



Bhutan e-Government Master Plan

**Ministry of Information & Communications
Department of Information Technology & Telecom**





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Royal Government of Bhutan

PRIME MINISTER

3rd January 2014

FOREWORD

Information Communication Technology (ICT) is changing the way individuals, societies, and the world interacts, communicates, and behaves. The potential of ICT is boundless and is constrained only by limits of the human imagination.

The Royal Government of Bhutan has prioritized ICT as the principal enabler for a knowledge-based society - a society that learns to learn, with a sound development policy inspired by the philosophy of GNH. Mandated with the responsibility to create an informed society bonded by a shared national consciousness, the Ministry of Information & Communications has undertaken numerous initiatives to enable Bhutan to build a knowledge society, including the establishment of ICT backbone infrastructure to improve access, developing and promoting the use of application systems, optimizing the use of technology and data sharing through adoption of uniform standards, creating the right environment by putting in place appropriate policy & legislation instruments, and providing ICT education.

However, there are many untapped areas we need to leverage to achieve the Royal Government's ICT agenda. Hence, the Government has embarked on developing this whole of government e-Gov Master Plan. Consolidating the gains made in the past years, the e-Government Master Plan provides a clear vision as well as holistic ICT programs and strategies for the Government for the next five years. Three desired outcomes aligned to the four pillars of GNH have been identified to achieve the ICT vision: *ICT for Good Governance*, *ICT for Information Society (culture & environment)* and *ICT for sustainable socio economic development*. Hence, all government sectors should align and draw inspiration from the ICT Strategies spelt out in the e-Gov Master Plan for their respective sectors.

A critical success factor in implementing the e-Gov Master Plan is also to have an effective Governance framework and processes which will enable the government to have a holistic overview on ICT spending, shared and common systems, cross-agency initiative across the whole of government for effective planning and an institutionalized monitoring and control mechanisms for ICT project through the governance system.

This eGov Masterplan has been developed through inclusive consultative processes involving stakeholders from the entire spectrum of ministries, autonomous agencies, corporations and private sector. I thank all the stakeholders for their meaningful and constructive contributions in developing this very important Master plan which will guide the development of ICT in the next five years. I have no doubt that this co-operative spirit will also continue during the implementation phase.

Tashi Delek!

(Tshering Tobgay)

EXECUTIVE SUMMARY

The Royal Government of Bhutan (RGoB) recognises the value that ICT can bring towards the achievement of Gross National Happiness. The Ministry of Information and Communications (MoIC), which helms the promotion of ICT in Bhutan, worked in collaboration with the Government Ministries, autonomous agencies, corporations and Non-Government Organisations (NGOs) to develop the e-Government Masterplan for the Kingdom of Bhutan. It is the first time that the Ministry embarked on a holistic approach to eGov planning guided by the development philosophy of Gross National Happiness (GNH).

The e-Government Masterplan seeks to drive social and economic development through ICT in the 11th Five-Year Plan (11FYP). It provides a coherent and holistic view of the ICT strategies, initiatives and projects that the RGoB will undertake over the next 5 years. To ensure effective implementation, it is required to institutionalize an e Gov Governance structure, including setting up of eGov Program Management Office (PMO) within DITT, MoIC as a key agent to drive effective governance. The Office will ensure smooth coordination of the committee meetings and manage effective implementation of ICT initiatives across all government agencies.

ACKNOWLEDGEMENTS

Stakeholder engagement is a crucial component of any plan as it involves changes to the way they are going to operate in the future. In order for the stakeholders to be fully engaged, the master planning processes adopted a very inclusive and participative approach.

- Conducted 1st stakeholder's roundtable meeting on August 24 2012 to inform participants about the objective of the Masterplan and seek suggestions/feedback on improving the master planning process/define scope.
- Interview/bilateral meeting with key stakeholders were held between September-October 2012 to help identify key priority ICT initiatives for the next five years and seek consensus on common initiatives, which cut across whole of government agencies. During the bilateral discussion, the team met with few Secretaries, Directors, PPD Chiefs and other officials from all the Ministries, Constitutional & Autonomous Agencies and Government owned corporations including private sector.
- Conducted 2nd stakeholder roundtable meeting on November 21 2012 to validate the content of the Masterplan and seek endorsement.
- The draft Masterplan was presented to Committee of Secretary on October 18 2012 for feedbacks and approval.

The participants who took part in the roundtables provided positive feedback¹.

The Ministry would like to thank the e-Gov Core team members, all the participants who attended the bilateral meetings as well as the Roundtable meetings, the list of which is as below. The feedback and contribution made by the participants to the entire eGov discussion has been invaluable.

¹ Based on usefulness rating of 1 to 6, 6 being the most useful, 79% of the workshop participants rated the workshop 5 and above in terms of usefulness, and 91% rated the workshop 4 and above in terms of usefulness.

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INTRODUCTION

The Ministry of Information & Communications has embarked on the development of Bhutan's first eGov Masterplan, building on the existing ICT policies/strategies including the ICT Roadmap that was aligned to the overall ICT vision. The effort was driven by the need to:

- Establish the current state of ICT readiness, identify gaps and chart way forward
- Identify/prioritize ICT projects across the whole-of Government and guide ICT spending
- Align to global technology developments and trends.
- Garner support of all agencies to collectively leverage ICT in Government service delivery

This eGov Masterplan will complement the 11FYP by providing a coherent and holistic view of RGoB's ICT initiative as an eGovernment. It covers key ICT initiatives that will cut across the whole-of Government and high priority ICT initiatives that are specific to Ministry/Agency business lines. The Masterplan will be further supplemented by key Sectoral Masterplan such as Education ICT Masterplan, Health ICT Masterplan, Finance ICT Masterplan, Tourism ICT Masterplan and few other important sectors.

A clear eGov governance structure and processes including setting up of e-Gov Programme management office (PMO) will be instituted to drive the implementation of the eGov Masterplan. Effective governance is critical to the achievement of the ICT vision and prudent management of investments in the area of ICT. A high-level 5-year implementation Roadmap and a communication plan to inform all stakeholders of information related to the eGov Masterplan (i.e the rationale, benefits, impact, approach and timeline etc targeting different groups) will be formalized.

1. APPROACH

A 5-stage consultative approach was adopted for the masterplanning exercise.

Guided by the tenets of good and effective governance, roundtable discussions and interviews with Government Ministries, autonomous agencies, corporations and Non-Government Organisations (NGOs) were conducted. The comments and recommendations were taken into account in the development of the final version of the Plan.

1.1 5-Stage Masterplanning Methodology

The 5-Stage Masterplanning Methodology is summarised below.

The process starts with **Stage 1: Plan** when the project kicks off with the establishment of governance structures and related processes to oversee and guide the entire planning exercise. **Stage 2: Discover** analyses the present state – its strengths, weaknesses, opportunities and threats, and feedback from engagement of key stakeholders from the Government, businesses and community. **Stage 3: Design** looks at the performance measurement. The Discovery and Design phases under Stage 2 and Stage 3 are iterative and result in validated concepts that form the basis for the development of the draft Plan. **Stage 4: Report** is when compiled information are put together into a draft Plan. **Stage 5: Consult** opens the draft Plan for consultation via roundtable reviews and via email poll for feedback in order to hear and incorporate the concerns and recommendations.

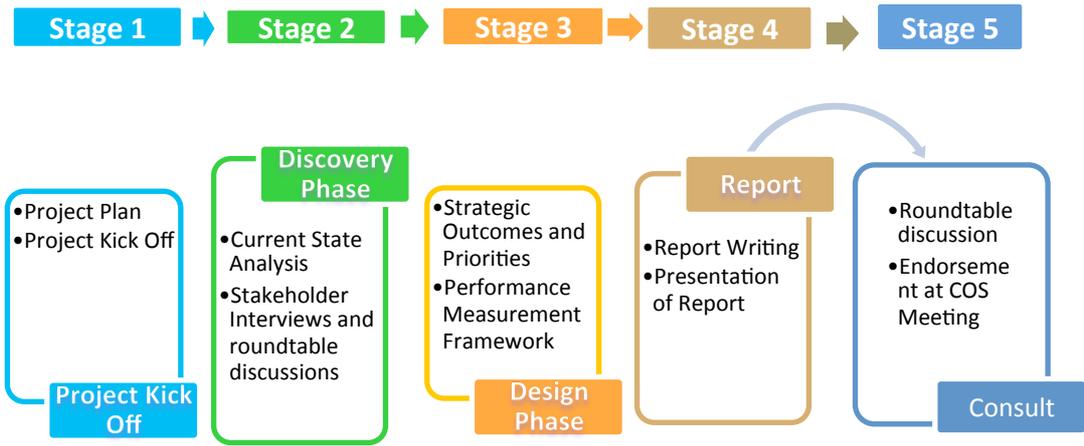


Figure 1: 5-Stage Masterplanning Methodology

2. TAKING STOCK

2.1 Bhutan's ICT Achievements To Date

Bhutan has made good progress in ICT, as can be seen from the many achievements made in terms of infrastructure, telecommunications, eService delivery, capacity building and policy formulation. Some of the notable achievements in these areas are highlighted below:

Infrastructure

- The National Broadband Masterplan project is being implemented to establish optical fibers in all 20 Dzongkhags and 205 Gewogs. Fibers have currently reached all 20 Dzongkhags and 138 Gewogs. Except for four gewogs, fibers to the remaining gewogs are scheduled for completion by July 2014.
- On the international front, a Second International Gateway at Gelephu has been established and operationalized to create the required redundancy. Power Grid Corporation of India Limited (PGCIL) has strung OPGW between Bongaigoan and Gelephu (BPC Gantry) to facilitate this connectivity.
- Video conferencing facility available to all 10 ministries and 20 Dzongkhags;
- More than 90 Government organizations are connected through the Thimphu Wide Area Network (WAN). This network will facilitate a secure, efficient and reliable communications across all public agencies in Thimphu and contributes towards realizing the role of ICT in enhancing good governance;
- 182 community centres (CCs) have been established. 131 CCs are planned to be connected with broadband internet by December 2013.
- Making computers freely accessible to some of the rural communities to facilitate learning² (HIWEL); and
- Establishment of first IT Park at Babesa on 1st Nov 2011.

² Hole-in-the-Wall Education Ltd (HiWEL) is an Indian initiative that facilitates learning for marginalized children and their communities through free and public access to computers. The computers, called Hole-in-the-Wall Learning Stations, are housed in self-contained robust units that are designed for ease of use and to withstand harsh weather conditions.

Telecommunications

- The second mobile operator was granted licence in 2006;
- Mobile subscribers has reached 77.8% (560,890 subscribers) as of Dec 2012; and
- All 205 gewogs have access to mobile services and remaining 74 villages will be connected by mobile services by end of December 2013.

e-Service Delivery

In the area of e-Services, a Government-to-Citizen (G2C) initiative is underway to implement 135 e-Services.

Capacity building

The RGoB is currently working with the Indian Government on a five-year capacity building initiative, called Chiphen Rigpel, starting from May 2010 to Apr 2015. It is a comprehensive programme that includes ICT training for Government and Local leaders, senior and middle level managers, ICT professionals, teachers, youths, monks, entrepreneurs and children in the rural communities. It also involves equipping schools with computer laboratories, setting up of ICT training centres in the University, Vocational Institutes and youth centres as well as learning stations in Community Centres.

Policy/Standards

Some ICT policies are already put in place, e.g. information sharing policy and policy to centralize all 350 ICT professionals in the Government to be under the DITT, but awaiting full implementation. The Telecom and Broadband Policy has been formulated and is currently undergoing GNH screening tool.

Standards based support for Dzongkha language has been developed in ICT systems and is now available on all main computer operating systems (MS Windows, Linux, Apple OSX) and in most types of application. Dzongkha characters are also now supported in most standard internet and communications protocols via the Unicode and ISO 10646 character encoding standards.

2.2 Key Findings

Clarity of Desired Outcomes and Goals

Through the development of the Bhutan ICT Roadmap, there is a clear articulation of the vision statement, desired outcomes and goals. However, the strategies and initiatives in the Roadmap need to be better aligned to these desired outcomes and goals, and re-validated.

Whole-of-Government Initiatives

More can be done with regard to Whole-of-Government initiatives, be it data, infrastructure or application systems.

In terms of data, the RGoB does not have data hubs for its people, businesses and land. In other words, there is no single source of truth for its people, business and land data and there is a lack of data sharing across the various government organisations.

In the area of infrastructure and applications, all Ministries run their own ICT infrastructure, namely server management and email, and this is putting a strain to the ICT professionals in the Ministries in terms of technical support. Ministries also have their own HR, Finance and Procurement systems which are governed under a set of specific common regulations.

Ministries' server rooms can be consolidated into a Government Data Centre and their messaging (email) infrastructure can be migrated to a centralized messaging infrastructure. By doing so, there is less duplication of work, economy of scale, security, more optimal storage management and better performance/service level.

Government-wide shared application systems such HR, Finance and Procurement can be developed so all Ministries can make use of such shared systems to perform their business operations.

Citizen Engagement

Most Governments around the world are striving towards active citizenry in their countries. They are looking at various means of reaching out to them, informing them and engaging them in policy making. The RGoB has yet to leverage on ICT extensively to engage citizens and businesses and could consider implementing initiatives such as policy consultation portal and use of social media to start engaging the citizens and businesses.

Mobile services

As Bhutan will continue to experience even higher mobile subscription and usage in the coming years, the RGoB should tap on the potential that the mobile channel can offer and deliver as many public services as possible via the mobile channel.

Governance

There is currently no oversight of ICT usage and spending in the Government. ICT issues are escalated to the Committee of Secretaries (COS) and committees are formed in an ad hoc manner to guide the implementation of ICT initiatives.

2.3 Addressing the Gaps

Based on information collated during the stock take and analysis of key findings, the execution of the following mechanisms will address the gaps that have been identified. These mechanisms are incorporated in the e-Government Masterplan.

- a) Align and re-validate the existing list of ICT strategies and initiatives to desired outcomes and goals for ICT;
- b) Conceptualise impactful Whole-of-Government initiatives, be it in the areas of data, infrastructure or application systems;
- c) Explore the use of the mobile platform for service delivery and support of dzongkha localisation. Initial implementation can include the use of SMS for notification and public announcement;
- d) Expand the existing limited 3 G mobile infrastructure so that services delivery over mobile could be more effective
- e) Establish governance structures to monitor and guide the successful implementation of the e-Government Masterplan; and
- f) Collect quality ICT statistics to establish baseline and Key Performance Indicators (KPIs) measurement and dissemination to regional and international bodies for benchmarking purposes.

3. E-GOVERNMENT MASTERPLAN

3.1 ICT Vision

“An ICT-Enabled, Knowledge-Based Society as a Foundation for Gross National Happiness”

The ICT Vision is positioned as a foundation for Gross National Happiness (GNH). It focuses on human capital investment and recognises information and ICT as key tenets of good governance, social and economic development in Bhutan. Education becomes a high priority as Bhutan builds a society that learns to learn.

3.2 Desired Outcomes

The three desired outcomes that the Royal Government of Bhutan hopes to achieve in order to realise the ICT Vision are as follows:

- ICT for Good Governance;
- ICT for a Bhutanese Information Society; and
- ICT as a Key Enabler for Sustainable Economic Development

3.3 Strategies

Strategies articulate, at a high-level, the priorities or focus areas for the period of the masterplan in order to attain the vision and desired outcomes. The strategies to be adopted for each desired outcome is listed in **Figure 2**.

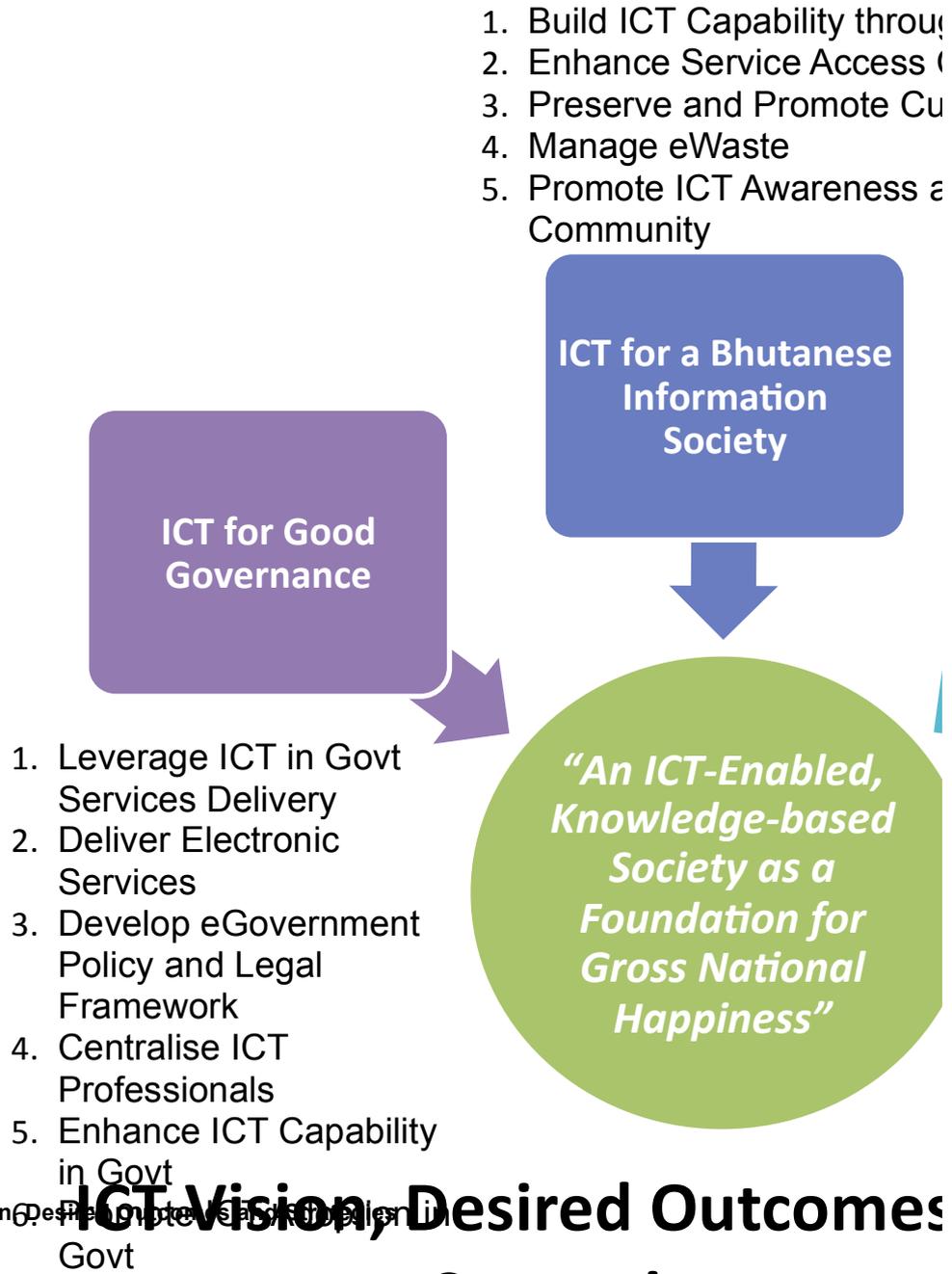


Figure 2: ICT Vision, Desired Outcomes & Strategies

3.4 ICT for Good Governance

Good governance is a key pillar of GNH and it is desirable that effective and transparent political and administrative processes within the government be further enhanced through the use of ICT.

The four goals that are identified to achieve this desired outcome are:

i) Transparency and Accountability

Processes and business rules can be encapsulated within ICT systems to promote transparency. Owners of these processes and rules could be clearly identified which enforces accountability.

ii) Effectiveness and Efficiency

Automating the business operations and sharing/consolidation of ICT resources within the Government will result in cost efficiency and effectiveness in decision-making.

iii) Citizen and Business Centricity

Government services, with the use of ICT, greatly improve the provision and outreach of services to the citizens and businesses, making it more convenient for them to do business with the Government.

iv) Citizen Participation and Engagement

ICT could provide a powerful platform to better engage and draw citizens' participation through online forums or social media.

