adopters e-government and learning apps Promote relevant digital content (local)	Support secure, private reliable e-commerce transactions / IPR framework	Enhanced e-government programmes Grants to broadband demand aggregators and community champions
Users	Early adopters (individuals and business	Mass adoption	Marginalised
	Encourage low cost computers Promote ethics on information use (fair use, privacy)		
LEGEND	Achieved	Partially implemented	Still to be undertaken/ completed

9.3 Open access

The kind of market failures highlighted above are typically addressed through regulatory policy: reforming licensing regimes, facilitating efficient access to radio-spectrum and, importantly, regulating access to dominant operators' networks. These have all been strategies that have enabled extension of broadband services in leading broadband countries. In more mature economies, broadband policies have focused on providing

regulated access to the incumbent operator's access network through unbundling the local loop to enable competition in the expensive last mile.

Various models exist, from bitstream (sale of fibre capacity) to fully unbundled local loops. Bitstream access refers to the provision of DSL services (high speed Internet) via the consumers' local loop connections. It involves the sharing of active components in the network between the incumbents operating the network and the suppliers requesting access (OECD AfDB2010). This is a complex, resource-intensive regulatory intervention in resource and skills constrained environments that require serious cost-benefit analysis. Enabling rapidly deployable competitive wireless local loops may provide the required access competition. Attention in many jurisdictions has been focused on providing cost-based access to existing bottleneck infrastructure at the other end such as landing stations and major points of presence. These are regarded as 'essential facilities' as it is not economically or technologically feasible for competitors to duplicate them.

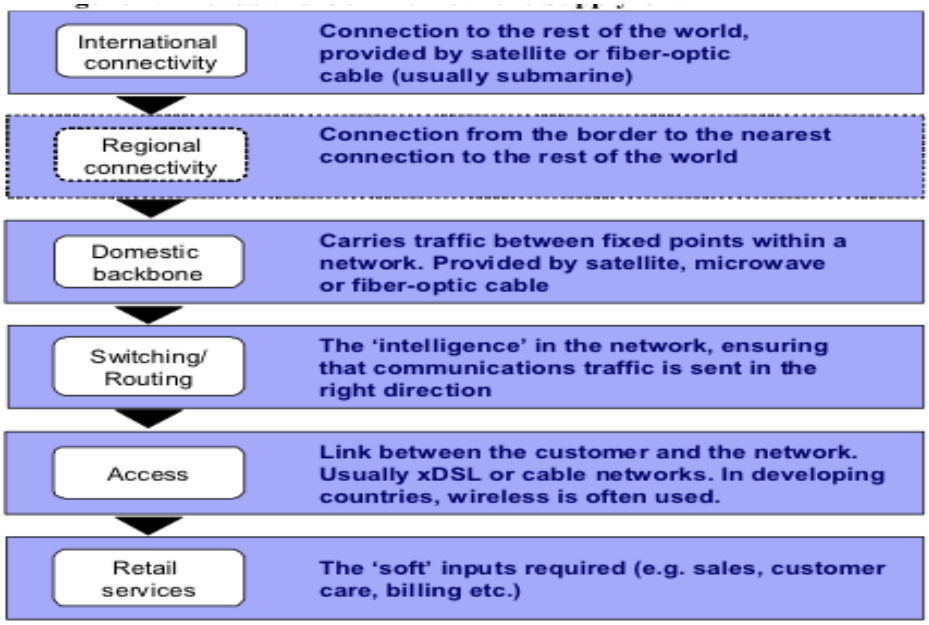
In November 2010, the African Union Minister of ICT directed the African Union Commission (AUC), through the Oliver Tambo Declaration, to develop a common definition, understanding and guideline on Open Access. Open Access can be understood as an extension of the long-standing regulated interconnection of operators network to allow for the seamless termination of their subscribers calls on each other' s networks.

9.4 Policy trade-offs

There is a trade-off between attracting investment and fostering competition. This is particularly so when conditions need to be created to stimulate the deployment of non-replicable infrastructure, such as broadband, while at the same time trying to encourage competition by providing access to facilities to new competitors.

However, creating conditions for competition means providing incentives that are not only financial but may reduce regulatory or policy risk. Bottlenecks in infrastructure layers, for example, are a major risk for new entrants. In economic terms, bottleneck facilities are an essential input for production of some services or goods for which there are no economically or technically viable alternative sources of supply. A single operator or club of operators that can prevent access to facilities by other market participants often owns these. Open Access seeks to facilitate competition in the use of the bottleneck facility, when market forces are unable to create a competitive ecosystem (OECD AU 2010). But Open Access can undercut the incentive for investment in new facilities and cost-based access to it and inhibit future investments in technological developments and innovations.

It will be necessary to systematically identify the bottlenecks in the broadband communications supply chain and example of which is provided below, and see how these can best be addressed by competition and where no access regulation may be required.



Source: Williams 2010

9.5 Prescriptive or enabling open access

'Infrastructure sharing' is a common commercial practice intended to overcome bottlenecks and reduce infrastructure costs, and includes the sharing of passive infrastructure such as mobile network towers and delivery of undersea cables such as EASSy and WACS. The key questions posed by the background paper prepared for the Ministerial meeting is whether Open Access should be imposed, which supplier it should be imposed on and on which part of the infrastructure (OECD AfDB2010).

Open access theoretically applies to suppliers that operate essential facilities or in those jurisdictions with competition frameworks, where operators have significant market power (SMP), or those in which public funds have historically been invested (so all publicly-owned enterprises). In this way the regulator can impose obligations of non-discrimination, cost orientation and transparency on the provision of access, and interconnection of facilities leasing when it has SMP or represents a public investment. The conditions for imposing open access then relate to the presence of essential facilities or when competition through private investments is absent, even after setting up a favourable environment, a precondition often not established in many African jurisdictions before either public investment or regulatory intervention.

While flexibility should guide the network layers for open access, generally it should apply to lower levels of the network, to passive infrastructure in the 1, 2, 3 ISO layers. Open access to higher levels should be encouraged only when an *ex ante* competition analysis justifies it, or it may lead to collusion (OECD AfDB 2010).

9.6 Open access application to retail, roaming and international gateways

The issue of open access at the retail level, particularly through local loop unbundling, is questionable in countries with small markets or limited fixed networks and prevalence of wireless competition, as is the case in most African countries. Where fixed network are more pervasive and penetration rates are higher, such as Mauritius, it may make more sense to consider such an intervention on the basis of a careful cost-benefit analysis. A few African countries have undertaken this. In Algeria 15 of the 75 ISPs are active on the local loop, which was partially unbundled for data services.

Another area that has been considered as applicable for open access purposes is roaming. Indeed, roaming represents a classical monopoly element as only the network owning the number can originate or terminate calls on that number, but in the light of 'plastic roaming' with replacement SIMS and the end of roaming charges within single commercial networks across large parts of Africa, this has become less of an issue (OECD AfDB2010). Of course for small island states highly dependent on roaming revenues from tourism, this remains a vital policy question.

Removing licensing constraints on international gateways are essential to enabling access to international capacity. This remains a major issue in countries with single monopoly (de facto or de jure) operators. *Telegeography* indicates that costs have gone down to USD 340 in 2007–2009 from USD 5308 in 1997–1998. In Cameroon, wholesale price of USD 16000 per Mb per month in 2004–2005 was reduced to between USD 2000 and 4000 per Mb per month in 2007–2009. However, the link between North America and Europe is as low as USD 2.5 per Mb per month (OECD AfDB 2010).

To remove artificial constraints on operators, international gateways need to be offered under non-discriminatory and transparent terms and conditions to all operators, though some small service providers may for commercial reasons prefer to negotiate commercial use of the incumbents' gateways.