Initiatives/Projects	Yr1	Yr2	Yr3	Yr4	Yr5	Budget (Nu/m)	Lead Agency
Networked Government							
P1. National Broadband Network (last mile)							DITT/MoIC
P2. Government Intranet (TWAN)						190	DITT/MoIC
P3. BhutanCIRT						25	DITT/MoIC
ICT Policy and Legal Framework							
P4. e-Government Policy						2	DITT/MoIC
P5. Telecom and Broadband Policy						20	DITT/MoIC
P6. ICM Act						1	DoIM/DITT/MoIC
ICT Capability Development							
P7. Parenting of ICT Professionals						267	DITT/MoIC
P8. Development of Leadership and Non-ICT Professionals						1000	DITT/MoIC, ChiphpenRigpel
ICT for Sectoral Transformation							
P9. ICT Masterplan for MoE							MoE
P10. ICT Masterplan for MoF							MoF
P11. ICT Masterplan for Health							MoH
P12. ICT Masterplan for Agriculture							MoA
P13. ICT Masterplan for Tourism							TCB
Whole-of-Government Shared Services							
P12. e-GIF						42	DITT/MoIC
P13. Common Data Hubs						50	DITT/MoIC
P14. Common Systems (Govt email, e-Procurement, National Spatial Data infra, e-Authentication, ePayment Gateway, Personal Information. sys)						121 (76 under DITT, 34mePr ocu, 11m GIS & 3.1m PIS)	Respective System Owners
P15. Government Data Centre						120	DITT/MoIC
Electronic Services							
P16. G2C Services						100	G2C office, DITT/MoIC
P17. G2B Services							MoEA
Ministry or Agency Specific ICT Initiatives							
P18. Natl. e-Commerce Framework							MoEA
P 19. Public Financial Mgt. System, Online Tax filing system& major overhaul customs process, Info sys on state owned enterprises, govt. Inventory sys, improvement of existing sys(MYRB, PEM, PLAMS)						129.65	MoF
P20. E-Medical Records, Web-based Health Mgmt Info Sys, Telemedicine						60.5	MoH
P21. Civil Registration System (AFIS, bi-lingual)						25	DCRC/MoHCA
P22. Labornet, Job Portal (Enhancement)						3.7	MoLHR
P23. GIS Digitised Road Network Map& GIS-based human settlement maps						2	MoWHS
P24 Intelligent Transport System						15	RSTA/MoIC
P25. Corruption Compliant MgtSystem						0.5	ACC
P26. Terrestrial Network						525	BBSC
P27. Audit Information Mgt System						24.75	RAA
P28. e-Filing System for Judiciary						4.1	Royal Court of Justice

3.4.1 Networked Government

It is important to network all government agencies including Gewogs and Dzongkhags within the fold of e-Government programme and achieve good governance. This will address the need for a safe, reliable and secure communication platform allowing for improved data sharing among government agencies. This network will also ensure availability of higher bandwidth capable of delivering the performance required by applications & real-time services, voice or video, in an efficient manner between agencies. Simultaneously, a dedicated security team will be required to ensure ICT infrastructure security as well as information security. Following are some of the key initiatives that will be implemented during the 11 FYP.

National Broadband Network

RGoB has embarked on implementing the ongoing National Broadband Master Plan project to harness the benefit of ICT with the objective of establishing a secure, sustainable, affordable and appropriate ICT backbone fiber optics network connecting all the Dzongkhags and access network connecting all Gewogs. The backbone infrastructure will be capable of delivering e-services efficiently and seamlessly to all sections of Bhutanese society.

The fiber optics network consisting of Optical Ground Wire (OPGW) and All Dielectric Self Supporting (ADSS) is being established leveraging the Bhutan Power Corporation (BPC) high voltage transmission and distribution network. As BPC's transmission and distribution network had been already deployed in almost every part of the country, it was considered in the national interest that BPC's infrastructure could be used to string OPGW and ADSS cables, which would result in prudent utilization of the infrastructure for facilitating fiber connectivity across the country. In addition to this, there is also huge cost savings for the Government and it poses minimal impact to the natural environment.

Currently, all the Dzongkhags and 138 Gewogs have the physical fibers connected, while the works to lay fiber to the remaining 70 Gewogs is under progress. The four remote Gewogs of Soe, Naro, Lunana and Lingshi will be connected by radio technology as these Gewogs doesn't have power distribution network to carry the fiber. While the OPGW cables form the core backbone infrastructure connecting all district administrative centres, the ADSS fiber are being extended from this core network and terminated in a strategic location in the Gewogs, from where Internet Service Providers (ISPs) will serve homes and

schools, Basic Health Units (BHUs) and other offices from that point of presence. The two Telcos have already leased a pair of OPGW fiber and are providing services in all the districts. Meanwhile, other ISPs have also applied for leasing a pair of fiber to take services to all the Dzongkhags.

This capital-intensive project was undertaken by the Government to create a level-playing field among the potential ICT players. Also, the Government has brought down the cost of fiber to ZERO with the objective of making ICT and media services universally accessible at affordable prices throughout country particularly in the rural and remote areas.

The Nu. 600m Government of India (GoI) funded project is led by DITT/MoIC and it is being implemented by BPC. The project was kick-started in 2009 and is targeted for completion by October 2013. The Focus now in the 11FYP would be on last mile connectivity. The Ministry will work with the telcos to see how the last mile services could be served.

Government Intranet (Thimphu Wide Area Network)

A dedicated, high security and high speed network connects all the ten ministries, the Prime Minister's office, other government agencies in Thimphu and Dzongkhag administration offices. The core of this network is the Government Intranet, also known as the Thimphu Wide Area Network (TWAN).

The Government will extend this network to all 205 Gewogs and Dzongkhag, to bring these offices within the fold of its e-Government programme. The connection of Gewog offices to the Internet and Government Intranet would be via the Community Centres at the Gewogs by virtue of close proximity. By the end of the 10 FYP, 185 Gewogs will each have a Community Centre (CC). The remaining 20 Gewogs will get their respective CC during the 11 FYP. Connectivity of these CCs to the Internet and Government Intranet is currently being established. The connection of Dzongkhag offices to the Internet and Government Intranet shall be achieved by leveraging the infrastructure of the Telecoms and ISPs.

As the TWAN was established in 2006, the network equipment would have reached the end of life in 2013 and hence would need to be replaced. The concurrent technology refresh of network equipment is required to ensure network stability because in addition to Internet and Government Intranet connectivity, the TWAN supports mission critical shared government systems.

Some of these systems include the Public Expenditure Management System (PEMS), Multi-Year Rolling Budget System (MYRB), Planning and Monitoring System (PLaMs) and Civil Service Information System (CSIS). The TWAN will also support all G2C and G2B e-Services, and new government systems such as the e-Procurement and Geospatial Information Systems planned for implementation during the 11 FYP. The extension work will commence by December 2013 and is expected to complete by June 2016. The total projected cost is Nu. 190m and the amount will be invested in replacing equipment and building new networks wherever necessary.

Bhutan CIRT

A secure Government Intranet underpinnes good governance. Bhutan today is firmly on the information superhighway. The Internet, mobile phones and online information systems have become a part of our everyday lives. With the vision of an ICT enabled information society and with increasing ICTisation taking place, our dependence on these ICT systems and services is growing by the day. Consequently, the inherent threats of the cyber world have not only become a reality but a real danger to our daily lives.

Like countries elsewhere, Bhutan requires a dedicated organization with a team of professionals comprising of members from law enforcement agencies (police, ACC, legal etc) to function independently and help the society manage cyber security threats and incidences. It is not only important to prevent cyber security incidents, but also vital to be able to manage an incident well when it inevitably occurs. A deliberate and systematic approach to managing cyber security incidents is critical to ensure that normalcy to life is restored as soon as possible following an incident.

The Bhutan Computer Incidence Response Team (BtCIRT) will be established to serve as the national agency for cyber security incidents. The BtCIRT will be responsible for performing the following and other functions relating to cyber security as may be warranted:

- i) Collect, analyse and disseminate information on cyber incidents;
- ii) Forecast and be alert of cyber security incidents;
- iii) Execute emergency measures for handling cyber security incidents;
- iv) Coordinate cyber incident response activities;

- v) Issue guidelines, advisories, vulnerability notes relating to information security practices, procedures, prevention, response and reporting of cyber incidents; and
- vi) Revisit Cyber Security clause in existing Bhutan ICM Act.

Bhutan is a member of International Multilateral Partnership Against Cyber Threat (IMPACT), which is supported by ITU. Both ITU and IMPACT's support and guidance will be sought in establishing BtCIRT and building capacity and professionalism in the area of cyber security.

For a start, BtCIRT will be established as a body under DITT/MoIC. It will be spun off as an autonomous agency once it is effectively functional.

The formation of BtCIRT will start in the beginning of 11FYP until 2015. The total budget estimate is Nu. 25m which will be utilized in enhancing human resource capacities.

3.4.2 ICT Policy & Legal Framework

Bhutan has come a long way since 1963, when the first works for building a telecommunications network was initiated as part of the first FYP for modern economic development of the country. The Internet was launched in June 1999 and in 2003, Bhutan's first GSM (Global System For Mobile Communication) mobile communication service was launched. Since then, Bhutan's development in the ICTisation process has been phenomenal. Not only on the infrastructure, but also on the content side such as e-Government applications, there has been a considerable development.

e-Government Policy

The trend in increasing use of ICT services indicates the need for a consolidated e-Government Policy that will capitalise on existing technologies to enhance competitiveness, increase productivity, improve service delivery and economic development, to promote greater social inclusion, and pave a way for sustainable and good governance practice. Currently, all the ICT policies and strategies are scattered. Without such a clear and comprehensive policy in place, achieving good governance would be farfetched.

The e-Government Policy will be developed to cover four broad areas:

i) Connectivity

- a) Provide backbone ICT infrastructure and facilitate the roll out of services to areas which are commercially not viable and that might not otherwise be served through the operation of market forces.
- b) Provide affordable ICT access at entry levels for the people of Bhutan.
- c) Provide Internet access and usage to benefit all communities in Bhutan whether they are academic, professional, urban, rural or local communities.
- d) Provide a dedicated, high speed and secure Government Intranet connecting the Dzongkhag, Gewog and Dungkhags offices.

ii) Security

- a) Establish Bhutan Computer Response Team (BtCIRT) to serve as the national agency cyber security incidents that constantly monitors, prevents and manages incidents.
- b) Establish the Government Data Centre with secure, high quality and availability infrastructure, server, and storage systems, where all government systems will be housed.
- c) Conduct regular ICT security audit for mission critical systems.

iii) Service Delivery

- a) Establish Website Interface Standards.
- b) Develop common standards to enable sharing of data and interoperability of services.
- c) Include provision to support Dzongkha, including Dzongkha localization, to avoid cost of re-developing systems later on. The standard for the common platform and applications needs to include the provision to enter, store, transmit, query, display, and properly collate (sort) Dzongkha Unicode data in UTF-8 or UTF-16 format. Such things as usernames and passwords should also be compatible with Dzongkha.

- d) Treat development of security applications such as those in the area of national security, government communications e.g. government email encryption separately to enable higher level of security.
- e) Enforce the use of government email for official government electronic communications.
- f) Provide e-Services that are accessible from anywhere and anytime and leverage the mobile platform where feasible.
- g) Establish a single source of truth through the development of common data hubs.

iv) Deployment

- a) Aggregate ICT demand of Government agencies and DHI portfolio companies to negotiate for bulk supply of ICT products and services e.g. computer desktops and notebooks, software licenses, application development and maintenance services.
- b) Strict vigilance over the testing and acceptance of products and services supplied to avoid procurement of products and services that do not meet requirements.
- c) Enforce the use of authorized software to combat virus/security and address legal/moral issues.
- d) Consider open source software over proprietary software to address current issues like system incompatibility, low cost of maintenance and ease of procurement (e-GIF will address this issue).

DITT/MoIC will be the lead agency in developing and implementing the e-Government Policy in close coordination with the line agencies. Given the importance and urgency of the policy to be put in place, the policy is proposed to be formulated in the first year of the 11FYP.

The e-Government Policy shall be flexible and adaptive to reflect the pace of change and ensure that the best outcomes are delivered to the Bhutanese society at any point in time. The policy shall be a living document, and will be reviewed and revised regularly to ensure its maximum currency and effectiveness.

Telecom and Broadband Policy

Telecommunications and Broadband development is occurring in a dynamic social, market and technological context. To provide an over-arching framework to enable best optimization of the telecommunications and broadband infrastructure, applications, services, access and usage, MoIC through support from World Bank and ITU, has developed the Telecom and Broadband Policy. The policy is flexible and adaptive to reflect the pace of change and ensure that the best outcomes are delivered to the Bhutanese society at any point in time. It will be a living document, and will be reviewed and revised regularly to ensure its maximum currency and effectiveness. The policy is currently undergoing GNH Policy Screening Tool and once approved will be implemented in the 11FYP.

Practical focus, with emphasis on specific targets and measurable deliverables, is detailed in the Telecom and Broadband Policy Strategic Action Plan in **Annex A**.

Information Communications & Media Act

The Bhutan Information, Communication & Media Act 2006 (ICM Act) was enacted by the National Assembly in 2006 and came into effect from 5 July 2006. This is the only Act which deals with the ICT sector, including printing and media. This Act is, therefore, seen as instrumental in streamlining the development and regulation of ICT and media sectors in the country. The responsibility for its enforcement has since been vested on the Bhutan Info-Comm & Media Authority (BICMA).

Recent developments indicate that certain provisions of the Act require amendment and additional provisions to address the new requirements emanating from the rapid technological development, making it necessary to have in place more stringent provisions, especially those dealing with emerging issues such as cyber security, data protection and privacy issues. The MoIC, as the agency responsible for administration of the Act, is required to propose its amendment from time to time. The Ministry has initiated the amendment since 2011 and submitted to Cabinet for discussion in the Winter Session of the Parliament 2012. The Cabinet however, directed that the amendment be deferred to the 11FYP.

The revised Act is planned for deliberation and endorsement in the first year of the 11FY (2013-2014). Considering that the amendment has now been deferred,

MolC should review it further for improvement, for which Nu. 1m is proposed. The scope of the services shall broadly include the following:

- i) Further review/refine the ICM Act;
- ii) Draft missing provisions to address cyber-security, data protection and privacy issues associated with spam, phishing, botnets, spyware etc that pose security risk to government, consumer and business users especially Data Centre and BPOs;
- iii) Make security provisions for mobile communications in view of Internet telephony and mobile services handling high volume of data and subjected to more frequent targets of cybercrime;
- iv) Address issues concerning VoIP infrastructure considering their increasing vulnerability to attack that plague other networked computing architecture;
- v) Provision for analogue to digital information migration;
- vi) Remove repetitions and inconsistent provisions relating to the above provisions; and
- vii) Present the revised draft to the stakeholders for feedback.

3.4.3 ICT Capability Development

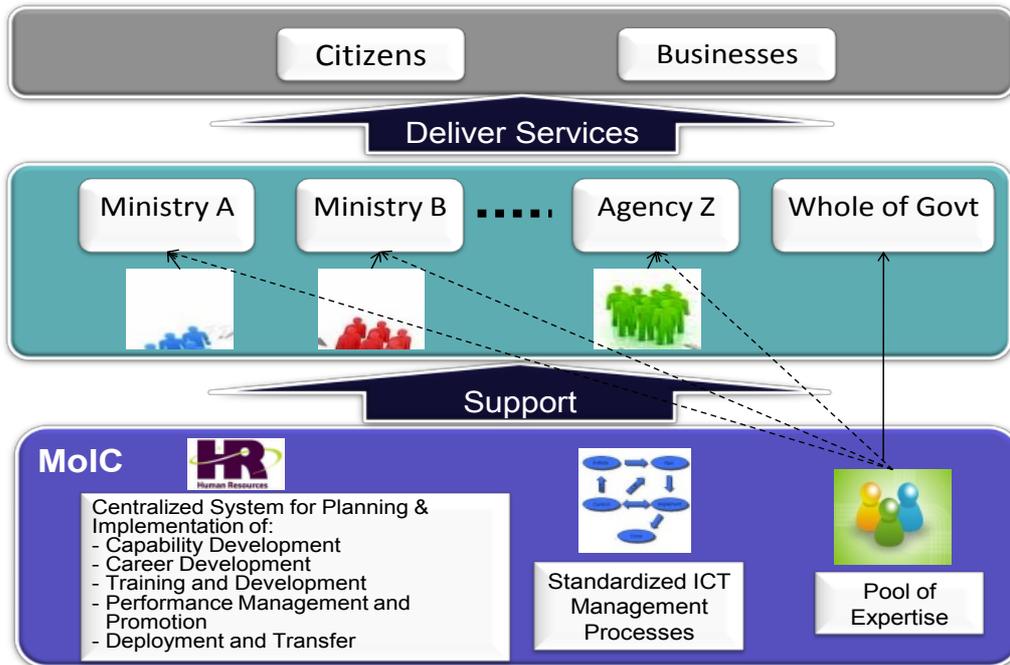
Parenting of ICT Professionals

As ICT implementation in the Government matures, the responsibilities of ICT professionals increase both in depth and coverage. This demands specialized skills in varied areas within the field. However, currently most agencies have only one or two ICT professionals to manage the agencies' ICT needs that range from day-to-day operations to planning and development of new systems. In addition, other ICT governance requirements such as information and system security are becoming new imperatives as more systems are implemented and more information is kept in the electronic form.

The current ICT support structure at agencies is increasingly challenged and is fast becoming ineffective in providing the expected range and quality of ICT services. ICT professionals often work in isolation in their respective agencies without peer support and mentorship. Opportunities for career development and advancement depend on the agencies they are working for.

Through the Parenting of ICT Professionals initiative, MoIC aims to:

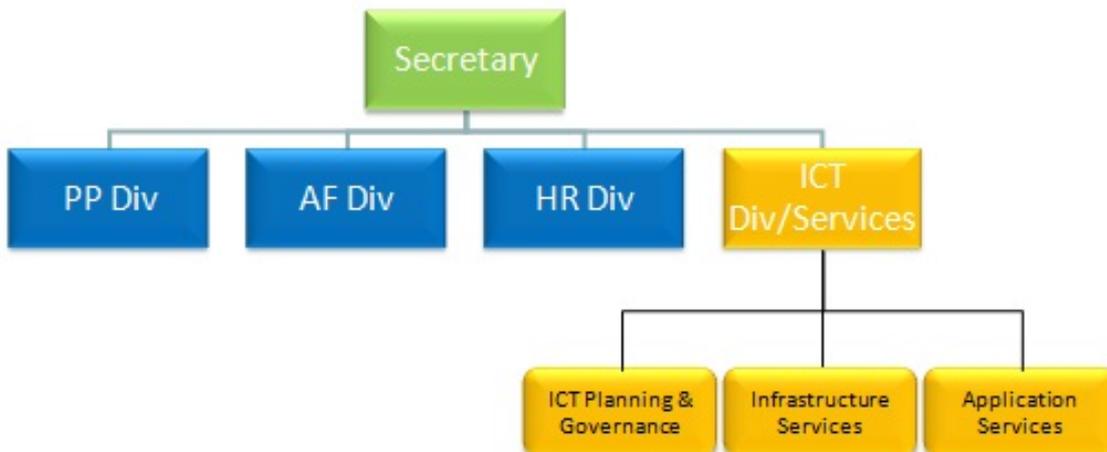
- i) Effectively support all RGoB agencies through the strategic use of ICT both at the agency level as well as at the Whole-of-Government level so that the agencies can deliver excellent government services;
- ii) Ensure well-coordinated and effective ICT investment and implementation;
- iii) Provide high quality ICT professional services through ICT capability development; and
- iv) Provide ICT professionals with ample opportunities for career development and advancement.



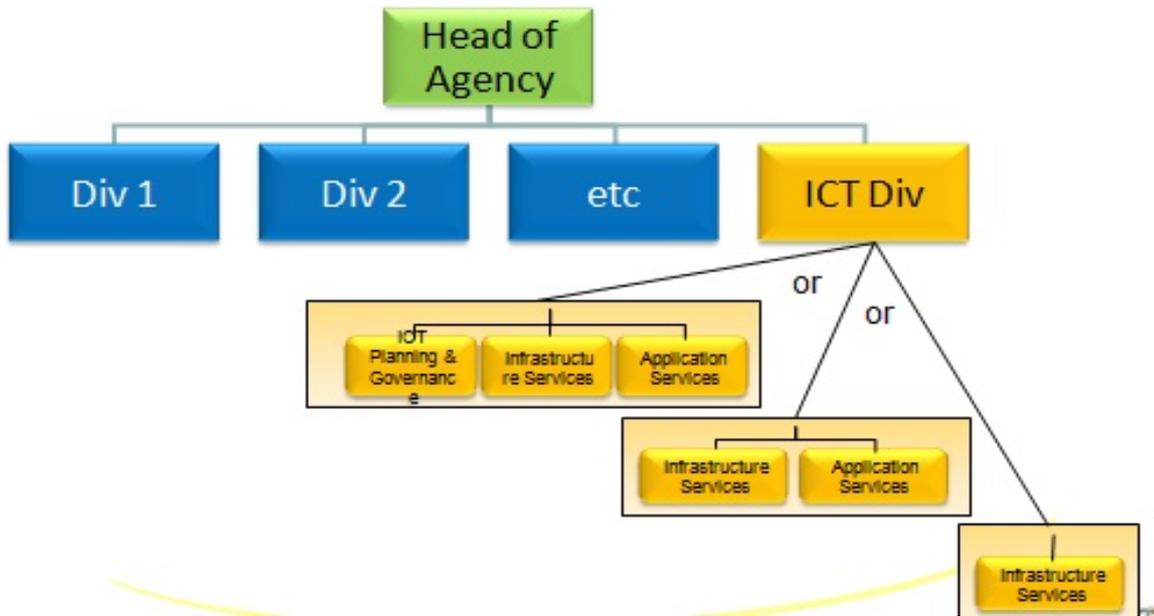
MoIC will professionalise the management of ICT resources and ICT management practices by implementing the following:

1. Structure and Establish ICT Division/Department in Agencies
 - Clearly define terms of reference of the ICT Division/Department within each agency
 - Set up ICT Division/Department with suitable structure within each agency

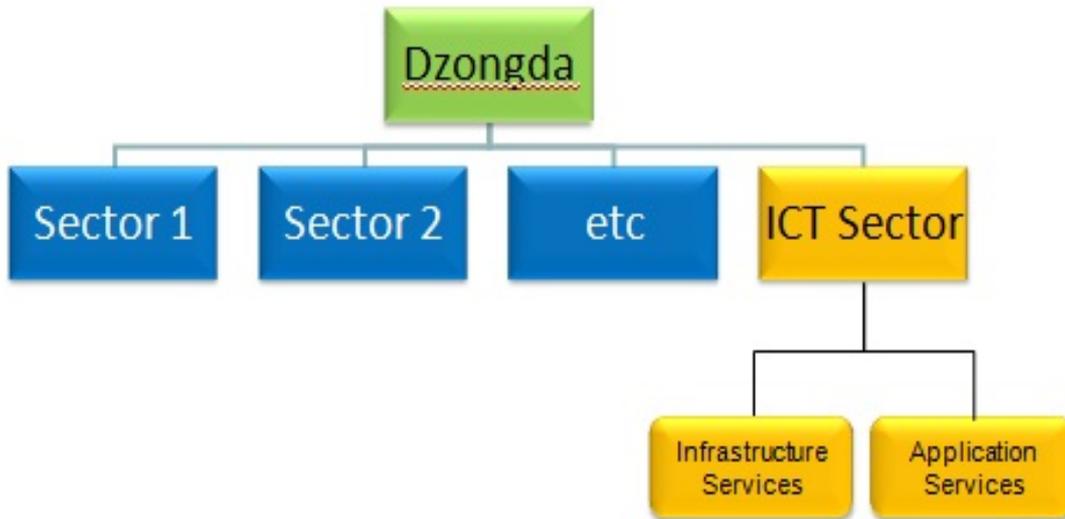
ICT Services structure in Ministries



ICT Services structure in Autonomous Agencies



ICT Services structure in Dzongkhags



2. Professionalise ICT HR practices

- Clearly define ICT job responsibilities
- Clearly define ICT career path
- Put in place ICT Competency Development Framework
- Put in place HR processes for ICT Professionals

3. Professionalise ICT Management Practices

- Put in place ICT Workplanning Processes including Five Year Planning and Annual Work Planning processes
- Put in place ICT Systems Delivery Processes such as Project Management, Systems Analysis and Design, IT Procurement
- Put in place Supporting ICT Processes such as Helpdesk Management, Problem Management and Systems Change Management.

4. Pool of Expertise

- Put in place group of experts in various ICT fields such as Infocomm Security, IT Master planning, Project Management etc.
- These groups of experts will provide technical advice and services and formulate guidelines for the whole of government.

5. Establish Communication Forums

- Put in place communications forums for ICT professionals and Government leadership

DITT/MoIC will be the lead agency in developing and implementing the Parenting of ICT Professionals initiative. Given the importance of this initiative, its implementation will commence in the first year of the 11FYP and estimated budget is Nu. 267m.

Development of Leadership & Non-ICT Professionals

The Chiphen Rigpel “Empowering a Society, Enabling a Nation” project is a five-year Nu 2.05b project (spread across seven agencies) that is fully funded by the Government of India. This ICT capacity development programme that commenced in 2010 aims to transform Bhutan into a knowledge based society. Over the last two years, its focus has been on laying the groundwork and

creating the groundswell for sustained and effective change. The first steps towards empowering the leaders of Bhutan and building infrastructural and institutional capacity have been completed and the results well-received by all stakeholders.

As the project progresses and touches more and more citizens, it is an opportune time to plan and initiate the next phase for ICT capacity development. The next phase will leverage on the fertile ground prepared by availability of trained manpower and existence of enabling processes, to develop knowledge creation capabilities which will create momentum towards achieving the vision of a knowledge-enabled Bhutan. There is a need to extend and expand the outcomes envisaged during Chiphen Rigpel project and reach an additional 30,000 Bhutanese citizens and institutions that were not covered under the current Chiphen Rigpel. For the next phase, the Government should continue to explore possibility on general ICT capability development.

To supplement its needs for more specialised and advanced ICT training, the Government should consider engaging the Royal University of Bhutan (RUB) to develop customized and localized ICT training courses, and engaging foreign training institutions like the Institute of System Science under the National University of Singapore to develop e-Government leaders and ICT professionals.

Current ChiphenRigpel training curricula should be revisited and crafted according to user's/learner's requirement. Emphasis should also be given on Dzongkha language computing. For instance, when users are trained to use applications for word-processing, spreadsheets, database management, presentations, page layout and graphics they need to be taught how to use these applications with Dzongkha. Those learning to develop websites, databases, and other applications need to know how to develop for Dzongkha as well as English.

Both ICT professionals and users need to have better knowledge and capability in Dzongkha computing. To this end relevant material needs to be included in the curricula for ICT courses in schools, colleges and private training institutions.

DITT/MoIC will lead the planning for the next phase for ICT Capability Development with MoE and MoLHR as participating agencies. The estimated project cost for implementing the next phase of ICT capability development is Nu. 1000m.

3.4.4 ICT for Sectoral Transformation

ICT is recognized as an engine for social and economic transformation to empower and transform the lives by developing ICT infrastructure, skilled pool of resource, innovative industries and empowering communities. The advancement and application of ICT provides limitless opportunities in almost every facet of our working and social lives. Through the adoption of ICT, the sectors would enhance the internal efficiency through improved service delivery and interactive engagement of government, people and business.

The initial five sectors identified for ICT transformation are Education, Finance, Health, Agriculture and Tourism.

ICT for Education

With the introduction of an ICT integrated teaching and learning environment, the education sector will use ICT as a tool to equip teachers, educators and students with the competencies and wide range of readily-available ICT resources. The application of ICT will transform the education practices in the country.

Description of the initiative to develop and implement the ICT Masterplan for Education can be found under Outcome: ICT for a Bhutanese Information Society.

ICT for Finance

To realize the vision of maintaining transparency, a comprehensive ICT infrastructure to automate and transform entire process of procurement, e-payment and online tax filing between government, business and citizens would be implemented. Existing diverse systems would be integrated and upgraded to fully functional web-based system thereby reducing turnaround time and unnecessary paper work.

ICT for Agriculture and Forestry

The emerging ICT enabled technology to guide and utilize the potential of ICT in addressing the challenges and uplifting the livelihoods of people by transforming operational efficiency in agriculture sector. It would contribute towards attaining Gross National Happiness by providing relevant agricultural information in rural areas to help farmers improve their labor productivity, increase their yields and realize a better price for their produce.

ICT for Health

A holistic ICT planning for better delivery of health care service is paramount. The ICT infrastructure to automate and transform entire process of health care delivery is what is required to be addressed in Health ICT Masterplan. Existing diverse systems should be integrated and upgraded to fully functional web-based system thereby reducing turnaround time and unnecessary paper work. The masterplan will be developed within end of 2013.

ICT For Tourism

Tourism is one of the key sector and ICT can play a very important role in improving the delivery of services. A separate ICT Masterplan is crucial to review existing gaps and come out with key strategies to take the sector to next level. The masterplan will be developed within end of 2013.

ICT Masterplan for Education

To attain its vision of "... *an educated and enlightened society of **gyalyong gakid pelzom** at peace with itself, at peace with the world, built and sustained by the idealism and the creative enterprise of our citizens*", the Ministry of Education (MoE) will formulate and implement the ICT Masterplan for Education in the 11FYP.

Today, ICT has a profound impact on the way in which people live, learn and play. It can extend the learning environment and contribute to the construction of a learning society. With more than 176,647 students studying in 553 schools and 109 Extended Classrooms (ECRs) taught by more than 7,932 teachers, the promotion on the use of ICT in education has been listed as one of the priority areas in Bhutan.

ICT has been taught as an optional subject in all middle and higher secondary schools since 1992. From 2000, MoE started capacity building programs with the participation of more than 200 teachers.

With the launch of the Chiphen Rigpel Project in 2010, Bhutan's level of ICT integration entered a new phase. ICT classes have been made mandatory from Class VII onwards, and compulsory basic ICT literacy training has been initiated for all teachers. To date, more than 2,000 teachers have been trained. A pool of master trainers has also been groomed from among teachers to develop and conduct ICT related capacity building workshops and training. Besides the existing IT labs in all Higher Secondary Schools (HSS), Middle Secondary

Schools (MSS) and a few Lower Secondary Schools (LSS). Computer laboratories have been established in 168 secondary schools under Chiphen Rigpel project.

Other noteworthy ICT projects that enhanced ICT integrated lessons in the classroom and inspired education transformation include:

- i) Weaving Infotech Resources into Education (WIRED) that was funded by RGOB and the Singapore International Foundation. The two year project integrated ICT into the teaching learning process in five pilot schools by 2011.
- ii) One Laptop Per Child (OLPC) project that was funded by the International Telecommunication Union (ITU). The project provisioned 210 “XO Laptops” to 21 schools in different Dzongkhags.
- iii) Provision of 300 Classmate PCs to 15 schools with support from Intel World Ahead Foundation.

The ICT Masterplan for Education will guide the execution of these three broad strategies:

1. Strengthen ICT Integration Into Curriculum, Pedagogy and Assessment

Besides, building relevant ICT skills in teachers and students, ICT would be utilised as a tool for teaching and learning, ultimately enhancing the quality of education. Dzongkha language should also be explored to include in the ICT Curriculum.

Sharing of educational contents, research papers and curricula online via TEIN network

2. Provide a Practice-Based and Model Approach for Differentiated Professional Development

Teachers would be trained to integrate ICT in the delivery of lessons in all subjects.

ICT Instructors would be recruited and regularized to enhance conceptual skills and develop critical thinking in schools.

Hardware technicians and network administrators would be recruited for all the secondary schools and the existing computer laboratory assistants' ICT capability would be enhanced.

3. Enhance ICT Provision in Schools to Implement Programmes in the ICT Masterplan for Education

Internet connectivity would be available to all schools, and computer labs in schools would be equipped to bring down computers to students ratio by 1:30 for Primary Schools and 1:10 for Secondary Schools.

The lead agencies to implement programs in the ICT Masterplan for Education would be the Department of School Education (DSE), Department of Curriculum, Research and Development (DCRD) and Policy and Planning Division (PPD) and the collaborating agencies would be Department of Information Technology and Telecom under Ministry of Information and Communications (DITT/MoIC) and the Royal Education Council (REC). The Masterplan will be developed within end of 2013.

ICT Masterplan for Finance

ICT can re-shape and transform the financial sector. Besides improving existing operational and decision making processes, ICT can evolve a whole new range of financial services for the people, businesses, and the Government.

In the Government sector, the Ministry of Finance (MoF) is guided by the strong vision to “steer and sustain a robust economy through a fiscal policy and culture of fiscal discipline”. MoF formulates and implements dynamic fiscal policies and sound financial management through maximization of resource generation, efficient allocation, prudent expenditure and debt management, and proper accountability of public resources.

While MoF has been an early advocate of ICT adoption in the Government, the ICT systems that currently support the ministry’s functions are disparate and archaic. The systems were not designed to ensure data accuracy, secure access, resource sharing, and ease of use and information retrieval. To mitigate the risks from these inefficiencies as well as technology obsolescence, an integrated approach to technology refresh needs to be adopted. Some of these systems include the Macro Economic Framework (MEF), Multi Year Rolling Budget (MYRB), Public Expenditure Management System (PEMS), Common Wealth Secretariat of Debt Recording and Management System (CS-DRMS), Bhutan Automated Customs System (BACS), Revenue Administration and Management Information System (RAMIS)³, and the Online PIT (Personal Income Tax) System.

³ RAMIS comprises the Tax Management System, Sales Tax System & Revenue Accounting System.

MoF would be the lead agency in driving the ICT Masterplan for Finance and collaborating agencies would be DITT/MoIC and other relevant agencies. The Masterplan will be developed in 2014.

ICT Masterplan for Agriculture and Forestry

In accordance with the Kingdom's Vision 2020, the Ministry of Agriculture and Forestry (MoAF) envisions information and communication technology as an *integrative and enabling, yet socially acceptable and culturally appropriate tool* for the fulfilment of: national food security; conservation of natural resources; sustainable economic production and enhancement of rural income; and the generation of employment opportunities.

The Ministry will walk the extra mile in proactively employing and efficiently utilizing information and communication technology in contributing to Gross National Happiness and people-centred development by ensuring food security, natural resources conservation, sustainable production, and poverty alleviation.

With the application of ICT in Agriculture and Forestry, decision-making will be made more objective and effective by improving the reliability and accuracy of data and information required for realistic planning and management. Information gathering, processing, retrieval and dissemination will be made efficient to improve access information; to expedite flow of information; to enhance outreach of educational and promotional programs; to maximize the opportunities offered by the information technology; to improve the effectiveness of use of print and audio-visual materials; and, to facilitate and coordinated development of spatial data standards and efficient data sharing mechanism.

The ICT Masterplan for Agriculture and Forestry will be guided by these strategic directions for the sector:

1. Establish a Knowledge Management System for MoAF

MoAF will adopt knowledge management approach for its organizational communication needs. The knowledge management strategy can make sharing and reusing of knowledge available to stakeholders within the Bhutanese Agriculture and Forestry sector – MoAF officials, researchers, extension workers and farmers – both documented and tacit knowledge on renewable natural resources not only locally but regionally and internationally as well.

The main components of the Renewable Natural Resources Knowledge Management System (RNRKMS) are the RNR website and portals, RNR

document management system, VERCON (Collaboration system, market information system), RNR research network and video-conferencing facility. The administration and technical support for the system will be provided by the Information and Communications Services (ICS). However, the respective departments will contribute the relevant contents for the system.

2. Establishing ICT Enabled RNR Service Access Channels

The RNR Service Access Channel will be used to improve the farmer's access to information and reinforce linkages with the research, extension, and market sub-systems. This will be addressed through deployment of low-end, low-cost information and communication technology such as cellular phones, VCDs, and cable television.

To take advantage of the Community Center and 70 per cent of the Bhutanese having subscribed to cellular service, MoAF will develop both web-based and mobile-based RNR services during the 11FYP.

3. Strengthening ICT Infrastructure and Capacity at Gewog

Since the frontline extension agents in Bhutan are the agents for the transfer of RNR information and technologies, ICT should be strengthened especially at the gewog level to maximize the utility of RNR ICT services. This will require the establishment of connectivity to the gewog RNR centres and building the ICT capacity of the gewog extension agents (agriculture, livestock, and forestry). Since the infrastructure backbone is provided by MoIC, the RNR sector will focus on last mile linkages, i.e., final leg of the telecommunications networks delivering communications connectivity to the actual users. The ICT capacity of the gewog extension agents will also be looked after by providing trainings on computer and internet know-hows, functionality of the RNRKMS, G2C services and other RNR services.

The Information and Communications Service (ICS) of the MoAF will lead the ICT plans and programs with close collaboration with other departments and agencies under the Ministry. Other collaborating agencies would be DITT/MoIC, and National Telecom Companies.

The overall proposed budget for the development and implementation of the ICT Masterplan for Agriculture and Forestry is estimated at Nu.25.9m for recurrent budget and Nu.13.27m for the capital budget. The Masterplan will be developed within 2014.

3.4.5 Whole-of-Government Shared Services

A whole-of-government (WOG) approach is necessary for a small country like Bhutan as resources are limited and capabilities are distributed. Synergies can only be reaped and redundancies reduced through coordination and collaboration. Government agencies need to go beyond operating within their jurisdiction to adopt the mindset of serving as an integrated e-Government that maximises ICT investments and reaps the synergies of working as one entity.

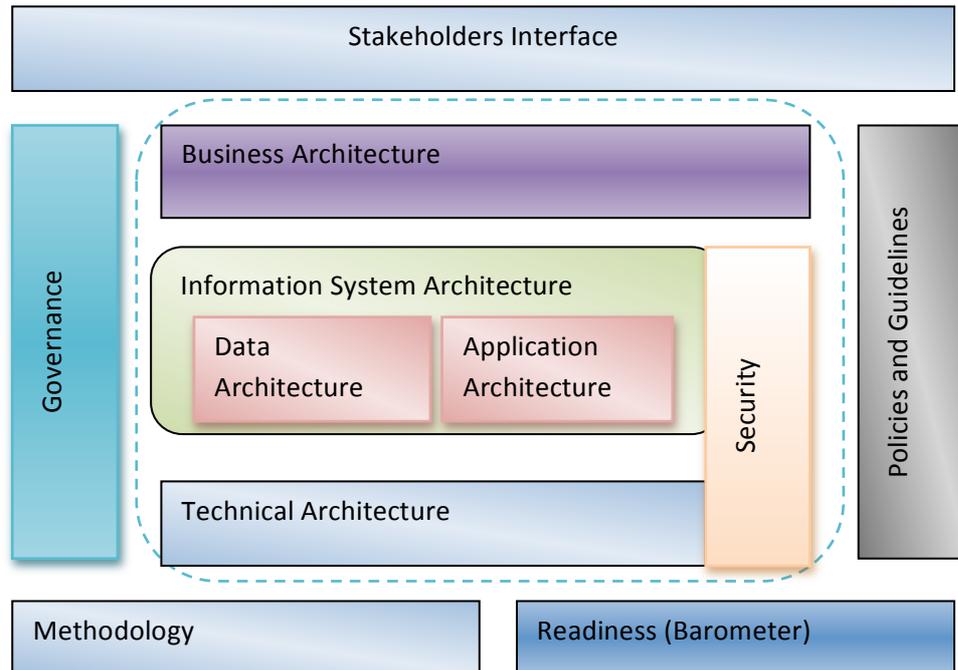
While government agencies are tasked with different functions and mandates, they do adopt common processes and have common ICT requirements in the area of systems, data and infrastructure. The WOG Shared Services initiative aims to facilitate interoperability within the Government and deliver common data hubs, common systems and data centre services for the Government.

e-Government Interoperability Framework

The electronic government interoperability framework (e-GIF), in its broad sense, is government enterprise architecture to define technical standards and best practices to enable ICT systems to integrate and interoperate across the RGoB. It institutes set of standards and guidelines that the government agencies must adopt to enable better sharing and collaboration within government agencies. It allows diverse government application systems to easily exchange data and use the data that has been exchanged meaningfully, with support of standardised technologies, data and applications.