Open access applicable to	Possible strategies
Not enforce where competitive markets or segments successfully operating	Commercial infrastructure sharing/facilities
Enforce on bottleneck facilities/market dominance/historically publicly-funded network (public utilities)	Non-discriminatory and transparent terms and conditions to all operators.
Apply to lower level of the network, to passive infrastructure in the 1,2, 3 ISO layers (higher levels only when ex ante competition analysis justifies it)	Infrastructure sharing, required interconnection, co-location, facilities/ capacity leasing
Retail open access	Local loop unbundling/bitstream
Roaming	Cost based termination
International gateways	Gateway competition, though some small service providers may for commercial reasons wish to have access

9.6.1 Creating an enabling Environment for Broadband Development

The cross cutting nature of ICT means that multiple policy initiatives are needed to create an enabling environment. Williams (2010 35:44) identifies several initiatives which can be divided in four groups:

- Removing political and regulatory bottlenecks, such as licencing
- Reducing the cost of investment
- Removing political and commercial risks
- Promoting effective competition in the downstream market.

Policy options to create enabling environment for broadband development

Create an enabling environment for infrastructure competition	Stimulate rollout in underserved areas
Remove regulatory obstacles to investment and competition - Remove limits on the number of network licenses - Encourage entry of alternative infrastructure providers - Remove constraints on the backbone services market - Improve the regulation of backbone networks	Implement incentive-based private sector models - Provide operators with incentives to cooperate in the development of backbone infrastructure in currently underserved areas of the country where infrastructure competition is not commercially viable
Reduce the cost of investment - Facilitate access to passive infrastructure - Promote infrastructure sharing	Establish competitive subsidy models - Provide operators with incentives to build networks in currently underserved areas through reductions in taxation or universal service fund (USF) contributions
Reduce political and commercial risks - Provide risk guarantees and political risk insurance - Aggregate demand	Create shared infrastructure/ consortium models - Provide operator(s) with a subsidy to build and operate a network in currently underserved areas of the country; provide services in these areas on a nondiscriminatory basis
Promote competition in the downstream market - Implement regulation that will effectively promote such competition	

Source: Williams 2010

9.7 Funding the infrastructure build out

The absence of state resources to fund the modernisation of public utility networks in the 1990s is what prompted the shifting of the risk (and returns) of investment onto the private sector through privatisation and partial privatisation strategies. Barely a decade, later countries face the challenge of finding capital to update legacy networks or build new broadband networks. In many countries because of the relatively low returns compared to other areas of investment in the sector or as a result of policy protectionism that has not allowed for competitive entry in the backbone, governments are again devising strategies to fund the build out of broadband network essential for the functioning of a globally competitive economy. While some developing countries are investing state capital in the development of a broadband backbone, such as the United States and South Africa, few

developing countries have the resources to undertake such a project without private sector support, or someone would question where the state should even if it can access the capital, where the private sector is willing to do so and free state capital for other developmental project the private sector is unable or unwilling to invest in.

What has emerged as a successful model to attract private capital into long term sunk infrastructural investments is Public Private Partnerships (PPPs). According to the Canadian Council for Public-Private Partnerships, PPPs are defined as a "cooperative venture between the public and private sectors, built on the expertise of each partner that best meets clearly defined public needs through the appropriate allocation of resources, risks and rewards"[11]. The largest PPP currently proposed is that in Australia with its proposed $43 billion broadband build out through state and private investment.

There are a number of different models that involve the use of the expertise or capital from the private sector. These include:

- **Build operate transfer:** A private entity receives a franchise to finance, design, build and operate a facility (and to charge user fees) for a specified period, after which ownership is transferred back to the public sector. Supply companies, who use the opportunity to build a market for their products, are often attracted to this model. An example of this would be in Uganda, where Huawei have received a long-term concession to build out the national backbone.
- **Build operate own**: The private sector finances, builds, owns, and operates a facility or service in perpetuity. The public constraints are stated in the original agreement and through on-going regulatory obligations but may also be incentivised through the state, often the biggest user of ICT services in developing countries agreeing to become the anchor tenant on the new network.
- **Design-Build (DB):** The private sector designs and builds infrastructure to meet public sector performance specifications, often for a fixed price, so the risk of cost overruns is transferred to the private sector. (Many do not consider DB's to be within the spectrum of PPP's).
- **Finance Only**: A private entity, usually a financial services company, funds a project directly or uses various mechanisms such as a long-term lease or bond issue. Again

[11] For more information on the Canadian Council on Public Private Partnership see http://www.pppcouncil.ca/resources/about-ppp/definitions.html

the degree to which there is state involvement will determine to what degree this is simply a commercial arrangement or a partnership.

10 Institutional review

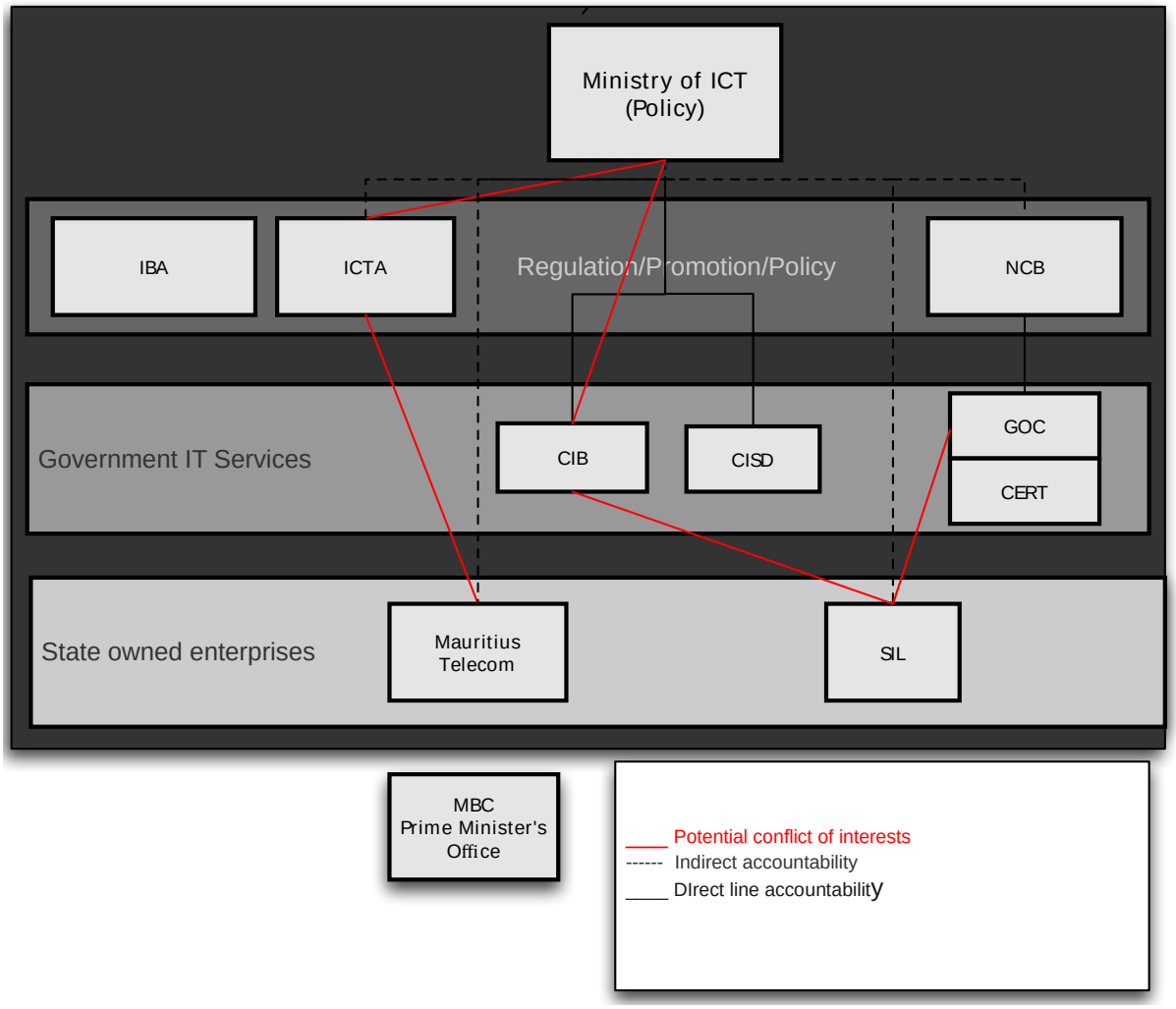
Most of the observations made in 2007 about the institutional arrangement for the sector and the need for reform is still relevant, as none of the proposed actions in this area were implemented. The institutional arrangements for the sector are characterised by lack of clarity of functions, resulting in performance outside the mandate of institutions, duplication of effort producing diseconomies of scale and scope that have undermined the realisation of NICTSP targets, and more importantly the delivery of services. If the NICTSP programmes are simply reviewed, assessed and re-prioritised without addressing the framework under which they are being undertaken, or not, as the case might be, the delivery will continue to be compromised. There are structural conflicts of interest within the arrangements that compromise effective decision-making.

Table 16: Current and proposed institutional arrangements

Functions	Responsibility currently	Responsibility proposed	Capacity requirements
Policy/awareness/demand stimulation **Policy co-ordination with other sectors** **Monitoring & evaluation of implementation.**	Ministry – CIB – IT ITSU – IT Security NCB – IT ICTA – Telecom PMO – Broadcasting	Ministry Integrated policy for converged environment. Data collection, monitoring & evaluation	Policy analysts with specialised knowledge in telecommunications, broadcasting & IT. Economic/Statistical
Implementation – Regulation **Licensing** **Economic regulation** **Consumer Protection/Awareness** **Demand stimulation** **Data protection**	Ministry ICTA – Telecom/ Postal IBA – Broadcasting IT security – NCB -CERT Domain names and IP address administration - Data Protection Commissioner	Converged telecom, broadcasting (postal) authority and regulated aspects of IT. Domain name – ICTA, national IT security – and Converged ICTA Data Protection Commission at least co-located with integrated NRA.	Regulatory economics, legal, engineering, IT, policy advice IT systems analysts, legal Investigators, registry officers, assessors

Other implementation – Education	University of Mauritius University of Technology (Mauritius) MITD HRDC NCB	ICT Academy – co-ordination function only, secretariat located in Ministry of ICT/ MITD board of interested parties.	High level value add – financial and legal services, R&D Software and applications development 3D animation (creative IT). Entry-level call centre
Operational – IT services for government	CIB (planning, procurement, e-government services) ITSU (IT security planning and IT audit) CISD (installation, maintenance, web development) NCB (GOC, web development) SIL (Applications development)	Directorate/Agency *Stage 1 or Scenario 1* -Single point of delivery of integrated ICT planning, procurement, delivery, for Government IT services, e-government services. Services Min of ICT just like any other department. As service centre, could be located anywhere, PMO, Civil Administration, proposed dedicated watch by Ministry of ICT. *Stage 2 or scenario 2* - Could also be semi-autonomous agency to provide the flexibility to be responsive, adopt attraction and retention strategies outside of civil services to compete with private sector for skills.	IT systems analysts Web management/ development Project management
Operational – State owned enterprises	MT, SIL		Scenario 1 - Privatised *Scenario 2* - National champions Scenario 3 – Operate out of policy ministry
Operational – private sector	Various associations	Sector associations continue but ICT Advisory Council of Stakeholders drawn from industry, civil society, universities, trade unions	

Figure 5: Current institutional arrangements and potential conflicts of interest



10.1 Recommendations and conclusions for institutional review

The figure below identifies the proposed new institutional arrangements for the sector that will enable the vision of Mauritius and an ICT regional leader and cyber island with ICT contributing significantly to the economy. Starting at the top of the diagram it divides the sector into functions. Policy-making is the prerogative of the executive, who has also the responsibility of co-ordinating sectoral policy with national policies. This is distinguished from policy implementation or regulation, which needs to occur with some level of autonomy, of course within the policy and legal framework, to be effective.

All regulatory functions across the three historically distinct areas of broadcasting, IT and telecommunications should be consolidated here in order to effectively regulate the

converged, next generation technologies, services and networks necessary for Mauritius to remain at the cutting edge globally. With the convergence of content and carriage (transmission) regulation, new regulatory functions such as data protection (commissioner), cyber-security (PKI and CERT functions) could at least be co-located for co-ordination of functions, with the potential to share support services. Although there may well be some rationalisation of administrative posts, it is likely over the next few years with the growing demand of ICT services and therefore the effective governance of them that demand for technical position will increase. For example there will be increased pressure on ICTA on the adoption of the proposed roadmap to move more swiftly on its creation of more effectively competitive environment.

The Data Protection Commissioner's office, anticipates its staff need to increase, as it attempts to deal with the growing demand for registration and renewal of around 12, 000 applications annually from the 100, 000 data controllers operating in Mauritius.

Within the Ministry of ICT, consolidation of IT services is urgently required to provide a single, integrated entity responsive to the needs of its users. This can be achieved in two stages or scenarios. In the first instance, this could take the form of a functional alignment of those entities (CIB and CISD) responsible for planning, procurement, installation, maintenance, web development, into a directorate which co-ordinates these functions, avoids duplication and pool resources to better meet needs. On the other hand or at a later stage, a body or agency with the legal character of a Parastatal body, which with some level of autonomy to be more flexibly responsive to the changing demands of government and the dynamism of the ICT industry could be established to consolidating all the ICT functions of CIB, CISD, GOC and ITSU.

The benefits of high levels of co-ordination in a single entity removing the duplication of technical and administrative systems would be significant. Its productivity could be enhanced by it operating as a zero/low budget cost recovery centre, based on service levels agreements that Ministries would enter into. This would also allow Ministries to pay for and receive the levels of services they require and are willing to pay for. Employment could be contract based, so the changing needs of government can be accommodated without long-term redundancy and allow for performance contract-based retention. Critically, it would allow the entity to compete with the private sector in attracting and retaining high-level skills required for it to be responsive and effective. Again, while this consolidation will eliminate the duplication of administrative functions, the requirement for technical staff is likely to

increase as the demands and improvements required of them escalate. The current ratios of technical and administrative staff need to be inverted.