The e-GIF will be governed by e-GIF Governance to support its adoption and maintenance. Its adoption and compliance by different government agencies will be reinforced through Cabinet Directive and Change Management Strategies. The e-GIF is a live document and will be periodically updated whenever there is change of technologies and policies.

The overview of the framework is as below:



The four main components of e-GIF are:

i) Business Architecture

The Business Architecture describes the different lines of business and the associated government functions that cut across the boundaries of different agencies.

ii) Applications Architecture

The Applications Architecture describes the common applications and application components that can be shared across the Government. It includes the technical standards and security considerations pertaining to the design and implementation of solutions and applications.

iii) Data Architecture

The Data Architecture lists the data definitions and data elements of common and shared data that are used across the Government. It will describe the data pertaining to 'People', 'Land' and 'Business' data hubs which are commonly used by various agencies' applications. It also defines technical standards, design and security considerations and best practices related to the management of data.

iv) Technical Architecture

The Technical Architecture defines the infrastructure technologies and their respective technical standards to enable better system integration and interoperability across the Government. It also defines the security considerations and standards related to the infrastructure technologies.

Through the development and implementation of e-GIF, the Government seeks to attain these outcomes:

1. Collaboration and interoperability across whole-of-the government and its systems.
2. Adoption of a Whole-of-Government approach to reduce duplication of effort and resources and improve service delivery through effective use of ICT.
3. Identification of new opportunities for ICT development;
4. Alignment of the ICT initiatives of every agency towards common e-Government goals.

DITT/MoIC has commenced the development of the e-GIF in July, 2012. The framework will be implemented in the 11FYP. DITT/MoIC will lead the implementation of e-GIF in close collaboration with the line agencies. The estimated cost for the implementation of e-GIF is Nu. 42m.

For more information, e-GIF excerpts are provided in the appendix E.

Common Data Hubs

The Government is custodian to the largest information repository in the country. All agencies generate and manage information in the course of government services delivery. However, there are many sources of related and duplicate information within the Government. This makes it challenging to obtain reliable information and the value of this information is not maximised.

There is a need to establish an authoritative source of information especially information relating to people, land, businesses and vehicles. The information in this “single source of truth” can then be accessed 24/7 by relevant government agencies as required for more effective and efficient government services delivery. Non-sensitive or publicly-available data can also be published by the

Government to facilitate data analysis and research, and application development.

In the 11FYP, data hubs pertaining to people, land, business and vehicle information will be established. The respective data custodians and eventual data hub owners are MoHCA, NLCS, MoEA and RSTA/MoIC. Grouped under the Common Data Hubs initiative, DITT/MoIC will lead the establishment of the People Hub, Land Hub and Business Hub. DITT/MoIC will work in collaboration with the data hub owners and line agencies that will be users of the respective data hubs.

The Common Data Hubs initiative is expected to commence at the start of the 11FYP (July 2013), starting with the establishment of the People Hub and Land Hub, and followed by the Business Hub and Vehicle Hub in conjunction with the development of G2B e-Services. The establishment of the data hubs will be outsourced on a Build Operate Transfer model at an estimated budget of Nu. 50m.

Common Systems

In the 11FYP, the Government will consolidate its requirements for common systems such as the Government Email, Government e-Procurement System, National Spatial Data Infrastructure, e-Authentication and e-Payment Gateway. This will enable the Government to put in place key systems while drawing on significant economies of scale. Where it makes sense to do so, the Government will pursue public-private partnerships to implement these systems, and use the Government's collective purchasing power to get the better value for money from the private sector.

i) Government Email

There is a need to unify electronic communications so that the RGoB would have in place one enterprise email service for the WOG that is available 24/7, secure, full-featured and more efficient to administer (easy central deployment of software upgrades and security patches, and management of email accounts etc). This can be done by mandating the use of the Government Email for official communications and consolidating and fulfilling the email service requirements across ministries and government agencies. The former will be addressed by the eGovernment policy and the latter through the One Government Email project.

Currently, the RGoB spends huge amount annually on multiple, isolated and disparate email installations across ministries and government agencies. There are different email instances, versions and software applications that are used for official communications, even personal email accounts on email services like Google mail and Yahoo mail.

While electronic communication is possible, there are concerns over the security of the information transfer and archival of email exchanges, and the reputation risk of the RGoB. Other helpful features of email services like the sharing of calendar and mailing lists across ministries and governance agencies could not be maximized because the email servers are standalone systems. Effort to administer the email servers are also duplicated in various ministries and agencies, either by IT staff onsite or outsourced to different service providers with different service levels agreements.

It is envisioned that the One Government Email will be hosted on a cluster of secured and high availability servers at the Government Data Center in the Thimphu TechPark. Alternatively, the One Government Email can be part of a cloud-based suite of enterprise applications (including word processing, document management etc) on the Government Cloud. Regardless, this being a central service, DITT/MoIC will work with all ministries and agencies to define the requirements of the One Government Email and manage the outsourcing contract. From a software licensing perspective, there is potential cost savings from the aggregation of demand for email services from ministries and agencies. From a resource management perspective, the administration of email services would be outsourced to dedicated and qualified professionals, hence relieving the ICT professionals to support the core business of their respective ministries and agencies.

ii) e-Procurement System

The Public Procurement system is an important instrument/tool to ensure and achieve efficient, effective and transparent management of public resources. The implementation of e-procurement system will immensely support the public procurement system by enhancing transparency and efficiency in government procurement processes. The electronic Government Procurement (e-GP) will generate significant saving by reducing cycle time

and avoiding unnecessary paper works. The system will also ensure transparency in the entire tendering procedures.

Since the e-GP system will manage the tenders electronically on a website, every bidder will have access to the tendering information anytime and anywhere with an internet connection. This will ensure large coverage of bidders and wider competition.

MoF will consider the use of Software as a Service (SaaS), a software model with the procurement application centrally hosted in a government cloud computing environment so that all ministries and agencies can access over the Internet. Such a model brings about benefits of low cost of ownership, no capital expenditure, and rapid deployment. Application Service Providers (ASP) deliver SaaS on a “pay-per-use” basis or a monthly/annual fee based on an agreed service level agreement. They will manage service updates, reliability, availability, scalability, security and back-end system integration, if required – thereby relieving IT staff to support strategic business functions.

For a start, the system will support small value purchases, quotations and tenders based on the value of purchases. For the activity, which includes capacity development and the development of system, an estimate of Nu 34 million of Capital Budget is proposed.

iii) National Spatial Data Infrastructure

The use of Geographic Information Systems (GIS) has steadily increased over the last decade. There is now a major investment in both GIS technology and GIS related data. Unfortunately, many of the applications were developed in isolation with different government agencies pioneering their own GIS development. As a consequence, there is redundancy in data and extensive duplication of effort and wastage of resources.

As the need of the country expands and the realization of the potential of GIS became more pronounced, the deficiencies and shortcomings of the standalone GIS systems became evident. There is also a lack of proper geo information policies, unorganized GIS community and incompatible data sets.

The Cabinet has directed the National Land Commission (NLC) to be the lead agency in developing the National Spatial Data Infrastructure (NSDI). NLC

needs to create awareness among the agencies to encourage usage of existing infrastructure by adding layers of information pertaining to their core business instead of developing similar spatial data infrastructure. There has to be a close coordination between NLC and the line agencies to better leverage the infrastructure for improving planning and delivery of government services.

For a start, the Election Commission of Bhutan (ECB) will contribute an electoral data layer with information on electoral boundaries and elector profiles etc and leverage the NSDI for the enhancement of the Election Management System. The Ministry of Works and Human Settlement (MoWHS) will contribute a human settlement data layer with information on settlement density and profile, a farm roads map, and a public works map. In future, MoWHS can leverage the NSDI to develop a “GIS-based Digitised Road Network Map” that presents a view of ongoing public works in the country and facilitates planning and decision making.

NLCS has proposed Nu 11m in the 11FYP to develop Bhutan National Spatial Infrastructure (NDSI) with data model, meta data, base data for Geo Portal and contribution to information dissemination. There is no committed donor funding.

iv) e-Authentication

Authentication is required for e-services where users must identify themselves. There is need for a secure and easy-to-use authentication method for the users to prove their identity and obtain personal information and services from the government agencies over the Internet.

A common Authentication Service, which provides end-to-end encryption of user IDs and password, will be established for government e-services that require authentication. With a common Authentication Service, citizens only need to remember only one Authentication ID and password for authentication when accessing different government e-services. It also reduces the needs for multiple government agencies to setup similar authentication service and duplicate user registration.

The Citizenship Identity Card Number issued by the Department of Civil Registration and Census has been identified to be used as the Authentication ID as the majority of the population will have been issued with the National Identification Number. Users can apply for the Authentication ID online using

the National Identification Number and the password will be sent to their email account.

To use an e-Service that requires authentication, the user will need to first logon using the Authentication ID.

The functionalities and features of the Authentication Service include:

a) Single Sign-On

The Authentication Service will provide single sign-on capability which uses one authentication method to verify the identity of a user while granting access to multiple applications and services. Once a user's credential has been successfully authenticated, the user will be granted appropriate access to the application. When a user request access to another application and if the second application accepts credentials from the user and the first application, no additional authentication will be required. This simplifies the authentication process by using the same mechanism to verify the user identity from application to application.

b) Authentication Method

Authentication can be implemented by using something you know (e.g. password) or something you have (e.g. token). Single factor authentication which uses Authentication ID and password is generally adopted for the implementation of government e-services. Two-factor authentication using biometrics is recommended to increase the assurance if there is a need to access a more secure system or sensitive information. Alternatively, password for one-time usage only can be randomly generated by a token, or generated by a server and sent to a mobile phone via a short message service (SMS).

c) Encryption

The Authentication Service will provide end-to-end encryption of the Authentication ID and password. This is to provide more assurance on the confidentiality and integrity of these key parameters used for authentication.

d) Non-repudiation

The Authentication Service will need to support non-repudiation requirement by providing conclusive proof of participation by both sender

and receiver of data in an online transaction environment. The Authentication service can also provide digital signature service by using a server digital certificate generated by a Certification Authority (CA). Digital certificate is an electronic file that certifies identity and contains other information such as the public key and the expiration date. Certification Authority is a trusted 3rd party that issues the digital certificate (e.g. VeriSign digital signature). The digital certificates shall comply with the x.509 version 3.0 standards as specified in Request for Comment (RFC) 3280.

e) Password Security

The password generation process shall be secure and support enforcement rules on the password. The recommended password security include password length (minimum eight characters), password change after first logon, account lockout after six invalid logon attempts and change of password every ninety days.

f) Online Application of Authentication ID

The registration of Citizenship Identity Card Number is supported by Passport, Birth Certificate or Affidavit. Using the Citizenship Identity Card Number, users can apply for the Authentication ID online.

The password for the first-time registration will be sent to their postal address in sealed envelope via registered mail.

g) Password Reset

It is recommended that password reset to be done by sending a temporary access code and one-time expiring URL via email.

v) e-Payment Gateway

Citizens make many different kinds of payment to the government. The payment can be fees, licenses and taxes. With e-payment service, citizens can make these payments more conveniently and easily via the Internet without the need to travel to a physical payment counter. By implementing e-payment service, the government not only delivers better services to their citizens and businesses, it also gains efficiency by automating the payment process.

It is recommended that a centralised e-Payment Gateway be established to connect to the bank or payment service provider instead of every agency setup their own gateway. E-services can interface with the banks/payment service providers via the e-Payment Gateway for payment transactions. It will save implementation cost and the government only needs to audit one payment gateway system.

For security reasons, all payment transactions shall be protected by digital signatures to ensure proper authentication and non-repudiation. All communication channels shall also be encrypted using standards-based specifications such as secure sockets layer (SSL) to prevent eavesdropping of messages by unauthorized parties. Audit trails shall also be maintained for all events transpired in the course of the payment transaction.

Description of the initiative to develop and implement the e-Payment Gateway can be found under Outcome: ICT as a Key Enabler for Sustainable Economic Development.

vi) Personal Information System

The Personnel Information system (PIS) is a Computer based system for maintenance of the records for individuals in an organization. The details pertaining to personnel, postings, qualifications, training attended; family details etc are stored in this system. Most of the agency has a PIS system and many more have proposed to develop PIS system for their agency in 11th five year plan. This could lead to duplication of the same system across the whole of Government and data which are not consistent for integration.

Therefore, DITT took an initiative to discuss with some of the agencies that have PIS system and those who proposed to develop PIS on possibility of having and using single system. It is found that RSCS has a civil service information system (CSIS) that captures every detail of civil servant and its HR action. It is proposed that all agencies should used the CSIS instead of developing their own PIS system. This will reduce duplication of effort and resources.

Following are the findings:

1. CSIS access is given only to HROs to view, update and take HR action for their ministries/agencies and the access to rest of civil servant is only to view their individual details.
2. Agencies want their agency head (chief, director and secretary) to have access to CSIS to view the entire employee under them and generate reports to take day to day decision etc. for which the access to CSIS is not provided. Moreover, CSIS doesn't meet some of the specific requirement of agencies and their report format is different from what is there in CSIS (CSIS has generic report).
3. RCSC clarified that they can give access to CSIS with only view details to their agencies head. But respective agencies have to write to RCSC requesting for access to CSIS.
4. CSIS can't be customized to meet the needs of every agency to be used as PIS system for them. Therefore, a team will carry a detail requirement study for PIS system (unique feature that is not there in CSIS) and what information (data) is common across. Based on the report, RCSC will prepare a master data (dynamic) which will be then shared with all the agencies, where agencies can have a reporting tool(in place of PIS) to generate different reports that meets their requirement.
5. All HR action and information to be updated in CSIS itself to make it consistent and as one of the data hub for e-gif standard.

Roughly about Nu. 3.1m is required to develop a common PIS system for whole of Govt if above solution is not possible. Following is the estimation.

Name	Cost
Requirement study	100000
Preparing RFP, tendering ,evaluation etc	50000
Development of system (outsourcing)	2000000
Training	500000
Equipments etc	500000
Total	31,50,000

The above is just a rough estimation; it might go 20% up or down.

Government Data Centre

This initiative seeks to establish a Government Data Centre to improve public service delivery and ensure disaster resiliency under the pillar, ICT for Good Governance. This will be a WOG approach towards the provision of data centre services to avoid duplication of investment in this area across the Government.

Currently, government agencies procure and maintain their own servers and network equipment either at their own premise or host with data centre service providers both locally and abroad. This demand for data centre services continues to increase as agencies leverage ICT for service delivery.

In the 11FYP, the Government will aggregate demand for data centre services and provide for services in these three areas through the Government Data Centre (GDC):

- **Hosting Services** – Agencies will have the option of Managed Server Hosting and Dedicated Server Hosting. The former allows agencies to co-host their solutions on Best of Breed servers that will be manned by dedicated and trained professionals 24/7. The latter gives agencies the flexibility to house and man their own servers at the GDC.
- **Managed Services** – IT Services Management including OS management, system monitoring, firewall management and email provisioning will be provided in accordance to defined service level agreement.
- **Connectivity Services** – Connectivity to the TWAN for secure intra-Government networking and high speed Internet access will be provided.

The GDC will be designed to ensure the highest level of reliability and availability so as to sustain mission-critical operations. Consideration will be placed in the area of physical infrastructure, security control, power supply, racks, environmental control, fire detection and suppression, 24/7 customer support and structured cabling.

The functioning of the Government is increasingly dependent upon ICT. Besides existing common systems, there are ICT solutions in use by agencies and many on-going and planned ICT initiatives. Currently besides individual websites and mail systems, the whole of government also uses a number of real time systems such as Public Expenditure Management System, Multi-Year Rolling System,

Planning and Monitoring System, and Civil Service Information Systems. The number of G2C, G2B and G2G activities already initiated will further increase Agency's ICT and data holdings. The rising demand for ICT to be available at all times will increase the need for reliable and efficient data centres. The current practice of maintaining several server rooms with sub-optimal conditions is not only costly but also unreliable and insecure.

Having a Government Data Centre will therefore extend several benefits such as:

- i) Consolidated demand and use of resources;
- ii) Reduced cost of maintaining and managing data centre physical infrastructure and associated costs;
- iii) Increased efficiency of data centre ICT assets;
- iv) Improved matching of data centre ICT facilities to business need;
- v) Standardized ICT infrastructure architectures; and
- vi) Sharing of resources.

In view of our limited resources and to optimise the use of our existing infrastructure and systems, a Government Data Centre needs to be established. This will avoid inefficient, costly and fragmented practices of the past and build a sound governance structure for ICT applications and e-services. It would be an opportunity for the government to do away with the current piecemeal approach which forces up the costs as well as avoid duplication. This will enable aggregating demand for data centre space and achieve better price of equipments as well as other related services such as power systems.

Government Data Centre will best function if its operations and maintenance are outsourced. In order that a third party delivers smooth services of operating and maintain the GDC, the ministry in charge will execute the following processes.

1. MoIC will set a policy to mandate all government agencies to use the Government Data Centre as a hot site for all their ICT infrastructure needs.
2. MoIC will establish detailed requirements of all Government Agencies through a Government Demand Analysis for a longer term. (aggregate the whole of government data centre demand)
3. MoIC will recommend a conceptual design of the GDC and the services to be provided along with the GDC business model.

4. MoIC will detail implementation plan/strategies through the process of consultation, research and analysis.
5. MoIC will develop a model for operations and maintenance with clear terms and conditions including security, privacy and data protection throughout data centre life cycle.
6. MoIC will seek to procure data centre services from GDC and seek the services necessary to assist agencies in moving to new data centre facilities.

From July 2013, MoIC will work with all government agencies to detail their data centre requirements. MoIC will outsource the operations and maintenance of the GDC through a tender and operations will commence in 2014. Nu. 120m is projected for the Data Centre.

3.4.6 Electronic Services

G2C Services

Service Delivery is one of the key components of the Good Governance Pillar of GNH. An “Enhanced and Simplified Government to Citizen Service Delivery System” is the vision of the Government-to-Citizen (G2C) project, a cross-agency e-Government initiative instituted for transparent, efficient and accessible government service delivery to the citizens. The G2C portal is at <http://www.citizenservices.gov.bt/>.

Key aspirations of the project are:

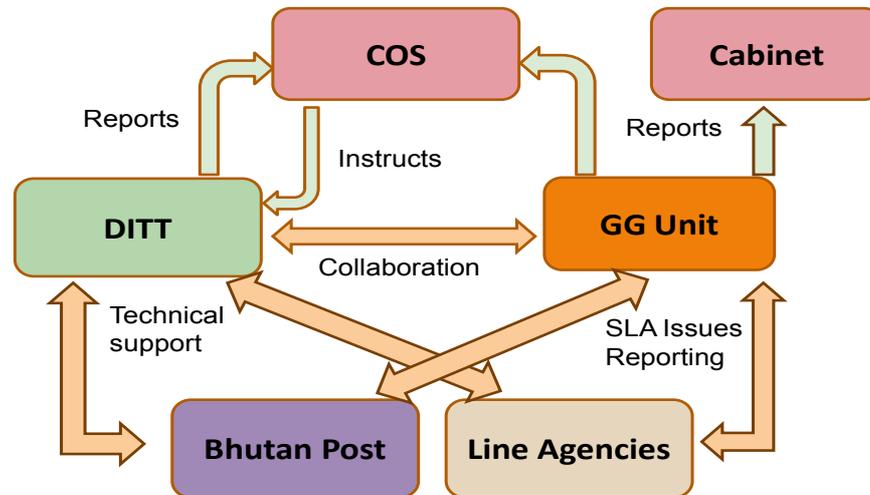
- i) Provide every citizen access to a variety of G2C services within a maximum of one day's reach of his/her location.
- ii) Reduce the turnaround time by 70% for G2C services and allow citizens to file their complaints and issues.
- iii) Achieve the best-in class ratio of civil servants employed in G2C services to population.