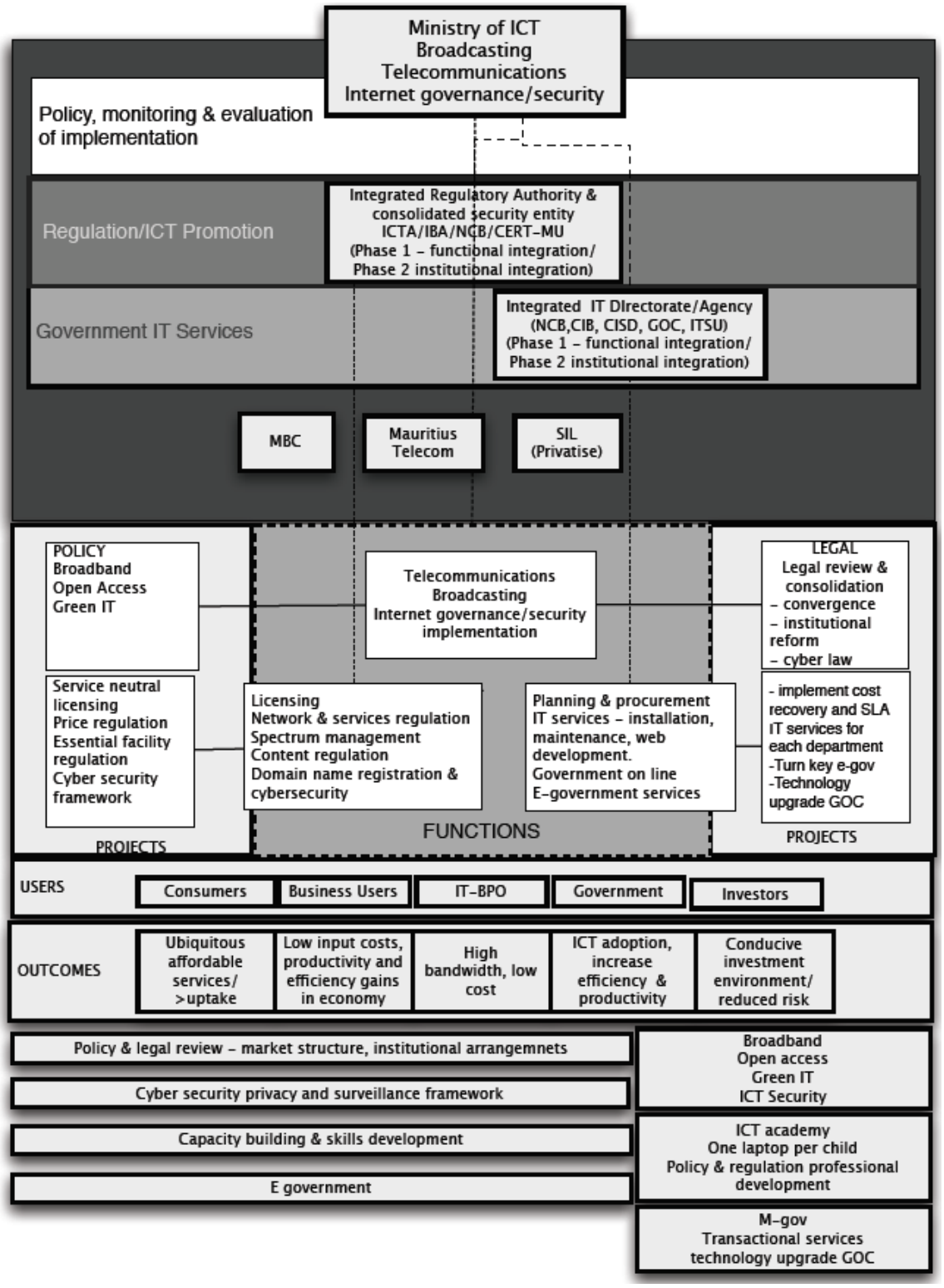
'Externally' the operational level includes Mauritius Telecom, SIL, and Mauritius Broadcasting Corporation. Shifting state owned entities out of the Ministry responsible for overall policy could accommodate perceived conflicts of interest resulting from ownership and procurement overlaps, or shareholder wellbeing and sector competition policy. Longer-term benefits of privatisation, if entities are no longer fulfilling their original purpose of being state owned, should also be considered.

Arising from clarity of functions, the form of the institution is determined, and then the separate policy, regulatory and operational programmes can unfold. These are identified below. For example, in order for the Ministry to provide direction to the sector through clear policy formulation, an integrated sector/broadband policy is necessary to provide a clear vision for the sector. This provides the framework for an integrated strategy and implementation by the national regulatory agency. It is clear that the legislation pertaining to the sector is out-dated and requires a complete review to accommodate the significant changes in the industry over the last 10 years.

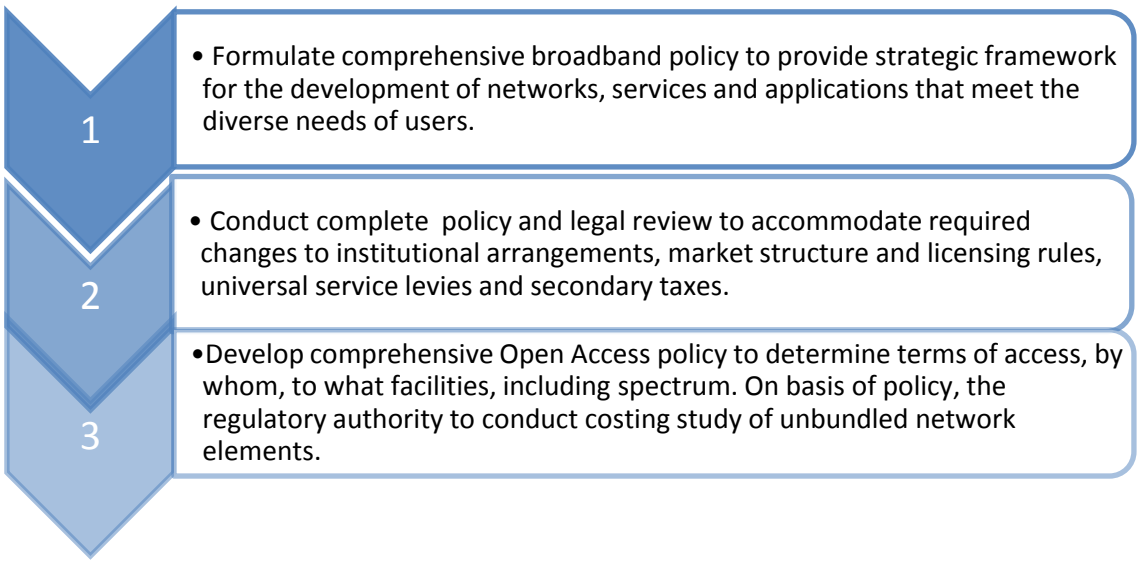
The regulator likewise after several years of successful regulatory intervention needs to do a thorough review of the market to establish the effectiveness of competition, the impact of market dominance in sector development and innovation and the success of mechanism to achieve universal access in the context of a broadband environment. Cyber-security and aspects of Internet governance have to be fully implemented and in a small country such as Mauritius, together with their overlapping nature in a converged environment could be addressed in a single agency. The operational aspects of this for Government should of course be housed and performed in the integrated operational entity proposed. A series of programmes and projects in that regards are listed below.

Policy formulation, regulation and government IT services being provided in this co-ordinated and consolidated way should enhance decision-making at all levels and in this way better meet the needs of users. There are different users with different needs, and the proposed project plan suggests projects that will enable the delivery of affordable services in line with the objectives of the policy.

Figure 6: Proposed institutional arrangement, arising functions and programmes to meet diverse user needs



On the basis of these revised institutional arrangements, it is proposed that the comprehensive broadband policy encompassing the ecosystem approach to developing networks, service, applications and users discussed above be used as the strategic framework to provide a rationale for projects and strategic location for them in the three years going forward.



i-MAURITIUS 2011- 2014 ROADMAP			
Strategic Area of Intervention	**Strategies**		
	2011-2012	**2012-2013**	**2013-2014**
S1 - POLICY & LEGAL, REVIEW Remove existing policy, legal and institutional constraints to ensure that the ICT sector becomes a major pillar of the economy and a regional ICT hub. Transform Mauritius into a knowledge- and information-based economy and society through development of comprehensive broadband policy.	S1.1.1 MICT undertakes policy review to deal with converging ICT sector and in consultation with regulatory and advisory bodies prepares policy paper for appropriate institutional arrangements within the sector and the network investment strategies, open access policies and demand stimulation strategies required for an integrated broadband policy for the country. S1.1.2 Review in consultation with regulatory agency current universal access policy. S1.1.3 MICT to co-ordinate alignment of indicators, definitions and statistics across sector agencies and CSO.	S1.2.1 Implementation of the Broadband Policy including revamped ICT Act and related legislations S1.2.2 Preparation of Green ICT policy paper for consultation.	S1.3.1 Monitoring and evaluating implementation of the Broadband Policy
S2: REGULATORY REVIEW Undertake regulatory interventions to ensure competitive market and consumer welfare	S2.1.1 ICTA to conduct market review to assess significant market power in the telecommunication sector and to conduct impact assessment of the introduction of competitive levers such as number portability and unbundling local loop to ensure favourable conditions for new entrants by end of 2011. S2.1.2 ICTA to conduct benchmarking	S2.2.1 Review of Regulatory Framework to align with the broadband policy S2.2.2 ICTA to review spectrum plan and ensure access to spectrum for emerging services.	