In its second phase of development, the G2C Project benefited from strategic direction and guidance from the G2C Board comprising the Committee of Secretaries (COS), and implementation support from a Project Office comprising members from various agencies led by a Project Director. A list of 135 services (see **Annex B**) to be electronically enabled was identified based on these criteria:

- a) Most commonly availed services;
- b) Services that are availed commonly by the rural citizens; and
- c) Services where the number of applications exceeds 100 in a month.

In the 11FYP, for better oversight and coordination with other e-Government activities, the G2C project management will be handed over to DITT/MoIC, with Committee of Secretaries still remaining as the Board for G2C project. The GG Unit in the Cabinet Secretariat shall oversee performance of G2C services. DITT shall provide technical support to all the Ministries and agencies. Critical members of the G2C project office will be retained with the DITT as deemed necessary to ensure continued support and ensure continuity of technical expertise. All Ministries/Agencies shall appoint a focal person each to ensure timely delivery of the services.

The following diagram illustrates G2C Governance and Reporting.



While the development of the remaining identified e-Services will continue, the focus will be to review the developed e-Services to ensure:

1. Availability of e-Services (currently, less than 20 of the 89 deployed e-Services are functioning) and possibility of making it available in Dzongkha;
2. Accessibility of e-Services anywhere, anytime (currently, e-Services are accessible only at Community Centres with the assistance of operators at the centres);
3. Ease of use of e-Services;
4. Consolidation of e-Services (where there is duplication across agencies);
5. Extension from e-Services to m-Services, that is, from the web to the mobile platform, where feasible;
6. Availability of maintenance services for e-Services; and
7. Inclusion of impactful e-Services omitted from the list e.g. Online Tax Filing.

DITT/MoIC has year marked Nu.100m for automation of G2C, G2B and G2G in the 11FYP.

G2B Services

As a part of the Government's Accelerating Bhutan Socio-Economic Development Project (ABSD), the Ministry of Economic Affairs (MoEA) with support from International Finance Cooperation (IFC) has developed the Government-to-Business (G2B) portal (<http://www.g2b.gov.bt/>). The one-stop portal provides comprehensive information on the 119 licenses, clearances and permits (issued by 29 agencies) that are required to start and operate a business in Bhutan. **Annex C** lists these business licenses.

In the 11FYP, the focus will be on policy review and business process re-engineering (BPR) and extending the G2B portal to provide seamless online business licensing services.

Policy review and BPR will be done concurrently. The former will establish the relevance, frequency of renewal and frequency for review for business licenses. The latter will require the various business process owners to map out as-is licensing processes to check for bottlenecks, non-value-adding work, and irrelevance activities and tasks. Then, desired to-be processes will be designed based on these principles:

- i) To eliminate or collapse steps;
- ii) To rationalised the need for 'in-person' application;
- iii) To streamline requirements for supporting documents;
- iv) To re-sequence steps;
- v) To simplify inter-dependency among agencies; and
- vi) To adopt relevant e-GIF standards.

The G2B portal will be enhanced with a guide to advice entrepreneurs on the licenses and permits they need. G2B e-Services for license and permit application, update, renewal and termination will be developed. As with G2C e-Services, development considerations should be given to availability, accessibility, usability, fit-for-purpose platform, and ease of maintenance.

The G2B Project will continue to be owned by MoEA but project managed by DITT/MoIC and reporting to the e-Government Executive Committee.

This initiative is best embarked on with the Business Data Hub initiative

3.4.7 Ministries/Agencies Specific ICT Initiatives

E-Commerce Framework and Portal

The Ministry of Economic Affairs (MoEA) will establish the e-Commerce Framework in consultation with the business community, BICTTA and DITT/MoIC. The framework will put in place the laws and regulations to govern and facilitate e-Commerce.

To ensure sustainability, BICTTA will be appointed to drive the development and operation of the e-Commerce Portal. The Agency of Promotion of Indigenous Crafts under MoEA will be the anchor tenant on the portal to promote Indigenous Craft and generate employment for Bhutanese artisans. The portal will also support the online businesses of Bhutanese entrepreneurs.

Public Financial Management System (Macroeconomic Framework Model)

The existing MEF model makes use of Microsoft excel sheets to input historical data and information, assumptions, analysis and inter-linkages amongst various macro-economic variables i.e. Gross Domestic Product (GDP), Balance of Payment (BoP), Government Debt, Revenue, Grants, Expenditure and Electricity.

With increasing data and information over the years, the excel-based framework has been constrained by lack of flexibility in terms of creating inter linkages and analysis of various macro-economic data. In the excel-based framework, there are risks of data loss and inconsistency with data inputs sourced from various government institutions.

Although, the existing excel-based MEF framework has provided a starting platform for the policymakers to the input, analysis and interpretation of macroeconomic data, with increasing scope of MEF activities and constraints faced by the existing excel-based framework, the framework needs to be up graded.

A web- based application model for MEF seeks to address the existing limitations faced by the excel-based framework.

The macroeconomic model would enable the projection of overall resources (tax, non-tax, grants and loans) accompanied by the projections of a sustainable fiscal path of major fiscal variables (deficits, debt, instruments of financing). It would maintain a statement of fiscal policy objectives, a set of integrated macroeconomic and fiscal assumptions, targets and projections. It will also ensure efficient and transparent resources allocation and provide predictability of spending in line ministries. The model will be a very reliable tool for economic policy decision-making.

Nu.25. 5 million of Capital Budget and Nu.1.0 million of Current Budget is proposed during the 11th FYP period for the activity.

Revenue Administration Management Information System (RAMIS)- Online Tax filing System

To fulfil the Government's recommendations on data integrity and interoperability and to achieve greater tax compliance through efficient tax administration and revenue management services, the automation of the current taxation processes will enhance and transform collection, processing, monitoring and accounting of taxes, reduce time and cost in tax collection and pin down risk of corruption.

A web-based system called Revenue Administration and Management Information System (RAMIS) will be developed during the 11th FYP. With its implementation, time lag in compilation of reports would be brought down thus enabling Department of Revenue and Customs to report on real-time basis. Additional features include Management Information System, Risk management and its inter-operability with already existing systems of various government agencies. The web-based system will create enabling environment for tax payers with the simplified tax procedures and on-line registration/tax filing which would lead to improved taxpayers compliances.

To further improve the taxation processes, major overhaul will be done in the network connectivity in the Department of Revenue and Customs. Adequate IT hard wares, X-rays and Scanners will be bought and installed at the necessary locations.

An estimate of Nu.30 million is proposed under the support of Asian Development Bank. Another estimate of Nu.16.2 million has been earmarked for procurement of IT hard wares, connectivity improvement, X-rays and scanners and other equipment.

Information System on State Owned Enterprises (SOEs)

The Ministry of Finance has to ensure that SoE business strategies are aligned with the Sector/ department policies and regulatory authorities while also ensuring sustainable businesses that provide economic benefit to the country. The MoF has shareholder-related oversight responsibilities over Government owned Enterprises. In addition, the ministry is also responsible for developing and implementing strategies to optimise the positive impact of the Public Enterprises on the economy and reduction of poverty by accelerating the economic growth.

The Ministry needs to collect and maintain information on the financial performance, financial positions and investments of the SoEs to forecast future revenue, project investment requirements, and plan & formulate policies. Therefore, an information system on the SOEs would greatly help ministry make accurate revenue projections and also help enhance the performance of public enterprises in the country by developing appropriate policies.

Nu. 25.0 million is proposed for the entire 11th FYP period.

Government Inventory System

For efficient management of government properties, a web based online inventory system will be developed.

For this activity, an estimate of Nu.5 million is proposed for the entire 11th FYP.

Besides, the programs and activities mentioned above, the Ministry of Finance will initiate improvement in the existing systems such as the Multi-Year Rolling Budget System (MYRB) and integrate the system with PEMS and PLAMS. For these activities, total capital budget of Nu. 26.95 million is proposed in the 11FYP.

Audit Resource management System (ARMS)

Audit Information Management System (AIMS) was developed in the year 1997 mainly to enable the Royal Audit Authority to automate the issuance of audit clearance certificates and store audit histories. The system also maintains information on audit observations and audit recoveries against individuals. However, the system does not cater to all audit functions and operations.

Therefore, the development of new system “Audit Resource Management System (ARMS)” was conceived and envisaged by the Royal Audit Authority to overcome all the shortcomings of the present system and cater to all audit functions. The concept was then proposed to Asian Development Bank (ADB) for support and in December 2010, the proposal was accepted and approved by ADB.

The development of ARMS is included in the RAA’s Strategic Plan 2010-2015 under Strategy 3.7 of Programmatic goal number 3 which is 'to reduce audit cost'.

The objectives of ARMS are as follows:

- To enhance efficiency and effectiveness of delivery of audit services;
- To manage work flow of all audit functions and operations;
- To reduce cost of audit;
- To document audit work paper electronically;
- To ensure that commitments are achieved by monitoring the progresses in the field; and
- To facilitate and tracking of performances of divisions, teams and individual auditors.

The system will be developed catering to all audit functions and operations. The system will computerize the whole auditing process right from the planning till follow-up. The system will be web-enabled which can be accessed from the field using Internet. The system will have features to monitor work progresses in the field and track performances of individuals, teams, divisions and departments. Electronic documentation of audit working paper will also be possible in the system. Further, the system will be capable of managing and maintaining information on human resources & related development activities, assets and inventories.

ARMS will replace the existing Audit Information Management System (AIMS) and Personnel Information System (PIS). The web-enabled audit resource management system (ARMS) is intended to enhance RAA's efficiency and effectiveness in providing audit services. It will help the RAA to efficiently plan and schedule audit assignments, monitor the progresses of audits in the field and track disposition of the large number of audit observations. Implementation of the ARMS will potentially improve the audit management processes and produce better quality audit reports. The ARMS will also provide the platform for an automated human resource management and inventory system.

The ARMS system is being developed with financial assistance from ADB (The cost estimates is Nu. 24.7m (US\$450,000). However, the amount is not adequate and request Government for additional support.

Enhancement of online Job Portal, Labour Net System and Bhutan Labour Market Information System.

The MoLHR in its effort to create easy access for employment opportunities and information sharing/dissemination, came up with the initiative of developing the Online Job Portal System, setting up Regional Offices incorporating Service Centres and other resources for effective public service delivery. The system enabled the job seekers to apply for jobs online, browse vacancies and other information etc. The system was developed in 2005.

The other popular online public service provided by the Ministry is the Online Labour Net System. The system has overwritten the manual labour recruitment process bringing efficient and effective recruitment process and removing hassles for the public. With the availability of such system, the public are more benefited.

The Bhutan Labour Market System (BLMIS) is used as a central data bank to store and disseminate various information such as Labour Force Survey and Job Prospects. The BLMIS is the central system of data bank.

The Ministry proposes to upgrade, enhance and integrate the above three systems in the 11th FYP for better service delivery. It is estimated to cost Nu. 3.7m.

SI #	Activities	Proposal	Cost estimate
1	Online Job Portal System	Enhancement and Integration with other existing system	0.95 m
2	Labour Net System	Enhancement	0.8 m
3	Bhutan Labour Market Information System (B-LMIS)	Enhancement	1.95m
		Total	3.70 m

Electronic Filing System in the Judiciary of Bhutan

The Judiciary of Bhutan has already adopted Case Information System and Case Management System in all the courts. In line with these Systems, the Judiciary of Bhutan is taking further step to develop Electronic filing system (EFS).

The system (EFS) will provide a platform for Law Firms (LFs) to file documents to the Courts electronically over the Internet. The EFS will be specifically designed to fully exploit the technology and also to minimize not just the physical movement of people and paper court documents from LFs to the Courts, but also to leverage the benefits of electronic storage within the Courts: i.e. faster document filing and retrieval, eradication of the misplacement of case files, concurrent access to view the same case filed by different parties, etc. This system will be first implemented for the civil cases only. Total of Nu. 4.1m is projected for the development and deployment of the system. It will be commenced in the 1st year of the 11FYP.

GIS-based digitized road network map for Bhutan

As of June 2011 Bhutan's total road network was 8,381.6 km. Out of this the Department of Roads (DoR) is responsible for maintenance of Primary National Highways, Secondary National Highways and Dzongkhag Roads comprising of approximately 3500 km (42%) of the total road network.

The roads having been built in geologically fragile mountains are subject to road blocks due to landslides in summer and snowfall in winter. Currently, information on road blocks are collected by the DoR headquarters from 8 regional field offices over telephone/telefax, which results in delayed dissemination of information to road users. In the absence of a GIS-based digitized road network map, road users are often left stranded on roads in remote locations for several hours due to road blocks. Such inconveniences to road users could be minimized if road users have access to GIS-based digitized road network map showing day-to-day road conditions. There is therefore an urgent need for DoR to develop a

GIS-based digitized road network map for the whole country to provide online road condition information to road users on day-to-day basis. The information on location of road blocks and estimated time of clearing road blocks could be highlighted on the map. The digitized road map could also include other road inventory data such as road geometric features (e.g. road width, whether road surface is black-topped etc.), location of retaining walls, breast walls, parapets, crash barriers etc. Similarly, digitized information could be collected for bridges and culverts on the road network. Information on bridges could include type of bridge (concrete, steel etc.), load capacity, width of bridge carriageway etc.

In the 11FYP, DoR plans to collect additional road inventory information using GPS equipment to include new roads that have been constructed after 2005/2006. To minimize cost of data collection, DoR engineers in regional field offices will be deployed for data collection after imparting 3-4 day's training on the use of GPS equipment. They will develop a database which will store the GIS maps and data on blockages etc, which could be pulled by land hub. To avoid the need to procure new sets of GPS equipment, it is proposed to hire GPS equipments from the National Land Commission (NLC). The additional digitized data collected by DoR will be submitted to the NLC with the request to process the data and produce GIS-based digitized road network map for DoR (layered over the Cadastral maps). If NLC declines to DoR's request, DoR might be compelled to outsource the work to a local GIS consultant. It is given to understand that NLC has also collected most of the data on existing infrastructure facilities while carrying out land cadastral survey in the 20 Dzongkhags.

It is estimated that about Nu.2 million would be required for procurement of GIS consultancy services and procurement of GPS equipment in case GPS equipment are not readily available with NLC. The budget requirement could be minimized if NLC agrees to hire out their GPS equipment and use their existing GIS software for production of the road network map for DoR.

GIS-based human settlement maps

Besides digitized road and bridge information, there is also a need for a comprehensive GIS-based digitized human settlement maps of all Dzongkhags showing existing infrastructures, land use pattern and population to enable the urban planners of the Department of Human Settlement (DoHS) to prepare

comprehensive human settlement plans. Unlike in the past, in the 11th Plan, DoHS has decided to adopt valley-based planning for which digitized maps of areas will be essential to facilitate proper human settlement plans.

Intelligent Transport System (ITS)

Traffic congestion and crashes have been increasing worldwide as a result of increased motorization, urbanization, population growth and changes in population density. Congestion reduces efficiency of transportation infrastructure and increases travel time, air pollution and fuel consumption. Intelligent Transport Systems (ITS) is being used widely to address these emerging issues.

Intelligent transport systems (ITS) are advanced applications which aim to provide innovative services relating to different modes of transport and traffic management system. This technology enables various users to be better informed to make safer, more coordinated, and smarter use of transport networks. ITS deploy information and communication technologies in the field of road transport, vehicles and users, traffic management, and road tolls. ITS vary in technologies applied, from basic management systems such as car navigation, traffic signal control systems; freight movement; automatic number plate recognition, speeding, security CCTV systems; and to more advanced applications that integrate live data and feedback from a number of other sources, such as parking guidance; weather information and the like.

Proposal to introduce ITS as part of the RSTA's 11th plan program, to be started as a priority activity. This will assist transport authority (RSTA) and Traffic Police in traffic management, monitoring speed, tracking the movement of public transport buses, locating accident spots for quick search and rescue operation etc. Use of CCTV and traffic control rooms is used widely these days and the need has already been felt both from road safety as well as law and order point of view.

RSTA will be the lead agency with Traffic Division of the Royal Bhutan Police, Department of Roads and the National Environment Commission as collaborating agencies. Cost is estimated to be Nu 15 million.

Telemedicine - "Reaching the Unreached."

Telemedicine project is envisioned to overcome the remoteness of various Basic Health Units (BHUs) and equip with quality health care services. Following were the specific objectives:

1. To provide specialized consultative opportunities for regional hospitals.
2. To provide specialized services to the people of catchments areas.
3. To enhance equitable and accessible basic health services at an appropriate cost
4. Improve further linkages for higher and broader range of services beyond national boundaries
5. Strengthen human resources capacity for Information Technology

Currently, SAARC telemedicine is inactive and has been discontinued. Rural Telemedicine is active at 14 telesites (10 hospitals and 4 BHU-I) and 2 expert end(National Referral Hospital, Thimphu and Regional Referral Hospital, Mongar). In 11FYP the telemedicine would be integrated into the Health Help Center system and telemedicine sites will be strengthened and expanded to 30 telesites and 3 expert end. Following activities will be carried out to enhance access to ICT enabled health services through telemedicine in the 11FYP:

1. Enhance capacity building of Telemedicine personnel, technologists, technicians and other health workers on telemedicine and HHC
2. Procurement of Telemedicine equipments
3. Recruitment of a National Consultant for 2 months
4. Meetings & workshop for telemedicine and HHC services
5. Develop SOPs, email client templates and web portal for email archives including integration with email client
6. Develop institutional visit with Kolkatta, Vellore and New Delhi to establish Tele-referral link

The program will be implemented by Ministry of Health in collaboration with DITT, MoIC and Telcos for technical and infrastructure support, and all hospitals and BHUs for ownership and adoption. The Telemedicine program will be implemented from 1st July 2013 to 30th June 2018 with a funding source from Royal Government and/or World Health Organization (WHO) at the overall

estimated cost of Nu. 38.162 million (Current: Nu. 2.630 million and Capital: Nu. 35.532 million).

Web based Bhutan Health Management Information System (BHMIS) Systems within Health Sector

BHMIS is a computerized record keeping of routine reporting system. BHMIS collects health related information and data from grass-root level to tertiary level of health facility. The Annual Health Bulletin and Quarterly Morbidity Activity report clearly show a wealth of data captured and generated by BHMIS at the BHU, district and national level, and assist health staff in making informed decisions as regards priority setting, targeting of interventions and modification of programme strategies.

The system was developed with following objectives:

- to bring the system in line with priorities in the health sector,
- to streamline recording and reporting where possible, and
- to take advantage of ICT to make data management and information use more efficient and effective.

In the current BHMIS, information collected from facilities have rarely been fed-back to the center after processing. Within the BHMIS division, there is a deficiency of human resources both in terms of number and capacity to adequately manage, analyze and use health information for evidence based planning and decision making. Similarly, there is a shortage of BHMIS skills and knowledge at the *Dzongkhag* and *Gewog* health facilities to effectively translate data into supporting decision-making. The reporting formats, especially the monthly morbidity indicators, should be modified; today, ANC, immunization, other counseling are grouped together. A systematic analysis of coverage may reveal existing gaps in the service delivery, but the coverage cannot be calculated (in the current system) at the district level due to gaps in vital registration system.

This program will build efficient and reliable web-based Bhutan Health Management & Information System (BHMIS) and its sub-system at all levels, strengthen timeliness, completeness and reliability of health data or information

collection and reporting, and facilitate effective data validation and dissemination. Emphasis will also be put on developing the BHMIS further for management purposes. Linkages with the financial management information system will be strengthened and the capacity for health personnel to utilize the information for analysis and decision-making will be strengthened by training of user groups. Finally, the dissemination of general statistical information and the accessibility to disaggregated data for further analysis will be improved by use of information technology. BHMIS will also be improved by correct grouping of ICD-10 coding, establishing correct denominators, integrating BHMIS with existing programs (TB, Malaria) and incorporating important monitoring indicators, incorporating the training, human resources, and infrastructure details in reporting formats on quarterly and annual basis and revision of the formats as specified in the report.

This system could be better on the mobile platform since it involves collection of data from the field which maybe more accessible with mobile phones.

The program will be implemented by Hospital Information Unit, Ministry of Health in collaboration with ICT unit, Department of Medical Services and DITT, with a funding source from Royal Government and/or World Health Organization (WHO). BHMIS web-based system developments will be either outsourced to local IT application development firm or developed in-house by ICT unit, MoH. The overall cost of the project is estimated at Nu. 4.35 million.

Web based Bhutan Medical Supplies Management System (BMSMS)

Until recently the BMSMS is called by DIGPY, an electronic drug inventory system, which extends down from Drugs Vaccines & Equipment Division (DVED) to hospitals and central district level. The Staff sends data from DIGPY to the DVED and also fill in a 6-monthly reporting form and send to DVED. However, recently the DIGPY system is not always maintained in health facilities and there has been no IT support so that some computers in facilities are not working. There has also been lack of staff training and even many senior staff were not able to export and analyze data for management purpose (e.g ABC analysis, consumption and quantification of need).

In the 11FYP, BMSMS is proposed to be strengthened into web based system which will have the following cycles/functions:

1. tendering process and purchase orders
2. pharmacy stock management system
3. drug inventory system
4. drug supply management and quantification system
5. monitor drug consumption through the system database in order to undertake:

The program will be led by ICU Unit in collaboration with DVED, Department of Medical Services, Ministry of Health with a funding source from Royal Government and/or Donor agencies. The up-gradation of the BMSMS will be either outsourced or hire an IT expert and consultant. User guide for the upgraded system will be developed and printed. Training will be provided to the users, in-charges of health centers and relevant officials of DVED and Medical Supply Depot (MSD).

The overall cost of the project is estimated at Nu. 1.1 million.

Hospital Information System

Automation of Hospitals using Hospital Information System not only enhances the efficiency of working of the Hospital but also optimizes the scarce resources of the Hospital like equipments, man power, medicines etc. The Electronic Medical Records of the citizens helps the country to provide quality healthcare facility to its citizens because Hospital will have all the historical data about the medical history of all the patients.

Therefore, in order to improve the service delivery both with respect to time and quality, Ministry of Health (MoH), with support from DITT/MoIC implemented Hospital Information System which integrated all modules of patient care as well as Hospital Management in 350 bedded Jigme Dorji Wangchuck National Referral Hospital (JDWNRH) on pilot basis. This helped to bridge the time gap in reporting and easy retrieval of the data. This initial step would be expanded to include all regional referral and district hospitals.

Currently HIS is being rolled out in phase wise and its in progress. The HIS in JDWNRH was in per site license costing approximately Nu. 9,750,000. Probably in the 11FYP, the service may extend to include Mongar and Gelephu Hospitals with slightly less expenditure based on number of services and beds, as compared to per site based on JDWNRH.

The centralized HIS setup will be housed in a data centre. The system can thus be used by all the Hospitals in the country in future with optimal cost of operation and maintenance.

Enhancement of Bhutan Civil Registration System

Bhutan Civil Registration System (BCRS) is a comprehensive database of the Bhutanese citizens and has been catering all the related Civil Registration services through this system. During the implementation of BCRS and issuance of new citizenship identity cards during 2004-2008, facial images and thumbprint impressions were captured in the BCRS. However, the verification process during the said period was based on the BCRS system only. Biometric authentication was not possible due to lack of technical capacity and expertise to develop an application within a short period of time. As a result, biometric authentication is being taken up as one of the major activities to further enhance the BCRS and deliver the civil registration service effectively and efficiently.

Another component for the enhancement of BCRS is through the development of a bi-lingual BCRS application, so that local government functionaries could be able to access some of the application being rolled out at the Gewog Administration. This will be taken up as a feasibility study to have a bi-lingual BCRS application and see the possibility of developing it within the 11th Five Year Plan.

Scope of the work:

- A. Development of Automated Fingerprint Information System (AFIS)
- B. Feasibility study on development of bi-lingual BCRS application (English and Dzongkha version BCRS)

The AFIS will be implemented in collaboration with the Department of Immigration and other relevant agencies considering the inter-operability issues raised during the recent round table meeting initiated by DITT, MoIC. As the technical and performance requirements of the AFIS are similar to those of the DoI, the DCRC will embark on the same AFIS initiated by DoI and implement the system accordingly. The tentative budgetary provision for AFIS for the DCRC is Nu. 22m and is planned to commence within the first year of the 11th FYP.

With regard to the development of a bi-lingual BCRS application, a detailed feasibility study will be carried out to explore the possibility of developing a bi-lingual BCRS application in consultation with the Department of Information Technology and

Telecommunication (DITT) and Dzongkhag Development Commission (DDC). By end of 11th FYP, the DCRC should be in a position to produce comprehensive detailed report on the possibility of developing bi-lingual BCRS application and database. Nu. 3m is projected for the feasibility study and is planned to commence only in 2015.

Improve the reach and quality of BBS radio and TV

BBS is undertaking lot of activities in the 11 FYP in order to improve the reach and quality of radio and TV services across the country and abroad. The activities are mainly geared towards improving the existing infrastructure and to establish 3rd TV channel. One of the major initiatives is to strengthen FM and Terrestrial TV services, which will improve quality of radio and TV reception across 20 dzongkhags. Simultaneously, BBS will also implement Digital Terrestrial TV broadcasting in few cities, to start with. It also has plan to strengthen its connectivity of regional bureau with headquarter and establish regional production studio at Kanglung and Gelephu to enable faster dissemination of information(Jul 2013-June 2016).

Additionally, there are lot of infrastructure developmental activities geared towards enhancing overall transmission networks. To incorporate the 3rd BBS channel and to improve its reach abroad, the upgradation of satellite earth station will take place from July 2014 and will complete in July 2015. Apart from this, remote monitoring and control system will be put in place to improve quality of shortwave reception(Dec 2013- Jul 2015).The existing digital archiving system will be enhanced(Jul 2013-June 2014).

The overall cost estimate for the entire program is Nu. 525 million.

3.5 ICT for Bhutanese Information Society

Initiatives/Projects	Yr 1	Yr2	Yr 3	Yr 4	Yr5	Budget	Lead Agency
Education as Foundation							
P1. ICT Masterplan for Education							MoE
P2. DrukREN						Nu. 100m	DITT/ MoIC
P3. ICT Manpower Council							DITT,MoLHR, RUB
Enhance Service Access Channel							
P4. Community Centre& Subsidies						Nu. 237m	DITT/ MoIC
P5. Mobile Services						Nu. 153m	DITT/ MoIC
P6. ICT awareness & Adoption						Nu. 20m	DITT/ MoIC
Promotion of Culture							
P7. National Digital Archive						Nu. 39.7m	MoHCA
P8. Support the Creative Industry						Nu. 543.55m	DoIM/ MoIC
P9. Enabling ICTs in Dzongkha							DDC
Reduce e-Waste							
P10. Implement e-Waste Regulation						Nu. 20m	DITT/ MoIC

ICT is changing the way individuals and societies function. In Bhutan, the Government has prioritized ICT as an important enabler of information-based society that learns to learn. The Government has been mandated to create an informed society bonded by shared national consciousness.

The concept of a Bhutanese Information Society envisages the convergence of ICT and Media and the Arts. An Information Society thrives on the ease and equal availability of information, allowing the people of Bhutan to make informed choices. Knowledge repositories that are built progressively will benefit the society as a whole and for generations to come.

Through the use of ICT, the Government also seeks to capture the rich culture and heritage of the country. Cultural materials and values could be captured in digital form so that they can be easily accessed and used as learning tools. Another aim of an information society is to promulgate ICT into the life of all Bhutanese so that they are exposed to technologies and are comfortable with its usage in their daily life. Goals that are identified to achieve this desired outcome of an Information Society are:

i) A Learning Society

By using ICT as an interactive medium to promote learning, the Government could inculcate the mindset of "learning to learn", with the advantage of learning from any place at any time.

- ii) Equal and Easy Access to Information
ICT provides an equitable platform for access to information. It would allow population from diverse segments (i.e. young or old, able or disabled) to have access to the same information
- iii) A Nation that Embraces the ICT Lifestyle
Bhutanese would embrace ICT as part of their lifestyle, be it the way they work, live or play.
- iv) Preservation and Promotion of Evolving Culture
ICT is an effective tool in preserving the Bhutanese culture and traditions in a digital form. It can also be used as a tool to capture the evolution of culture and traditions and to help promote them.
- v) Enhanced Environmental Consciousness
ICT can help to conserve the environment by reducing carbon footprint (e.g. through reduced travelling and paper usage). It can also be a platform to create environmental awareness and a tool to support disaster management (e.g. pre-warning and post-disaster management).

To achieve the goals, corresponding broad strategies are identified as below.

3.5.1 Education as Foundation

Education is considered as the foundation that imbibes the mindset of “learning to learn”. The importance of ICT has been recognized as an interactive medium to promote learning. Today it is incorporated into the school curricula to enhance ICT skills in teaching and learning process.

To enable develop a comprehensive platform for learning; three key initiatives have been identified.

- i) ICT Masterplan for Education
- ii) Establish DrukREN and connect to TEIN Network
- iii) Establish ICT Manpower Council

ICT Masterplan for Education

To attain its vision of “ *an educated and enlightened society of ‘gyalyong gakid pelzom’ at peace with itself, at peace with the world, built and sustained by the idealism and the creative enterprise of our citizens*”, the Ministry of Education needs to embark on developing the Education ICT Masterplan.

The Master Plan will chart the way forward in extending the learning environment and contribute to the construction of a learning society. With more than 176,647 students studying in 553 schools and 109 Extended Classrooms (ECRs) taught by more than 7,932 teachers, the use of ICT in education has become paramount.

ICT has been taught as an optional subject in all middle and higher secondary schools since 1992. From 2000, MoE started ICT capacity building programs with the participation of more than 200 teachers.

With the launch of the ChiphenRigpel Project in 2010, Bhutan’s level of ICT integration has entered a new phase. ICT classes have been made mandatory from class VII onwards, and compulsory basic ICT literacy training has been initiated for all teachers. To date, more than 2000 teachers have been trained. A pool of master trainers has also been created from among teachers for ICT related capacity building workshops and trainings. Besides the existing IT labs in all Higher Secondary Schools (HSS) and Middle Secondary Schools (MSS) and a few Lower Secondary Schools (LSS), an additional 168 ChiphenRigpel laboratories have been established in 168 secondary schools.

In addition to the ChiphenRigphel project, these ICT projects were set up towards enhancing ICT integrated lessons in the classroom and inspiring education transformation.

- i) Weaving Infotech Resources into Education (WIRED), a two year project completed in 2011 was funded by RGOB and the Singapore International Foundation. The integration of ICT into the teaching learning process was piloted in five schools.
- ii) Provision of 210 “XO Laptops” to 21 schools in Dzongkhags under One Laptop Per Child (OLPC) project, funded by International Telecommunication Union (ITU).
- iii) Provision of 300 Classmate PCs to 15 schools with support from Intel World Ahead Foundation.

While ICT in Education has been identified as a priority for the country, unless there is a focused and clear master plan, Bhutan would not be able to benefit from the full potential of ICT.

The three broad strategies of the Education ICT Masterplan are:

i) Strengthening ICT Integration Into Curriculum, Pedagogy and Assessment

In addition to building relevant ICT skills in teachers and students, ICT would be utilised as a tool for teaching and learning, ultimately enhancing the quality of education.

The strengthened ICT Curriculum would be shared with all the private schools to ensure that all children, regardless of school or location, would get exact same ICT education that will provide students with the uniform skills and knowledge to participate in the diverse and changing job market.

ii) Provide a Practice-Based and Model Approach for Differentiated Professional Development

Recruitment and regularization of ICT instructors to enhance conceptual skills and develop critical thinking in schools.

iii) Enhance ICT Provision in Schools to Implement Education ICT Masterplan

Providing Internet connectivity to all schools, equipping computer labs in schools and bringing down of computers to students ratio by 1:30 for Primary Schools and 1:10 for Secondary Schools, thereby reducing the learning time of children to pick up IT knowledge, skills and Internet browsing skills. The program will also explore from USF that will provide subsidies for Internet access, including connectivity/network infrastructure to support high speed Internet access for schools.

The lead agencies to take up ICT plans and programs would be Department of School Education (DSE), Department of Curriculum, Research and Development (DCRD) and Policy and Planning Division (PPD) and the collaborating agencies would be Department of Information Technology and Telecom under Ministry of Information and Communications (DITT/MoIC) and the Royal Education Council (REC). The overall proposed budget for School IT in the 11th Plan is roughly estimated at Nu. 127.97m for recurrent budget and Nu.780.2m for capital budget.

DrukREN

Preparing Bhutan for an Information society is incomplete if conducive environment for higher learning is not created by the Government. Hence the need to establish the National Education and Research Network (NREN), which is a dedicated high capacity network which will be connected to the global “academic Internet”. All SAARC countries, except Afghanistan and Bhutan, have either already established or is in process of connecting to NREN.

TEIN (Trans Eurasia Information Network) funded by the European Union (EU) connects NRENs in the Asia Pacific. Bhutan would benefit from having its own national research and education network called DrukREN that connects all hospitals and education (university level) and research institutes such as colleges and institutes under the Royal University of Bhutan (RUB), private degree colleges/institutes, Jigme Dorji Wangchuck National Referral Hospital (JDWNRH), Regional and Dzongkhag hospitals, Renewable Natural Resources Research Centre (RNRRC) and Centre for Bhutan Studies (CBS).

With this internal network established, Bhutan would then connect to the global academic Internet, TEIN. Connecting Bhutan to the global research and education networks is very attractive for the country, in terms of resources it is going to make available, in the form of data and information, lectures, research papers and specialists. Research institutes and researches in Bhutan will also be able to participate and collaborate on research activities such as radio-astronomy, distributed (grid) computing, tele-medicine, climatology, crop research etc of national, regional and international relevance.

DrukREN would be established by leasing bandwidth from Internet Service Providers (ISPs). Last mile fiber cables to RUB colleges and institutes (both public and private), and regional hospitals, which will form the core of DrukREN, are being established under the National Broadband Master Plan Project. Further, DrukREN will then be connected to National Knowledge Network (NKN) of India. This connection to NKN will be achieved through the regional network being built under the ongoing South Asia Sub Regional Economic Cooperation (SASEC) Information Highway Project. Initial dialogues with TEIN and NKN have already taken place.

The success of DrukREN dependent on the implementation of National Broadband Master Plan, SASEC regional network and the cooperation and agreement of NKN to connect DrukREN.

DITT, MoIC will be the lead implementing agency in collaboration with Royal University of Bhutan, Ministry of Health and other line agencies. The estimated cost is Nu. 100m and is scheduled to commence in the first year of the 11FYP (2013-2014).

ICT Manpower Council

It is recommended to create the ICT Manpower Council, which will involve key Government entities, the institutes of Higher learning (Universities and Technical Colleges) and the ICT enterprises. The platform will allow Institute of Higher Learnings to develop programmes that will ensure that training, curriculum and course syllabus for students are relevant to industry needs. The platform can also help to organize formal industry internship programmes, and to leverage existing resources for both students and professional training.

These structured engagements with a strategic and academic alignment with MoE, Royal University of Bhutan (RUB) and vocational institutions under MoLHR will allow for more interactions among the key players in manpower development and help in idea sharing and more coordinated ICT activities. It will help develop built strong linkage between the academia and industry to churn out better skilled manpower as required by the ICT Industry. Opportunities must also be created for on-the-job-training in the Government, industry and academia to improve the talent pool.

To support ICT manpower development, the council must explore convergent curriculum and up-gradation of skills to enhance the pool of resources to meet the requirement of the industry. For instance, depending on the need, any professionals could be converted to ICT professionals. This would contribute towards improving Bhutan's value and credibility as a workplace of choice and will attract and retain trained Bhutanese professionals.

The ICT manpower Council will be chaired by MoIC and include relevant ministries and agencies such as Ministry of labour & Human Resources, Ministry of Education, Royal University of Bhutan, and Industry players from both ICT and user sectors. The Council can meet once a quarter, with DITT/MoIC providing the secretariat support or this mandate can be assumed by the Private Sector ICT Advisory Committee under the eGov Governance Structure.

3.5.2 Enhance Service Access Channel

ICT provides an equitable platform for access to information. It would allow all section of society to have access to the same information. Two modes of access channels (Community Centre and Mobile Services) are identified as below.

Community Centres Access & Subsidies

Enable accessibility of information and electronic services anytime, anywhere is instrumental in achieving Information society. Community Centre (CC) in the Gewog has been identified as one potential hub where community can have access to information and government services.

The DITT/MoIC was mandated by the RGoB to establish one CC in every Gewog totalling to 205 CCs in the country. The project was started in mid 2009 and in the first Phase DITT with the financial assistance of Nu. 115m from ChiphenRigphel established 100 CCs (25 co-location). With the financial assistance of Nu.112 m from SAARC Development Fund (SDF) and Nu. 40m from GNHC, DITT has completed establishment of 82 CCs. Three CCs will be completed by end of May 2013. The remaining 20 CCs will be established in 11FYP due to unavailability of funds and absence of electricity in those Gewogs.

The approximate cost of constructing and equipping 20 CC is Nu. 50m.

The CCs are located in very remote areas and not able to sustain the services. Therefore, the Government approved 5 year subsidy to Bhutan Post, who is currently operating and managing the CCs. The subsidy is based on the business model developed by Bhutan Post and DITT/MoIC has been instructed by the Cabinet to keep subsidy in its annual budget. The subsidy is exclusive of recurrent Internet cost.

DITT/MoIC has agreed to bear the recurrent Internet charges for first 5 years. The recurrent cost incurred for the connectivity will be provisioned in DITT's annual budget for payment to Internet Service Providers as and when necessary.

Mobile Services

Bhutan Telecom Ltd and Tashi Infocom Ltd have a combined subscriber base of 560,890 mobile users, i.e, 77.8 of 100 inhabitants as of December 2012. Currently 2G coverage is available widely. 3G is available in main towns. Although the 3G uptake has been tepid due to high prices of devices and data services, the subscriber base has been growing steadily.

Given this high mobile penetration rate and growing demand for data services, portability of mobile phones, lower cost and its accessibility, the mobile platform is an effective medium for the Government to reach their citizens with services and important messages, and gather data and feedback. Various mobile channels such as Short Messaging Services (SMS), Interactive Voice Response (IVR), and mobile web, can be used as alternate medium for service delivery.

An initial assessment study and discussions through the workshops were carried out in November 2011, in collaboration with the International Telecommunications Union (ITU). Four application areas for mobile services were identified - Health, Disaster Management, Agriculture and Finance. With two mobile operators providing access to their SMS gateway and other network resources, the following mobile services were proposed for development:

Health - Android based application for health workers to track mother and baby, for pre-natal and post-natal monitoring.

Disaster - Web interface for sending SMS alerts directly in case of natural disaster and emergency. With this application, the Department of Disaster Management will bypass the current practice of informing telcos for broadcasting, and will have greater control and freedom to create messages and send at time of urgency.

Agriculture – Interactive Voice Response (IVR) system with qualitative information that provides farmers with up-to-date price information of the basic agricultural produce.

Finance - Android based application that provides information on bank and banking services.

A more detailed assessment, to propose an m-government services strategic framework for the 11th FYP, was carried out in 2013 that was supported by the Swiss Development Cooperation (SDC). The study covered the current situation by looking at both the existing and possible demand and supply side of m-services and how it can complement G2C services. It has also captured the legal and technical recommendations, among many other related recommendations.

An important recommendation is the single Multi Service Delivery Gateway (MSDG) proposed as the core infrastructure that can be leveraged by all agencies in the government. In addition to cost savings and coordination, it will enable the availability of public services through mobile devices with minimum

effort for the participating Government Departments and Agencies. Various mobile channels, such as voice, text (e-mail and SMS), General Packet Radio Service (GPRS), Unstructured Supplementary Service Data (USSD), Cell Broadcast (CBC), and Interactive Voice Response System (IVRS), that will ensure that all users are able to access and use the mobile based services, will be incorporated in the MSDG. In the gateway a smart app store for mobile applications related to service delivery will be incorporated. In addition a payment gateway will be integrated within the MSDG that will serve the purpose of allowing users to pay for public services using mobile phones. The projected cost of the MSDG is approximately Nu. 103 m.