	pricing studies for interim assessment of wholesale services (IPLC and terrestrial, leased links, and interconnection) S2.1.3 ICTA to develop service neutral licensing framework for converged environment to be included into the new ICT Act.		
S3 - INSTITUTIONAL REFORM (IR) Ensure institutional arrangements for the sector that will enhance performance and optimize delivery of services	S3.1.1 MICT to prepare interim plan for consolidation and co-ordination of functions within existing institutions (with support of Industrial Relations and Human Resource/Change management expertise) in consultation with CIB, CISD, ITSU,	S3.2.1 MICT to implement institutional arrangements emerging from policy review and in consultation with sector agencies develop fully integrated institutional design for converging telecommunications, broadcasting and ICT sector, including a HR plan and implementation budget.	S3.3.1 Implementation of institutional redesign with consolidation of policy, regulatory and operational functions in dedicated institutions with overall co-ordination and monitoring & evaluation by MICT.
S4 - NETWORK DEVELOPMENT Enable the development of high speed networks to meet the growing demands of consumers and business	S4.1.1 - Network Development strategy is being considered as part of the broadband policy at S1.1.1	S4.2.1 In line with the broadband policy attract investment in the sector including implementation of Special Purpose Vehicle (SPV) for undersea cable S4.2.2 Tapping of USF for network extension to remote locations and islands.	S4.3.1 MICT in consultation with regulatory agency and ICT Advisory Council to identify strategies and funding for accelerated deployment of next generation network extension - FTTC/FTTH
S5 –SERVICES Telecommunications Enable competitive range of ICT services to meet diverse needs of users. Capacity Building	S5.1.1 - Development of a service neutral licensing strategy as indicated in S2.1.3	S5.2.1 - Regulations for abuse of dominance, anti-competitive practice following market review and in consultation with Competition Commission of Mauritius	S5.3.1 Competition in services review/ post-policy implementation - wholesale pricing, spectrum access, number portability, local loop unbundling.

Enhance BPO and IT-enabled service competitiveness and move up value chain of service offerings IT-Enabled Overall local ICT services excellence for export, to serve as regional hub and provide regional leadership	S5.1.2 Conduct regular workforce survey in the ICT/ BPO sector to determine current employment levels and assess needs gap. S5.1.3 - ICT Academy to develop plan on the basis of gap analysis for training to meet diverse needs of different components of BPO-IT enabled services industry. 5.1.4 MICT, BOI and Enterprise Mauritius to co-ordinate IT enabled services/BPO promotion and investment and monitor and report on investment in the sector	S5.2.2 – Consolidate ICT Academy.	S5.3.2 Transform ICT Academy into a fully-fledged body for the sector based on a PPP model.
S6 Services/Applications Including E-GOVERNMENT Redefining the strategic areas for e-Government services based on user needs.	S6.1.1 MICT to convene consultative meetings with the major stakeholders and draw up the structure of the proposed e-Government Apex body along with its TOR. S6.1.2 MICT to take up the proposal for the formal notification of Apex Bodies by the Government.	S6.2.1 Alignment with the National ID Card. (MICT) S6.2.2 A joint consultative committee is formed by MICT to look into the technical/financial aspects of the MNIC roll-out plans as it emerges and the potential links with the e-Gov services/data sharing. S6.2.3 DPO to organize a consultative meeting with the e-Gov stakeholders and MNIC implementing agencies/Dept to discuss the issues regarding the Data Protection and set the legal teams	

Branding E-government Building an e-Government brand for Mauritius and strengthening the sectoral champions	S6.1.3 CIB to conduct e-Government needs survey on citizen and business centric services.	S6.2.4 Implementation of citizen and business centric services on the basis of needs survey	
	S6.1.4 MICT / National e-Gov Apex Committee to develop the e-Gov Brand Marketing and Awareness Campaign.	S6.2.5 Implementation of National e-Gov Brand Marketing and Awareness Campaign.	S6.3.1 Accelerate the e-Gov Brand Marketing and Awareness Campaign.
	S6.1.5 CIB to align the role and functions of the CIO in view of the strategic importance of ICT in Public Service delivery.	S6.2.6 Implementation of Capacity building exercise for the CIOs	S6.3.2 ICT Strategy at the level of Ministries and Departments driven by reinforced CIO functions
S7 Community Empowerment Programme Building an all inclusive Information Based Society	S7.1.1 Accelerated roll-out of the Universal ICT Programme S7.1.2 Roll-out of computer clubs across the Republic of Mauritius. S7.1.3 Deployment of Techno-preneur programme	S7.2.1 Technopreneurship portal to support virtual incubator and guidance to start ups	S7.3.1 Evaluate the impact of strategies to build an all inclusive information society
	COMMUNITY – S7.1.4 Development of a framework for promotion of local / community content development		S7.3.2 Creating an enabling environment

			for Internet Access as citizen ‘s right
	INDUSTRY – S7.1.5 ICT Academy (See S5.1.3) Enabling Broadband strategy Enabling Business Environment		
	EDUCATION SECTOR S7.1.6 Review of ICT Literacy programmes and making ICT pervasive in Education S7.1.7 Ministry of Education and Human Resources to finalize the “One laptop per child” project with MICT/MOFED and plan its roll out.		
S8 IS (Information Security) Creating a national Coordination set up for all IT security Concern. Implementation of IT Security standards across sectors Risk assessment and third party audit enforcement	S8.1.1 Setting up of a National IT Security Committee **(NITSC)**. S8.1.2 Review of the legal framework in the area of ICT Security. S8.1.3 Adoption of CIIP	S8.2.1 Creation of an enforcement mechanism and putting in place all the necessary Legal Frameworks for IT Security. S8.2.2 Creating of awareness for the adoption of Information Security Management System at National Level.	S8.3.1 Ensure compulsory risk assessment of systems and applications. S8.3.2 Setting up a National Test Bed S8.3.3 Plan to conduct third party audits for all systems, networks and applications.
S9 - Human capital development Identify the human capital gaps and the market needs**.** Gear up the education and training and research undertakings in the country in	S9.1.1 Ministry of ICT in collaboration with stakeholders to draw the TOR for a National ICT Workforce Survey to quantify employment in ICT (and BPO) sector. S9.1.2 Ministry and other agencies to jointly operate a National IT Skill Training and Employment placement Portal (informs the state of the supply of qualified IT professionals against the demand, roster of	S9.2.1 MICT and other stakeholders to set up a joint coordination committee to develop a national IT HR Development programme focusing on key IT job categories/skills (identified in the survey).	

support of the ICT sector.	skilled persons for the employers/industry, and the employee as well as training for potential foreign investors to the country in IT sector. This strategy is linked to the ICT Academy Initiative. (see S5.1.3)		

12 Arising Summary Action Plan

ACTION PLAN SUMMARY	ACTION	RESPONSIBILITY	COMPLETION BY	COST
P1	Policy and legal review	MICT	End of 2011	Within MICT budget but with expanded high level policy expertise within Ministry following review (which may come from agencies currently providing policy services to MICT)
P2	New ICT policy framework including broadband and open access policy	MICT	End 2011	To be costed on basis of policy choices and implementation plan (policy & regulation)
P3	Revise or repeal ICT Act & other related legislations and introduce new integrated legal framework	MICT	2012	As part of operational budget of Ministry of ICT
P4	Consolidate existing indicators portal for online updating of data	MICT, ICTA, NCB, CSO	2011	Within current operational budget (consolidated budget 2011 Rs2 million)
P5	Review universal access policy and implement revised policy including	MICT/ICTA	Mid 2011	As part of operational budget of Ministry of ICT (Additional policy staff as

	disbursement plan for USF			part of institutional review.)
R1	Market review	ICTA	Mid 2011	Within ICTA operational budget
R2	Integrated pricing review	ICTA	End 2011	Within ICTA operational budget
R3	Spectrum review	ICTA	End 2011	Will require external expertise (consultant Rs750 000)
R4	Developing of regulations for abuse of dominance, anti-competitive practice in consultation with Competition Commission of Mauritius	MICT/ICTA/CCM	2012	As part of operational budget of Ministry of ICT
R5	Broadband regulations (if required from new policy framework – may be taken care of by licensing, open access, and market review)	ICTA	End 2012	Special budget arising from policy choices.
R6	Open access (including ULL if included in policy) back bone investment (potential regulatory forbearance) and competition regulations	ICTA	End of 2012	Special budget arising from policy choices
R7	Dot.mu re-delegation	ICTA	End 2012	Rs500 000 (budgeted)