In the 11 FYP, DITT will have consultation meetings with the stakeholders including the Mobile Operators to collect requirements for the recommended mobile services from the recent study and to enhance the previous developments. A wide range of participants from the collaborating agencies will be involved in the requirement gathering and throughout the project lifetime to ensure a strong and durable impact of the mobile service applications. The development of mobile services and development of MSDG will be outsourced to either consortia of local or regional IT firms by working through the required tender process.

The project will be led by DITT with funding source from RGoB and/or donor agencies. The funding will cover only the application development cost and the central infrastructure. Ideally the mobile services will need to be deployed on the central infrastructure. Otherwise, in the absence of the MSDG, the respective participating agencies' current infrastructure may be required to be utilized for deployment. In order to ensure its continuity and ongoing updating after the end of the project, the agencies may need to develop a sustainability plan, allow integration with other existing applications and with heterogeneous data sources.

The overall cost of the project is estimated at Nu.50m with additional cost of Nu.103 m for the MSDG.

ICT Awareness and Adoption

The Royal Government of Bhutan (RGoB) is committed to creating an Information Society wherein Bhutanese would embrace ICT as part of their life style. In other words, all sections of the society can leverage ICT to make their lives better and convenient. To enable this, adequate awareness and capacity building program on ICT must be carried out nationwide. The program should be

implemented by educating through outreach programs to spread awareness about the benefits and service delivery points amongst the common masses.

Activities at different levels (national, district and gewog) with different target audience will be carried out, such as;

- ICT conference for Government ICT professionals
- Workshops for non ICT professionals
- ICT fair for private sectors and workshop for private ICT professionals
- ICT awareness programs to general public through TV and radio programs, press release, street theatre etc
- ICT awareness programs for ICT services and technology demonstration at CCs for the rural communities.

Promotion Division under DITT/MoIC will be the lead implementing agency and will work in close collaboration with BICMA, Bhutan Chamber of Commerce and Industries (BCCI), Bhutan ICT and Training Association (BICTTA), Ministry of Economic Affairs (MoEA) and other relevant stakeholders. The detail programs and budget requirement is as depicted below in the ICT Promotions and Adoption Calendar.

ICT Promotion and Adoption Calendar

Sl. No	Target group	Event	Subject/Theme	Budget	Remarks
1	Government -	3 days ICT Conference, Award	Theme	5m	Annual, Q1 (Sep)
	ICT professionals				Developing proper criteria and process
	Government - Non ICT Professional	1 day ICT Workshop	ITU Theme	0.5m	Q4 (May)
		- Update new technologies and ICT achievements			Some activities could be outsourced
- Share information on ICT (security, software, social network etc.)					
2	Private Sector	3 day (max) ICT fair	Theme	1m	Once in two years Q3 (Mar)
		- Showcase new technologies			- Research Div. to research on emerging new technologies
		- Award			- Private Sector and Universities could research on new technologies
		1 day G2B Interaction on relevant emergent technologies	Theme (Scope and opportunities, new technologies)	0.5m	
3	Public	ICT Awareness for Public	- Updating new technologies and ICT achievements	1.5m	All outsourced
		- TV, Radio Program	- Information on ICT (security, software, social network etc.)		
		- Press release		0.5m (Street Theatre)	
		- Street theatre		1m(TV,radio)	

	Communities/	ICT Awareness for Communities			On-going
4	Rural	- ICT Services and Technology demo at CCs		11m	- Collaborate with Dzongkhag ICT, CC operators, DLG for theme (eg. video conference, skype etc.)
					- This is in addition to activities under ICT Awareness for Public
5	Schools	ICT Awareness for Students, and Teachers		0.5m	Annual - Collaborate with MoE for sponsorship and Theme (eg. Mobile apps, animation etc.)
			Total	20m	

3.5.3 Promote Culture

National Digital Archive

The Information Society underpinned promotion of culture, which is another important pillar of Gross National Happiness. Bhutan has long recognized the importance of its cultural heritage, both as a mark of its sovereignty and national treasure. However, to maintain its importance and value, it is necessary to preserve, conserve and promote both tangible and intangible cultural heritages. With imagination being the only limit, through creative use of ICT, Bhutan can enhance preservation and conservation of cultural content and resources in digital format for time immemorial, and find innovative and creative ways to share these content and resources with the Bhutanese citizens and rest of the world.

Ministry of Home and Cultural Affairs (MoHCA) has therefore proposed a “National Digital Archive Program” in the 11FYP. The main objective will be to establish diverse digital content that showcases Bhutan’s cultural and social diversity, and to provide basic digitized output to other projects for value-adding and application (including education, business and academic research) or

international exchange. Under this program, a database of content and resources will be established and also make these content and resources available to Bhutanese using Internet and technology. Content and resources which have educational and economical value and available in public and private sphere will be digitized. The content types will include natural sciences, archaeology, languages, geography, ethnic cultures, history, economy, democratization, art, aesthetics, and life.

In order to achieve the outcome, in the 11FYP, these eight projects are will be implemented.

Project Name	Lead Agencies	Participating Entities	Est' cost (m)
Inventory of five domains of Intangible Cultural Heritage in 8 Dzongkhags	Research and Media Division, National Library of Bhutan (NLB), MOHCA	Dzongkhags and Communities.	3.100
Research & documentation of performing arts (Lozay, Zhungdra, Zhey, Tsangmo and Mask dance)	Royal Academy of Performing Arts (RAPA), MOHCA	Dzongkhags and Communities.	1.100
Inspection, reverification, computerization and photography of cultural properties	Department of Culture	Dratshang, Dzongkhags, Community and RBP.	8.700
Initiate archival survey in 5 Dzongkhags and document collection	Department of Culture	Dzongkhags and Communities.	3.300
Advocacy/sensitization programme on history, religions, tradition and culture	Department of Culture	RAPA, National Library, Textile Musuem, TaDzong, Trongsa, National Museum, DCP, DCH and Driglam Section.	11.500
Conduct of exhibitions and colloquiums on culture, religions, traditions and living expressions	TaDzong (Trongsa), National Museum Paro, Textile Musuem, DCP	Dzongkhags, Community and Dratshang	6.500
Development and installation of information systems and database	RAPA & NLB	DIT and ICT, MoHCA	6.500
Storing and Digitizing National Films (Commercial Feature Films)	BICMA	MPAB	
Digitizing of the Program Contents of the National Broadcaster	BBSC		

Supporting the Creative Industry

In today's information economy, knowledge and creativity fuelled by ICT are fast becoming powerful engines of socio-economic growth and key agent for promotion of cultural and human well being. It is time that Bhutan embarks on a journey of reinvention to harness the multi-dimensional creativity of our people to embark on the path of developing a "Creative Industry" which will contribute to formation of a society which learns to learn- an Information society.

Creative industries refer to a set of core industries or areas of activity constituting the recording industry; music and theatre production; the motion picture industry; book, journal and newspaper publishing; the computer software industry; photography; commercial art; and the radio, television and cable broadcasting industries.

However, to tap the potential of creative industries, there are some major challenges, such as the inadequacy of relevant creative capacity to produce and circulate cultural goods and services in forms that can be readily consumed; weak cultural infrastructure and institutional capability; and lack of access to finance and technology. Therefore, innovative and realistic programs are proposed to overcome the above challenges to create value-added products and content and fuse arts, business and ICT to contribute to Bhutan's competitive advantage.

The Department of Information and Media (DoIM) will be the lead agency in implementing this initiative through its 11FYP outcome "Culture, tradition and contemporary Arts kept alive through media". It will be implemented in close collaboration with creative industries and content producers. The following strategies have been identified to achieve the desired outcome:

i) Promotion of Traditional and Local Bhutanese Content

The first major challenge for creating creative industries is the lack of relevant creative capacity to produce and circulate cultural goods and services in forms that can be readily consumed by consumers within and outside the country.

Therefore, this project will focus towards creating the following opportunities:

- a) Conduct training in creative media, film, animations and contemporary arts in collaboration with Motion Picture Association of Bhutan (MPAB),

Audio Visuals, VAST and others. Nu. 9 m is estimated to carry out this training. It will commence in the first year of the 11FYP.

- b) Organize international and national level workshops, seminars and conferences in collaboration with MPAB, VAST and others. Nu. 7m is projected for this activity. It will commence in the 2nd year of the 11FYP.
 - c) Organize debates, exhibitions, quiz, drama, reality shows, film festivals to promote culture and tradition in collaboration with MPAB, VAST and others. Nu. 4.3m is estimated for carrying out this activity. It will commence in the 2nd year of the 11FYP.
 - d) Produce comic books, documentaries, animations etc in collaboration with private sector. Nu. 2.250 is estimated for this activity. It will commence in the 2nd year of the 11FYP.
 - e) Organize Internships or apprenticeship programs and build effective partnership and network in creative media and films. Nu. 4m is estimated for this activity and it will be implemented in close collaboration with MPAB, Vast and others towards 2nd year of the 11FYP.
 - f) Conduct Training on Traditional Songs and Dances in collaboration with Royal Academy of Performing Arts (RAPA)
- ii) Funds and Incentives

The second major challenge is the weak cultural infrastructure and institutional capability; and lack of access to finance and technology resources. For instance, currently, small and micro creative enterprises do not have access to credit facilities or to loans and investment which would make their business viable, and from which artists and creators would be able to make a living exclusively from their creative or artistic works, like any other professional.

In order to overcome these challenges, the program-Funds and Incentives will be geared towards providing support mechanisms for the creative industries and practitioners through technical assistance and grant scheme in the area of Development, Production, Marketing and Talent. Technical assistance will be provided in the form of information sharing & expertise, instruction, skills training, transmission of working knowledge and consulting services. Nu. 13m

is projected for this activity and is expected to commence from first year of the 11FYP. DoIM will implement this in close collaboration with MPAB, VAST and others.

Further a construction of a 'State of the Art Multipurpose Theatre' is also proposed to showcase and produce content. The theater will also house a "**render farm**" which will be equipped with the state of the art technology and high speed Internet connectivity that will help practitioners to use the infrastructure to produce and transfer animations and special visual effects content. DoIM has estimated Nu. 504m for this initiative and it will be implemented in collaboration with MoHCA, Thimphu Thromdey, MoWHS and MoF.

Enabling ICT in Dzongkha

Language is a powerful medium through which one's culture is transmitted and hence an important contributor to the achievement of Information Society. Bhutan has long recognized the importance of its language, both as a mark of its identity and sovereignty. Dzongkha is the primary working language of government in Bhutan and, with few exceptions, all officials correspondence and communications within the country should be carried out in Dzongkha. Hence, as more and more government work and communications is carried out through means of ICT, it is imperative that support for national language is enabled at heart of all eGov ICT systems.

The Dzongkha Development Commission (DDC) is the lead promoter of dzongkha language in the country and the following two programmes has been identified to enable usage of ICT in promotion of Dzongkha language.

i) Enactment of National Language Act (Policy)

In order to provide required legal backing which will ensure all Government agencies/officials, private employees, as well as the general public to use Dzongkha; a National Language Act should be enacted.

In addition, to enable ICT in Dzongkha, a policy needed to be developed to promote usage of ICT to promote Dzongkha through Localization. In today's age, access to ICT plays a major role in the overall development of the country. To encompass all section of the society into the development process, it is paramount to localize ICTs to make it more accessible to less/non literate population. Using ICT, the challenge of bridging the digital divide caused by the language barrier must be conquer. Localized ICTs make information and communication more accessible to less literate population or the other section of the society who has not been into a formal modern education system.

The policy will be developed in house by DDC and cost is not foreseen. It is crucial that eGovernment system and applications must be designed to be able to support the Dzongkha language.

ii) Dzongkha Language Computing System and Content Creation

Bhutan has long recognized the importance of its cultural heritage, both in its own right and as a mark of its sovereignty and nation status. ICTs provide a

number of tools to enhance the preservation and conservation of this heritage, as well as new ways of sharing this rich culture with the rest of the world.

In this context, to promote the language, it is important to build Dzongkha language support in major computing platforms and devices such as mobile, ipad, Internet, etc. The applications also need to be developed for Dzongkha language computing to support access and generation of local language content to take ICT to the masses, driven by the fact that around 160,000⁴ rural and illiterate citizens have now completed basic literacy and numeracy programmes in Dzongkha.

And increasingly, Dzongkha language content and applications in Digital form like digital dictionary, dzongkha website, mobile applications etc. has to be created and supported for applications to reach a critical mass.

DDC shall upgrade and maintain the standards-based Dzongkha computing system to enable Dzongkha ICT at par with English computing systems. This program will be led by DDC with technical support from DITT. The hired IT expert/ consultant will develop new Dzongkha software and applications as well as impart Dzongkha computing training to all suppliers/vendors and institutes.

The overall cost of the project is estimated at Nu. 26.4m.

Training and Awareness Program on Dzongkha Language Contents and Applications will be conducted.

Overall, this programme will be lead by DDC in collaboration with DITT and DoIM

3.5.4 Reduce e-Waste

Preservation of environment is an important aspect of Information Society upholding the 4th pillar of Gross National Happiness. The development and growth of ICT has improved people's lives in many ways and electronic products have become part and partial of our everyday life. Due to economic growth and technological advances, it is often cheaper and convenient to buy a new electronic product than to upgrade an old one. Thus our growing dependence on electronic products has given rise to a new environmental challenge of e-Waste. e-Waste include: PCs, TVs, telephones, cell

phones, air conditioners, electronic toy, etc. e-Waste often end up in landfills or incinerators and studies have proven that the toxic substances like mercury and lead, which are commonly used in electronic products, contaminate the land, water and air.

Implement e-Waste Regulation

Comprehending the ill effects of e-Waste on public health, environment and socioeconomic development, DITT/MoIC as the organization responsible to combat e-Waste will implement the e-Waste Regulation.

Developing an infrastructure that is able to locally refurbish and recycle used and end-of-life equipment is necessary and Bhutan must start an E-Recycling project in order to reduce e-Waste. However, e-Waste recycling program is very expensive, time consuming, while on the other hand the volume of waste generated is so small that it does not justify setting up a plant.

The project will have two initiatives to help control and prevent the potential damage of e-Waste in Bhutan:

- Export e-Waste through a Government-to-Government collaboration (signing of an MoU).
- Create awareness and educate public through education, training, and awareness programs to handle e-waste.

One of the most important strategies for promotion of e-Waste reduction is to raise public awareness so as to change behaviour and practices towards waste disposal and waste management. Since implementation of sustainable e-Waste practices largely depends upon behavioural factors, two methods can be adopted- “Educational Method and Media Method” to bring about behavioural changes. The Educational Method will focus on systematic capacity building through formal and non-formal educational activities such as workshops, seminars, trainings etc. on e-Waste and e-Waste management. Whereas the Media Method will focus on mass awareness campaigns (road shows, street theatres, drama, paintings, arts etc.) news articles on good practices, developing publicity materials (advertisements, brochures, jingles, etc.) and media products (documentaries, short films, songs, stories, animations, etc.) and disseminate to the general public through print and broadcast.

These activities will emphasis on the provision of appropriate and timely information to decision makers, stakeholders in the public and private sectors, and also to communities and consumers. The activities will include but not limit to the following areas/subjects:

- Reduce, Reuse and Recycle (3R) concept of waste;
- Information on source separation, promotion of waste reduction at source;
- Best practices and success stories on waste minimization and recycling;
- Financial and environmental benefits of 3R

A total of Nu. 20m is estimated for this initiative and the target is to reduce e-waste by more than 10 metric tonnes by end of 11FYP.

3.6 ICT as a Key Enabler for Sustainable Economic Development

Initiatives/Projects	Yr1	Yr2	Yr3	Yr4	Yr5	Budget	Lead Agency
ICT Adoption in Financial Sector							
P1. National e-Payment Gateway							RMA
P2. E-Commerce Framework and Portal						IFC	MoEA, BICTTA
ICT Adoption in Tourism Sector							
P3. Hotel Monitoring System							TCB
P4. Natl. Recreational Visit Permit Processing Sys							TCB
P5. Enhanced Tourism Web Portal						0.69	TCB
ICT Industry Development							
P6. Incentives and Grants							MoF, MoIC, MoEA
P7. Strengthen the Bhutan ICT and Training Association							MoIC, DHI, BICTTA
P8. Develop Bhutan Tech Village						Nu. 250m	MoIC, MoLHR, RUB
P9. ICT Manpower Development							MoLHR
National ICT Infrastructure and Services							
P10. Intl Telecom Gateway via Bangladesh.						Nu. 20m	ISP/Telecos
P11. Emergency Communication Network						Nu. 30m	DDM/BBSCl
P12. BBS Terrestrial Network						Nu. 525m	BBSCl

Bhutan has an English-speaking local population that is literate and has a willing-to-work mindset. Bhutan's government and businesses are investing in e-Government and are expected to do so in the foreseeable future as ICT becomes a key enabler for economic growth, social development and national competitiveness.

ICT industry development efforts will go towards raising the industry-relevant competency level of the ICT professionals to take on higher value-add work in the ICT sector; and creating more opportunities for ICT enterprises in Bhutan, with more jobs and increasing revenue. These goals will be achieved through the execution of the "3Gs", strategies for ICT industry development with the support of four principles.

Strategies for ICT Industry Development

1. **Grow** Bhutanese capabilities based on selected niche technologies and business drivers;
2. **Groom** Bhutanese ICT manpower and enterprises by leveraging industry partnerships; and

3. **Generate** demand and accelerate adoption of ICT.

Principles for ICT Industry Development

1. Establish a definite role for ICT industry development
2. Take a focused approach and identify niche areas
3. Leverage partnerships when developing capabilities
4. Boost the domestic demand for ICT

In the 11FYP, MoIC will drive the implementation of programmes under these key areas for ICT Industry Development:

- i) ICT Manpower Development

ICT talent attraction and development is strategic to the growth of the ICT industry and ICT adoption in key sectors. This will be done through Talent Seeding, Talent Attraction and Development, and Talent Upgrading.

- ii) ICT Eco-System Development

Programmes focusing on enhancing the ICT enterprises and eco-system are the cornerstones for industry development activities. ICT eco-system development will be done through Industry Collaborations, Technology Development and Enterprise Development. These translate into opportunities for pro-active measures by MOIC to enhance industry capabilities.

- iii) Demand Generation

While the industry development strategies will focus on enhancing ICT enterprises and manpower, it is also important to stimulate demand for ICT products and services and encourage greater adoption of ICT by the general populace, users sectors and Government. Without demand for ICT, all the investments in development and growing the supply side will come to naught. Demand for ICT is thus important for ICT sector growth and will influence the amount of foreign and local investments in the ICT sector. Demand-side programmes, typically, are driven by the objectives of the user sectors, such as enhancing the competitiveness of the user sectors and improving Government efficiency. Demand generation will be from Aggregated Government Demand in ICT, Themed Demand through National Flagship Projects and Private Sector Demand.

iv) Stakeholder Engagement

As a whole, for the ICT industry, the engagement platform will through the BICTTA, which will be used for dialogue between MOIC and the ICT industry, allowing ICT enterprises an opportunity to discuss and provide feedback. Plans for the industry can be shared and inputs sought. The engagement platform can also provide a way for more organised collaborations within the industry.

(Strengthening BICTTA)

v) Grants and Incentives

MOIC will develop an incentive (grants) mechanism to encourage take-up and support capacity building. The incentives will be in the following areas:

- Manpower Development: Take up of Specialised ICT Training
- Technology Development: Take up of projects or development of innovative solutions and services in the targeted technology areas
- Industry Collaborations: Partnership managers and collaboration programmes, e.g. training academies, competency centres, partnership projects.

vi) Thimphu Tech Park

It is important to raise the vibrancy and buzz of the ICT industry, and the objective is to make the ICT industry more exciting and rewarding; in turn, attracting more professionals to be part of the ICT industry. Existing platforms, such as the IT Park can be leveraged more effectively to raise the profile of local ICT efforts, celebrate successes and encourage innovation. More can also be done to share industry activities (such as public and private sector projects) and achievements with the public at large, such as through a regular industry publication online.