R8	Implementation of PKI	ICTA	2012	Rs 750 000 (budgeted)
IR1	Develop plan for consolidation and co-ordination of functions within existing institutions	MICT	2011	As part of operational budget of Ministry of ICT
IR2	Develop a fully integrated institutional design for converging telecommunications, broadcasting and ICT sector, arising from policy review of institutional arrangements	MICT	2012	As part of operational budget of Ministry of ICT
ND1	Setting up of a Special Purpose Vehicle for Broadband Network/Cable investment/Academy (possible strategy arising from policy framework)	MICT	2012	As part of operational budget of Ministry of ICT – Financing from PPP
ND2	Identify strategies and funding for Next Generation Network	MICT	2012/2013	As part of operational budget of Ministry of ICT – Financing from PPP
S1	Co-ordinate IT enabled services/BPO promotion and	BOI/MICT/EM	2011	As part of operational budget of Ministry of ICT

	investment			
S2	ICT Academy	MICT/NCB	2011 (Ongoing)	Budget still to be finalised
S3	ICT laboratory - applications	UoM/UTM	2011	Rs2m (start up costs)
S4	Multi-disciplinary ICT policy and regulation think tank	MICT/ UoM/UTM	2012	Rs2m (start up costs)
E-gov 1	Constitution of e-Govt Apex Body	MICT	July, 2011	As part of operational budget of Ministry of ICT
E-gov 2	Conduct and implementation of an E-gov needs survey	CIB/NCB/GOC	2011/2012	RS2 million for survey
E-gov 3	National e-Government Service Delivery Gateway	MICT, CIB, CISD, NCB	July, 2011	Admin measures – actual need of any equipment can be known only after assessing the infrastructure at GOC - So no figures or we can just put 2 million for additional equipment/applications to be developed at GOC to enable it act as the E-gov

				Gateway
E-gov 4	Alignment with the MNIC Project	CIB	2011/2012	Alignment with MNIC (estimation from the MNIC present estimates:- Rs50 Million
E-gov 5	Development of media, communication and branding strategy for e-Government	MICT, NCB	End 2011, ongoing	Rs750 000
E-gov 6	Develop a platform for Data Protection Issues	DPO/MICT	End 2011	As part of operational budget of Ministry of ICT
E-gov 7	Capacity building for CIOs	MICT/Ministry of Civil Service	2011	Rs2 Million
E-gov 8	Strengthening of PIAPs	MICT	2011-2013	PIAPs / CSCs: Cost of each CSCs to be taken from NCB - at this stage the PIAPs are already budgeted for (what we suggested is a PPP Model - that has to be first developed to get actual Govt investment). To develop the Model Business Plan, an estimated budget of Rs2 Million should be earmarked.
IBS1	Accelerated roll-out of the Universal ICT Education	NCB	2011	Self-financing

	Programme			
IBS2	Roll-out of Computer Clubs	NCB	2011	Finance from Corporate Social Responsibility
IBS3	Development of Techno-preneur programme	NCB	2012	NCB Budget
IBS4	Development of a framework for promotion of Local Community Content	NCB/IBA	2011	NCB Budget
IS 1	Formation of a National IT Security Committee	CERT-MU, ITSU, DPO, ICTA	2011	No cost- admin measures
IS 2	Review of ICT Security Legal framework	MICT, CERT-MU, ITSU, DPO, ICTA, SLO	2011	As part of operational budget of Ministry of ICT
IS 3	Adoption of Critical Information Infrastructure Protection framework	MICT, CERT-MU, ITSU	2011	As part of operational budget of Ministry of ICT
IS 4	Creation of an Enforcement Mechanism and putting in place all the necessary Legal Frameworks for IT Security	CERT-MU, ITSU,ICTA,	2011	As part of operational budget of Ministry of ICT
IS 5	Promoting implementation of ISMSs	CERT-MU, ITSU	2012	NCB Budget
IS 6	Risk assessment of systems and applications	CERT-MU, ITSU	2013	NCB Budget

IS 7	Conduct of third party audits for systems, networks and applications.	CERT-MU, ITSU	2012	Present cost charged by 3rd party Audit contracted so far is Rs2Million per system audit. So actual number of system will depend on how much the Govt/system owner will pay
IS 8	Setting up of a National Test Bed.	CERT-MU, ITSU	2013	NCB Budget
HC 1	Conduct a National ICT Workforce Survey and gap analysis	CSO/MICT	2011	Rs 1,5 million
HC2	Operate a national IT skill, training and employment placement portal	MICT/NCB/HRDC/Ministry of Labour	2012	Rs2 Million

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14 Appendix 1 – NICTSP status review

LEGEND Will be completed by 2011 (32)		Implemented but unlikely to be completed by 2011 (34)		Not implemented(28)		Unknown/unidentified (30)
NICTSP		PROJECT TITLE	OWNER	START	FINISH	STATUS
Reviewing ICT Policy, effecting legal and regulatory changes	S1P1	Affecting appropriate changes for technical and institutional capabilities in the emerging converged environment	MICT	Feb-08	Jul-08	A proposal for an integrated institutional structure under an ICT DIRECTORATE has been suggested by the CIB
	S1P2	Comprehensive review of ICT policy to lend strategic directions to activities in ICT and other sectors	MICT	Nov-09	Feb-10	Ongoing under the present AfDB assisted exercise
Information security culture and emergency response systems	S1P3	Amendment of Data Protection and Privacy Laws, Establishment Data Protection Commissioner's Office; Finalization of Codes of Conduct for the Privacy Sector	PMO	Feb-08	Jul-08	DPO is established; applied for EU accreditation – which provides a strong signal to investors on data security for the country. Guidelines on 'Privacy Impact assessment' and Privacy Enhancing Technologies' under consideration of ITSU. ITSU has already scrutinized security aspects of the applications being developed by CISD
	S1P4	Changes in Copyrights Act, 2003	MoAC	Nov-09	May-10	Ongoing. Put on hold for the new version of WPO guidelines/model

	S1P5	Changes in Cybercrime & Comp Misuse Act, 2003	MICT	Nov-08	May-09	
	S1P6	Harmonise Elect Transaction Act with UNCITRAL Convention 2005	MICT	Jul-08	Jan-09	
	S1P7	Enact Anti-Spam Law	MICT	Aug-08	Feb-09	Legislative changes on anti spam laws drafting guidelines prepared and submitted to State Law Office
	S1P8	Child Protection Act	MoERC, DC	Nov-08	Apr-09	
	S1P9	Formulate a Broadband Policy	MICT	Sep-08	Mar-09	Incomplete
	S1P10	Labour Laws for the IT Sector	MoLIRE	Feb-08	Aug-08	New Labour Laws in place. IT related issues being explored.
	S1P11	Organise / Design National ICT Authority of Mauritius	MICT	Nov-09	Jul-12	Not started
	S2P1	Establish a PKI infrastructure	ICTA	Feb -08	Jun-08	In progress. MOU with NIC/India on PKI signed
	S2P2	Setting Up of Mauritian CERT	NCB	Feb-08	Jun-12	Completed (80%)
	S2P3	Implement a code of good practices for ISPs	ICTA	Mar-08	Jun-08	Not ready
	S2P4	Institute a framework to monitor Internet traffic	CERT	Oct-08	Mar-09	In progress

	S2P5	Create a baseline security standard framework to be adopted by different sectors	NCB	Feb-08	May-08	Completed
	S2P6	Setting up local chapters of international professional information security associations in Mauritius	CERT	Aug-08	Jun-09	Local Chapter of ISACA has been established in Mauritius.
	S2P7	Setting up and institutionalising an Information Security Assurance Framework	CERT	Aug-08	Apr-09	Ongoing, 75% completed
	S2P8	Include Information about information security threats, safety measures in the curriculum at lower secondary level	MoHER	Mar-09	Oct-09	Not Started
	S2P9	Info Sec Awareness Programs in Public Services	NCB/ITSU	Jul-08	Jul-12	Awareness on IT Security in the Public Service has been ongoing since 2005. Awareness sessions have been carried out at all government sites and yearly plan established yearly. Several fact sheets have been prepared and circulated to the whole civil service on security topics such virus, spam, phishing, safe internet surfing etc.
	S2P10	Critical Information Infrastructure Protection and performing information security risk profiling	CERT	Aug-08	Jun-09	Almost completed

	S2P11	Promote the adoption of Information Security Standards at the National Level	NCB	Aug-08	Jul-12	Ongoing
	S2P12	Implement the recommendations of the Anti-Spam Action Plan	NCB	Feb-08	Jul-11	Ongoing, Completed (75%)
	S2P13	Develop a Child Safety Action Plan	NCB	Feb-08	Jul-11	Child Safety law is in final stage of completion.
	S2P14	Consultative process towards building a National Cryptography Policy	ICTA	Nov-08	May-09	Not started
	S2P15	Organisation of Regional Information Security Event	NCB	Jun-09	Dec-11	Ongoing. Local/National programmes Organised
Harnessing emerging technologies and enhancing infrastructure capacity	S2P16	Info Sec standards in the Civil Services	ITSU	Feb-09	Jan-12	ISMS for government units have been implemented for 10 sites. One site has been certified. Other sites are planning certification within 2011-13.
Education through ICT	S4P1	Review of Curricula for Primary and Secondary Schools for enhancing ICTs in Education	MoEHR	Nov-08	Feb-10	Completed
	S4P2	Teachers' IT Licence	MoHER	Feb-08	Jun-08	On going

	S4P3	Teacher's Training in ICT	MoE	Feb-08	Oct-11	Ongoing. Under "Partners In Learning" programme, Microsoft has trained 40 Educators on a training of trainers basis. Heads of dept of Biology, Chemistry and Physics have been trained during the month of Feb 2010.
	S4P4	Portal for Education	MoHER	Feb-08	Oct-09	Tender launched in 2009 evoked no response. Based on a MoE-Microsoft pilot test of a portal for schools, a revised technical specifications document has been prepared. No funds available for the project in 2011. However, funds have been provided for a study on e-education projects including the e-education portal.
	S4P5	Increase PC Penetration in Primary School	MICT	Feb-08	Feb-12	Ongoing. Regular installation of ICT equipment in schools done by MoEHR.
	S5P1	Setting up a National ICT Evaluation and Research Network (NICTERN)	NCB	Feb-08	Jul-08	Ongoing. 75% Completed
	S5P2	Definition of "ICT Sector" and "ICT Services"	NCB	Jul-08	Oct-08	Completed
	S5P3	Definition of ICT indicators	NCB	Aug-08	Mar-09	Completed
	S5P4	State of the ICT Report	NCB	Jul-08	May-12	Ongoing. 75% Completed
Promotion adoption of ICT to deliver better health care	C2P1	Implementation of an e-Health Action Plan	MoHQL/CIB	Feb-08	Oct-09	E-Health plan completed in Sep 2008.

	C2P2	Development, Testing and Roll-out of the e-Health Action Plan	MoHQL/CIB	Oct-09	Dec-10	Ongoing. The E-health plan comprises 12 projects, the first one being the recruitment of Programme Managers (IPMs). The IPMs are in post since January 2011.
	C2P3	Awareness / Capacity Building of Health Workers	MoHQL	Feb-08	Jun-12	Ongoing. The Ministry of Health and Quality of Life has started a capacity building programme for its staff through the enlistment of officers on the IC3 course.
Accelerated e-government through process re-engineering and coordinated planning	A1P1	Centralised Planning &implementation of eGovernance in Mauritius	MICT / CIB	Feb-08	Jun-12	
	A1P2	Recasting Process Reform Template for IT Solutions in the Depts	EGC	Aug-08	Nov-08	Recasting of e-business plan to e-Government Master plan completed in June, 2008.
	A1P3	Conducting e-Governance Master Plan Exercise	e-Govt Change Managers / CIB	Mar-09	May-12	Ongoing. Plans prepared for Ministry of Health and Quality of Life, Prisons Department. Plan under finalisation for Agricultural sector.
	A1P4	e-Governance Communication Initiative	MICT	Aug-08	May-12	
Scaling up e-government through flagship applications	A2P1	Electronic Identification Systems for Citizens (restyled as Mauritius National Identity Card Project)	MISS	Feb-08	Jun-12	On-going. Government has enlisted the services of CrimsonLogic Pte Ltd under a Government to Government initiative with Singapore for the provision of advisory services for MNIC. The report is expected in March 2011.

	A2P2	Mauritius Police Force - Crime Occurrence Tracking System	MPF/CIB	Aug-08	Nov-08	Ongoing. Contract signed on 16 Dec 2009. Implementation in progress for phase I (i.e. deployment at 2 of the 7 Police Divisions). Requirements Analysis completed. Validation exercises carried out. Commissioning of hardware completed. Configuration of application in progress. User Acceptance Test in progress Discussions on phase II (roll-out to other Police Divisions) started.
	A2P3	M/Arts & Culture- Computerisation of National Archives	MoAC/CIB	Mar-09	May-12	Completed Contract signed on 26 June 2009. Application software is live since July 2010.
	A2P4	National Assembly e-Parliament	PMO/CIB	Feb-08	Oct-09	Component I operational since Mar 2009. Component II: ongoing. Component I: Digital Recording System operational. Component II: NA has sent the software requirements for Electronic Document Management System to CIB. Technical specifications being finalised. The application software is being considered under the MOU between MICT and National Informatics Centre Services Incorporated (NICSI), India. NICSI is currently carrying out a gap analysis on the basis of NA's requirements. Additionally, NA is currently implementing the library software provided by NICSI
	A2P5	Setting up of a VoIP Call Centre for Government Services	MICT/CIB	Dec-09	May-12	

	A2P6	Awards and incentives to adopt eGovernance and generally reform governance	MICT	Nov-08	Jul-12	
	A2P7	Ministry of Information and Communication Technology. – e-Document Management System	MICT	Feb-08	Aug-09	In progress. This project is being considered in the context of the computerisation of a Ministry/department. For e.g. implementation of e-document solution has been integrated in the system for the Passport and Immigration Office. A similar approach is being adopted for National Assembly and other Ministries and departments.
	A2P8	Cost Sharing Alternatives in eGovernance	MICT	Oct-09	Mar-11	Completed in Sept 2009. Web-based project management and collaboration tool.
	A2P9	Planning and Design on the Feasibility of PPP in e-Government	MICT	Nov-09	Apr-11	
	A2P10	Streamlined Procurement Systems for eGovernance	MoFED	Nov-08	Sep-10	e-Phase 0 of the project which comprises posting of notices for tenders on an E-Procurement portal has been completed. Problems are being encountered with the GoA solution due to a change in the e-procurement solution vendor. The assistance of NICSI has been sought for the implementation of the e-procurement solution. A demo was conducted by NICSI on 15 Nov 2010. NICSI has provided additional clarifications on the e-procurement solution.

	A2P11	Implementation of a Project Management Solution	MICT	Feb-08	Feb-09	Completed. Web-based project management and collaboration tool.
	A2P12	Mauritius Police Force - GPS in all Govt. vehicles and implementation	MPF	Feb-08	Nov-09	Discussion started. Renamed as Fleet Management System. Funds not available for 2011.
	A2P13	Cabinet Office: e-Cabinet	PMO	Feb-08	Nov-08	Ongoing. Contract for hardware awarded. Requirements for application software are currently being compiled.
	A2P14	Comprehensive Feasibility exercise to explore the possibility of shared services	MICT	Oct-09	Jul-11	
	A2P15	Identification of part-time courses and executive development programmes for e-Governance capacity-building exercises	MICT	Nov-08	Jul-11	Online training materials provided online to staff of Central Informatics Bureau through UIEP Phase II project.
	A2P16	Exploring possibilities of Open Source deployment	MICT	Nov-08	Jan-11	Not undertaken
	A2P17	Security Audit	MICT	Feb-08	Oct-08	Audits of complex information systems by outsourced consultants have been completed for 5 sites including for GINS, Labour system, blood transfusion system. Internal audits have been ongoing in Government since 2007 with scans completed via an automated vulnerability scanner for several Ministries and Departments. The scanning exercise is ongoing according to a yearly plan.

	A2P18	Enhancement of GINS Infrastructure	MICT	Feb-08	Dec-08	Completed on June 2008. GINS communication lines have been upgraded at E. Anquetil, Air Mauritius and R. Seeneevassen Buildings
	A2P19	Development of e-Filing System for the Judiciary	Judiciary	Feb-08	Apr-10	Ongoing. Contract awarded in March 2010.The project is funded at 75% by the Investment Climate Fund for Africa and the remaining 25% by the Government of Mauritius. Contract awarded in March 2010. The project is funded at 75% by the Investment Climate Fund for Africa and the remaining 25% by the Government of Mauritius. Commissioning of hardware in progress
	A2P20	Development of a Web-based system for Local Self-Government	LGSC	Nov-08	Oct-10	Not undertaken
	A2P21	Redesign of a Computerised System for the National Transport Authority	NTA	Feb-08	Apr-09	Completed in June 2008. A server in cluster environment has been installed at NTA in 2008.
	A2P22	eBusiness Plan for the Traffic Branch and implementing the recommendations	PMO, Police	Feb-08	Nov-10	Technical specifications for the solution are currently under preparation at the level of the CIB.

	A2P2**3**	Review and Modernise Work Permit System	MoLIRE	Nov-08	Jul-11	Ongoing. Following the inconclusive selection exercise on the basis of a notice of Expression of Interest, MoLIRE has decided to tap the resources of ILO for the preparation of the e-Government Master Plan for Work Permit. Employment Division is considering different options for securing the services of a consultant or the preparation of the e-Government Master Plan.
	A2P24	Implementation of a New Prison Management System	PMO, Prison Dept	Nov-08	Feb-11	The RFP for the Prison Management System has been finalised. The requirements for the application software have been submitted to NICSI for a proposal in line with the MOU between MICT and NICSI. Following receipt of the proposal, comments of the Prisons Department and CIB have been submitted to NICSI on 25 February 2011 for consideration.
	A2P25	Implementation of an e-Payment Gateway	MICT	Nov-08	Mar-10	Point of Sales has been introduced in January 2011. The Ministry of Finance and Economic Development is looking at the setting up of the payment gateway.
	A2P26	Setting up a Disaster Recovery Centre (DRC) for the Government Online Centre	MICT	Feb-08	Apr-09	Ongoing
Enhancing connectivity and content for community empowerment	A3P1	Setting up PIAPs	NCB	Feb-08	Oct-12	Ongoing. 60% Completed

	A3P2	Community Empowerment Programme	NCB	Feb-08	Dec-09	Completed
	A3P4	Digital Literacy Project	NCB	Feb-08	Dec-08	Completed
Collaborative planning for manpower development in IT and ITES/BPO sector	L1P1`	Production of Biennial Collaboration Plans	HRDC	Feb-08	Oct-12	No consolidated collaborative plan available
	L1P2	Setting up and Operationalising a BPO training centre	MoEHR	Feb-08	Jan-09	Presently the MICT is taking the lead to set up the proposed centre
	L1P3	Scheme for providing BPO training for prospective employees	HRDC	Oct-08	Apr-12	HRDC is providing the training under POTI
	L1P4	Internship arrangements (summer projects)	MoEHR	Feb-08	Jul-12	HRDC is conducting training through the WBL (Work Based Learning) program. But the Program is not formalised as such.
	L1P5	Academia industry conferences	ICT Association	May-08	Aug-12	Delayed. Awaiting fund.
	L1P6	Research projects to be sponsored by industries and government	MRC	Apr-09	Oct-12	Delayed. Awaiting fund.
	L1P7	Award for three best research projects	MICT	Apr-10	Jun-12	

	L1P8	Executive Development Programmes to be run by the universities	Universities	Apr-08	Jul-12	Delayed. Awaiting fund.
	L1P9`	Partnership with ICT Multinationals	MoEHR	Nov-09	Jun-12	A few partnerships are signed with MNCs like Microsoft.
	L1P10	Return of Non-resident Mauritians	MoEHR	Nov-08	Oct-10	Ongoing. Discussion started with Min of Foreign Affairs
	L1P11	Memorandum of Understanding with countries in the region	MICT	Nov-08	Oct-10	Awaiting information from Foreign Affairs
	L1P12	ICT Career Counselling	MoLIRE	Feb-08	Apr-09	No stabilized programme launched. General career counselling programmes are conducted regularly. HDRC awaits fund allocation from MOFED but is coming up with the “Centre d’Orientation Academique et Professionelle” (Career Guidance and Counselling Service) that will include career counselling for all sectors of the economy including ICT.
Building leadership competencies	L2P1	Regional Anchor and Centre of Excellence	Universities	Feb-08	Jan-12	Not started
	L2P2	Horizontal Transfer of Indigenous Solutions (HORTIS)	MICT	Nov-08	Jun-12	SIL operations in Namibia and Zambia (but limited)

	L2P3	Island of Expertise in ICT Business Incubation	NCB	Feb-08	Jun-12	Preliminary survey on potential e-businesses outside Mu is being explored by NCB
	L2P4	Regional Leadership in Information Security	NCB	Mar-08	April-12	
	L2P5	Creation of a National Technology Test bed	MoEHR / HRDC	Nov-08	May-09	
	A2P1	Design and implementation of e-action plan				Component II: Technical specifications for Electronic Document System being finalised
	C1P1	Roadmap to promote e-Business among SMEs	MISCC	Feb-08	Mar-09	Ongoing. TOR/Tender ready
	C1P2	Rolling-out Reward, Incentives & Subsidies	MISCC	Nov-08	Jun-12	Not Started
	C1P3	Enhancement of Enterprise Mauritius Portal	EM	Mar-09	Jan-10	Not Started
	C1P4	Data, Webpage and application Hosting on Shared Infrastructure	EM	Mar-09	Dec-09	Not Started
	C1P5	e-Business Awareness among the SMEs	SEHDA	Dec-09	Feb-12	Not Started
	C1P6	Capacity Building for SMEs on ICT	SEHDA	Mar-09	May-12	Not Started
	C4P3	Awareness Campaign and Capacity Building Session	ASMH & AHRIM	Feb-08	Jun-12	Not Started.

A preferred offshore destination for IT and ITES-BPO services	E1P2	Web Presence for MOS, the Two Wings	NCB	Nov-08	Jan-10	Ongoing, A first version (soft launch) of the Portal is operational
	E1P4	Constitution ICT exports market intelligence wing	NCB	Feb-08	Jun-12	Ongoing. ICT tenders and market intelligence are being provided on the ICT Export Portal
	E1P5	Export Services fair in EU countries	MICT	Nov-08	Aug-12	Ongoing

15 Appendix 2 - Interview Schedule

INTERVIEWS
Ministry of Information and Communication Technology
National Computer Board/ CERT-MU
Central Informatics Bureau (CIB)/Central Information Systems Division (CISD), IT Security Unit
Government Online Centre (GOC)
University of Mauritius (UOM)
University Technology Mauritius (UTM)
Central Statistics Office (CSO)
Outsourcing & Telecommunications Association of Mauritius (OTAM)
Mauritius Telecom
Information and Communication Technology Authority (ICTA)
Ministry of Education and Human Resources
Ministry of Civil Service and Administrative Reforms
Human Resource Development Council (HRDC)
Ministry of Tourism and Leisure/ Mauritius Tourism Promotion Agency (MTPA)
Mauritius IT Industry Association (MITIA)
Independent Broadcasting Authority (IBA)
Police IT Unit
Ministry of Finance and Economic Development
State Informatics Ltd
Board of Investment
Enterprise Mauritius
Mahanagar Telephone Mauritius Ltd (MTML)
Emtel
Competition Commission Mauritius (CCM)

Mauritius Institute of Training & Development (MITD)