MOIC will develop an IT Park campaign to raise the profile of the ICT industry. The campaign will serve to promote ICT events e.g. office openings and product launches, exhibitions and seminars; and award ceremonies, and government initiatives e.g. co-location of data centres at the Government Data Centre at the park.

vii) National ICT Infrastructure and Services

One key area, which requires significant attention, is the availability, quality and affordability of Internet broadband infrastructure. There has been increasing demand for broadband connectivity over the few years, and this trend will only continue into the future. To enable ICT applications and services that are highly integrated into everyday life – used pervasively for work, study, play and entertainment, there need for a high-speed broadband connectivity anytime, anywhere. Such a broadband is no longer a luxury, but a source of national competitive advantage.

Many countries have recognised that broadband is a strategic infrastructure enabler for knowledge-based economies and have invested in upgrading their broadband infrastructure.

This segment highlights key programmes for ICT Industry Development.

3.6.1 ICT Adoption in Financial Sector

Private sector is designated as the “engine of growth” and ICT can be the enabler to simplify, expedite and reduce the cost of doing business in Bhutan. Ease of doing business has always been a key driver for economic development and enabling the ease of doing business is one of the key factors for private sector development.

As an implementation strategy, develop and implement ICT adoption in key sectors that drives the economy of the country and creates the enabling environment for the private sector growth.

In order to enable growth of the private sector in the country it is critical to have a very strong financial sector. The aim of this project is to achieve greater efficiency in the financial sector through ICT adoption, thereby leading to better access to financial services.

For the last five years, RMA has improved access to financial services using ICT. They have implemented inter-bank electronic fund transfer and clearing system and also automated the stock exchange system of Royal Securities Exchange of Bhutan.

In the 11FYP, to facilitate commercial transaction online, RMA with the support of MoF will implement:

National e-Payment Gateway

The National e-Payment Gateway will provide an operational component of the e-governance infrastructure and full e-commerce facilities that allow secure online payments.

Enabling the gateway will increase the adoption of e-Services along with electronic payments, particularly Internet-enabled payments which are easy and efficient. The presence of such a robust and secure e-Payment Gateway enables e-government shared services to be paid for electronically using major local and international credit & debit cards, and in future, other electronic payment instruments beside business and private transactions. In this phase, an e-Payment gateway will be established by RMA in collaboration with MoF and other relevant stakeholders. The gateway will have two categories of online payments, namely Online Purchases – these include online purchases from e-Commerce; and Online Bill Payment – these include

payment transactions from G2C and G2B e-Services. Detail description of the Functions of the National e-Payment Gateway is in **Annex D**.

E-Commerce Framework and Portal

The Ministry of Economic Affairs (MoEA) will develop a strategy including a framework if necessary in consultation with the business community, BICTTA and DITT/MoIC. The strategy should look at existing financial rules/regulations and determine if they are prohibitive to e-commerce and suggest solutions to encourage the take up of e-commerce in the country. The strategy/framework will put in place the laws and regulations to govern and facilitate e-Commerce.

To ensure sustainability, BICTTA will be appointed to drive the development and operation of the e-Commerce Portal. The Agency of Promotion of Indigenous Crafts under MoEA will be the anchor tenant on the portal to promote **Zorig Chusum** and generate employment for Bhutanese artisans. The portal will also support the online businesses of Bhutanese entrepreneurs.

3.6.2 ICT Adoption in Tourism Sector

Tourism is the largest income generating sector, besides hydro power in Bhutan. Bhutan's deep rooted culture and tradition, and exotic natural habitats and sceneries attract tourists from all over the world.

In this era of information society, Bhutan has great potential to leverage on ICT to further enhance its tourism industry. With the emerging trend of using Internet around the world, there exists enormous opportunities for processing and distributing right information, not only to leisure travellers but also to the business groups. To this end, use of ICT has become a key enabler for the growth of tourism industry.

ICT Adoption in Tourism sector aims to use ICT to harness greater benefits and efficient growth of this sector. TCB has a tourism website which provides useful information but there is no option for interaction on the website.

The Tourism Council of Bhutan (TCB) owns Tashel Online Visa System used by tour operators to apply for tourist visa on behalf of their clients. Through the system the visa is processed, approved and also can generate tour invoice.

Tax Exemption System is implemented with Department of Revenue and Customs (DRC). This system is used by hoteliers, tour operator and TCB to process for tax exemption when they import goods/ products from outside Bhutan. Hoteliers and tour operator process for exemption online and TCB provides recommendations and is then submitted to DRC. All the processes involved are online except the final certificate issued by DRC is manual.

In the 11FYP, TCB will lead the development of the following systems. However, to a large extent the systems to be developed will be driven by the ICT Masterplan for Toursim which will be developed by end of 2013.

i) Hotel Monitoring System (HMS)

This system will be owned by TCB. Objective of this system is to monitor the proper and optimal usage of the designated hotels.HMS will be accessible to tour operator, hotel operator and TCB with different level of access.

ii) National Recreational Visit Permit Processing System

This system will be developed in collaboration with the Ministry of Agriculture and Forest. Objective of this system is to ease processing of visit permit to national recreational areas. This is will be integrated with the Tashel system. Tour operators will be the user of this system.

iii) Enhanced Tourism Web Portal

The existing tourism website provides a lot of important information but lack interactive aspect of the website. The existing website can be enhanced to a web portal with interactive features. All the isolated systems that TCB has developed and plan to developed can also be integrated to this portal. This portal will then be a one window for tourist, travel agents, tour operators, hoteliers and others. Nu. 0.675mis available and is targeted for completion by Feb 2013

Suggestions:virtual tour of Bhutan,API(Application Programming Interface) for hotel reservation.

3.6.3 ICT Industry Development

MoIC with relevant collaborating agencies has been trying to develop the ICT industry in Bhutan. Bhutan has edge over other countries in providing low cost, green hydro power which is a critical factor for the industry. Mobile coverage within the country has been remarkable and has a very stable government with a very strong green branding for Bhutan.

Yet the current telecom cost situation has not been favourable for the development beside the scalability in terms of manpower and market. However, in order to overcome the challenges and to develop the ICT industry, Bhutan needs to identify a niche area for the industry and government has to provide initial support for the industry.

Incentives and Grants

RGoB has created enabling environment for the industry to grow. Enabling environment includes fiscal incentives⁵ and non fiscal incentives like providing land on lease for 90 years, providing ancillary facilities beside other financial support to the Bhutan's first IT Park , Thimphu TechPark and to the IT industry.

However telecom cost has always been an issue beside the local market and the scalability of the manpower.

As a short term measure, the investors locating in the Thimphu TechPark is provided with a telecom subsidy and the manpower has been trained. Initiatives has been undertaken to promote entrepreneurship in the country

In order to sustain the industry, initial support for the development of the industry is crucial.

Recommendations:

1. Scrutinize the requirement of incentives(MoF).
2. Subsidise telecom cost
3. Quality check of Internet services.

⁵ Foreign Direct Investment (FDI) Policy, 2010 and Economic Development Policy, 2010

Strengthen the Bhutan ICT and Training Association (BICTTA)

For the ICT industry to grow, it is important to have a strong ICT association who could lead and guide the development of the ICT industry.

At present, Bhutan ICT and Training Association is in existence but with a very limited presence. To strengthen the BICTTA, build capability through collaboration and exchange programs with similar association around the region like NASSCOM in India, SITF in Singapore. This collaboration could also understand the structure of BICTTA and if necessary restructure the BICTTA with a very strong mandate and terms of reference. BICTTA also needs to be a registered body.

BICTTA presence will also be made very prominent through collaborating in organizing national ICT event with the aim to expand the events to international level. Initial support to BICTTA will also be provided to analyse/publish ICT trends and reports annually which will be fed into the planning for the ICT industry in future. The aim of this project will be to create a self sustaining strong Bhutan ICT and Training Association.

The success of this project will depend on the level of engagement from DHI, MoIC and BICTTA who will be leading this project.

Develop Bhutan TechVillage

The RGoB will develop BTV in Babesa which will include the current Thimphu TechPark campus developed in the 5 acres and expansion into the additional 13-acres serviced land.

The proposed plan in the 13-acre site is to build the ecosystem with the expansion of the TTP complex, build an independent commercial Data Centre infrastructure and an ITES/BPO company campus, for implementation.

Based on the success of the current project, it is recommended that PPP model be deployed/replicated for implementation of the next phase of the BTV project but with equivalent or more stake from local than an FDI company. In terms of the institutional ecosystem requirements for the BTV project, active involvement of relevant stakeholders like MoLHR, RUB, private sector and corporations will be crucial and must be ensured by the Government.

While the first PPP IT Park Project is intended to convince the Bhutanese and the world at large about Bhutan's comparative advantages and catapult it to the next level of growth in the ICT sector, the journey towards this must be carefully calibrated and conditions nurtured. Also the current project is the facilitator for a more ambitious design of RGOB to attract steady and reliable investments into Bhutan. In order to achieve this, an additional 13 acres government land adjacent to the current 5-acre project site has been approved by RGOB for up-scaling the development and promotion of the IT/ITES/BPO industry. Leveraging on the investment promotion activities and roadshows undertaken so far, building up and sustaining the interests of globally reputed companies to invest in Bhutan will be part of the overall strategy for the Bhutan TechVillage (BTV).

Presently, DITT/MoIC and MoLHR have worked towards creating a talent pool for the Bhutan's first IT Park. Approximately 1030 trained talent pool has been created. In the next phase i.e development of BTV, will have the capacity to recruit more than 3,000 Bhutanese in IT/ITES sector.

Therefore through this project, talent pool for the industry will be created with the following activities: introduction and implementation of an assessment of competency test that would entail assessing candidates on key IT/ITES skills through standard assessment thus making easier for firms to screen candidates and also provide training needs analysis to candidates and conducting Just-in-Time (JIT) training for potential candidates for employment with identified investors

BTV project will also aim to promote innovation and entrepreneurship in the country and provide gainful employment to the growing youth population, promote inclusive growth and lay a stronger foundation for the Bhutanese economy.

At present, Incubation centre which is part of the Bhutan Innovation and Technology Centre (BITC), mandated to support and grow entrepreneurship ecosystem in the country is housed in the Thimphu TechPark. Through this project, seed fund support for the incubation centre will be provisioned. Since BITC will have the required expertise and hence RGoB will provide seed fund as a support for growth of innovation and entrepreneurship.

This project will also strongly link up the colleges of Bhutan to the Incubation centre so that the young innovators have the path already laid down. Provision will also be

made to promote and support ICT innovators so that we have a pool of innovators who will have the potential to go global.

Therefore this project will promote the development of knowledge-based enterprises in Bhutan.

The estimated budget is Nu,250 m and will be implemented within the 11th FYP

ICT Manpower

Human Resource continues to play a key role. Current status indicates that the IT manpower do not have a deep technical skills and is more appropriate for low end basic ICT jobs.

Though there are more than 200 ICT professionals with basic skills in the market but there is very less demand in the market. Therefore an ICT manpower and demand creation has to be developed simultaneously.

Bhutan also needs to identify niche area that has the potential to grow and develop the industry. Current analysis indicates that Media and Entertainment industry is growing strongly in Bhutan and Bhutanese have the required creativity skills.

Therefore opportunities for demand creations can be envisioned more towards graphics and animation due to creativity skills requirement, mobile services due to high penetration and good connectivity beside opportunities in the IT Park and bringing in global ICT investors.

Opportunities will also be created with policy intervention that MoLHR has been implementing. It is also important to have a strong linkage between the academia and industry to churn out better skilled manpower for the industry. Also provide more opportunities for on the job training between the Government, industry and academia.

With the demand creation, convergent curriculum will also be considered wherein any professionals can be converted to IT professionals.

This initiative ties in with the initiative to develop and implement the Bhutan Institute . Details can be found under Outcome: ICT for a Bhutanese Information Society.

3.6.4 National ICT Infrastructure and Services

Bhutan strives to achieve sustainable socio economic development through many ways, one of which is to promote growth of IT and IT enabled sector for revenue and employment generation. Reliable ICT infrastructures including telecom redundancy with risk management arrangement are paramount to attracting ICT investment and taking the sector forward.

International Telecom Gateway via Bangladesh

Bhutan has two international gateways today; one from Phuntsholing and the other from Gelephu. However, all the fiber cables providing these connections pass through a narrow strip of land, the so called “chicken neck” (single point of failure), in Siliguri. This poses a risk to Bhutan’s international connectivity being affected by incidents (natural calamities etc) in Siliguri.

As a consequence, additional redundancy avoiding the “chicken neck” is desired for the overall reliability and full redundancy of Bhutan’s international connectivity. In addition the requirement is vital for Bhutan’s aspiration to engage in IT and ITES opportunities which the Government has already identified and embraced as an important sector for revenue and employment generation. The 2nd international gateway will benefit Bhutan in terms of attracting foreign investments in the sector and in particular to the ITPark. In the long run, it will enhance and promote Bhutan as IT/ITES business hub, which in turn will contribute to the country’s socio-economic growth.

Therefore, an alternate international connectivity through Bangladesh, which has international submarine cable landing, is proposed. The connection will be either from Gelephu or Samdrup Jongkhar on the Bhutanese side through Tripura in India, to finally Cox Bazaar in Bangladesh.

The establishment of this gateway will be carried out by the Telcos and Internet Service Providers (ISPs). DITT/MoIC will facilitate in terms of securing administrative approvals of the Government of India and the Government of Bangladesh. DITT/MoIC will also facilitate to establish missing fiber links at the border crossings, and in other ways to realize this objective. The overall cost estimate is Nu. 20 m and the work will be carried out from July 2013 and expected to be completed by July 2014.

Emergency Communication Network

With the increasing number of natural disaster cases arising from global climatic changes, Bhutan is also in a vulnerable situation. Communicating with affected communities becomes particularly difficult and virtually impossible during such calamities due to lack of good communications system in place.

Therefore, the establishment of a country-wide Emergency Communication Network is highly crucial. The goal is “To develop capacities for communication with sufficient redundancy to meet the connectivity needs during a disaster and to build an adequate transportation network for speedier disaster response”.

Department of Disaster Management (DDM) in close collaboration with Bhutan Telecom or TICL, shall design and implement a new communication network to overcome these challenges.

Also, National Emergency Operations Centre (NEOC) will be setup in Thimphu to maintain continuous disaster surveillance, tracking and ensure real-time warning dissemination to the Dzongkhags, Dungkhags, Gewogs and Thromdes likely to be impacted by an impending disaster. At the district level, Dzongkhag Emergency Operations Centre will be setup. It will maintain continuous contact with the NEOC and disseminate information to respective areas in case of emergency.

The overall budget estimate for this project is Nu. 30 m. The work will start from July 2013 until June 2018.

BBS Terrestrial Network

BBS is undertaking lot of activities in the 11 FYP in order to improve the reach and quality of radio and TV services across the country and abroad. The activities will mainly improve the existing infrastructure and establish TV channel. One of the major initiatives is to strengthen FM and Terrestrial TV services, which will improve quality of radio and TV reception across 20 Dzongkhags (2013 - 2018). Simultaneously, BBS will also implement Digital Terrestrial TV broadcasting in few cities. It also has plan to strengthen its regional bureau connectivity with headquarter and establish regional production studio at Kanglung and Gelephu to enable faster dissemination of information. Additionally, there are lot of infrastructure developmental activities geared towards enhancing overall transmission networks. To incorporate the 2nd BBS radio channel and to improve its reach abroad, the up

gradation of satellite earth station will take place from July 2014 and will be completed in July 2015. Apart from this, remote monitoring and control system will be put in place to improve quality of shortwave reception. The existing digital archiving system will be enhanced. The overall cost estimate for the entire program is Nu. 525m.

3.7 e-Government Governance Structure

One of the critical success factors to the successful implementation of any e-Government Masterplan is in having an effective governance structure. Such a governance structure will have a strong oversight of ICT spending, shared systems, cross-agency initiatives across the whole of government and an institutionalised monitoring and control of ongoing projects.

The following guiding principles were used in the design of the e-Government governance structure for Bhutan.

Principle 1

To ensure clear visibility and accountability at all levels of the governance structure to derive synergies in driving ICT initiatives.

Principle 2

To expand the terms of reference, establish the frequency of meetings of each committee.

Principle 3

To establish necessary forums and set clear roles and responsibilities and submission guidelines.

Principle 4

To identify and involve the right parties - Government ministries in the governance structure and to provide platforms for these decision makers to discuss and make decisions to drive ICT initiatives that ultimately bring benefits to the Government as a whole.

3.7.1 Cabinet Terms of Reference

Roles and Responsibilities

- Provide overall strategic guidance in line with the national goals.
- Approve the e-Gov Masterplan
- Champion e-Gov initiatives within and outside the country.
- Resolve high level issues.
- Review and approve policies referred to by the e-Gov Council.

3.7.2 e-Government Council Terms of Reference

Roles and Responsibilities

- Resolves issues for effective implementation of e-Government initiatives
- Accountable to the Cabinet for the successful implementation of the e-Gov Masterplan.
- Approve new and changes to ICT policies and where necessary refer policies to the Cabinet for decision.
- Resolve issues for effective implementation of e-Gov initiatives and escalate the unresolved issues to the Cabinet for their decision.
- Drive organisational transformation for the Government as a whole through harnessing full potential of e-Government
- Monitor the progress of e-Gov programmes and initiatives.

Chairperson

Secretary, Cabinet Secretariat

Coordination and Support

e-Government Programme Management Office (PMO), DITT/MoIC

Members

Secretaries of Ministries (10), Heads of Autonomous Agencies: GNHC, NLCS, NEC, ACC & RAA.

Frequency of Meeting

Quarterly

3.7.3 e-Government Executive Committee Terms of Reference

Roles and Responsibilities

- Conceptualize and ensure successful implementation of the e-Gov Masterplan.
- Endorse new or changes to ICT policies for approval by the e-Gov Council.
- Approve new or changes to ICT standards for the effective implementation of e-Gov Masterplan. (Note: If the change in the ICT standards affects the existing policies/regulations, then the changes to the affected policies/regulations must be first approved by the relevant authorities).
- Manage the progress of e-Gov programmes and initiatives.
- Resolve issues relating to e-Gov and refer unresolved issues to the e-Gov Council.
- Provide guidance for effective and cost-efficient ICT deployment in the Government
- Review and endorse all ministries' ICT development project proposals referred to by the e-Gov Review Committee.
- Review and approve all Ministries Five Year ICT Projects referred to by the e-Gov Review Committee
- Evaluate and approve agencies' exception requests for non-compliance with established service-wide ICT policies and standards (including security standards).

Chairperson and Vice-Chairperson

Secretary MoIC and Director DITT/MoIC

Coordination and Support

e-Government PMO, DITT/MoIC

Members

1. Directors from DNB, RCSC, GNHC (3)
2. Chief Planning Officer, PPD, MoIC
3. Selected ICT Initiative Owners (up to 10)*

4. Division Chiefs, DITT/MoIC (4)

Note

The e-Government PMO will review the composition of the e-Government Executive Committee on an annual basis. The e-Government PMO will invite ICT Initiative Owners (Business or ICT Heads) from ministries and agencies to be members of the committee based on the commencement and completion year of the respective initiatives.

The Division Chiefs from DITT/MoIC would include those from the Applications, Infrastructure and Telecom Division or ICT Management Division).

Frequency of Meeting

Once in two months initially, quarterly in steady state

3.7.4 e-Government Review Committee Terms of Reference

Roles and Responsibilities

- Review and endorse ICT policies and changes.
- Review and endorse the government-wide ICT standards.
- Review and recommend the adoption of ICT best practices.
- Review and endorse all Ministries' ICT project proposals and where necessary refer to the e-Gov Executive committee.
- Review and endorse all Ministries Five Year ICT Projects at the beginning of the FYP discussion.
- Review and endorse all ministries' ICT tender specifications and tender evaluation reports for projects.
- Oversee and monitor the progress of ICT Projects implementation

Chairperson

Director DITT/MoIC

Coordination and Support

e-Government PMO, DITT/MoIC

Members

1. PMCD Chief, GNHC
2. Rep from DNB, MoF
3. Applications & Infrastructure Division Chiefs, DITT/MoIC
4. e-GIF Team, DITT/MoIC* (2)
5. Selected Chief ICT Officers* (up to 6)
6. Rep from PPD, MoIC

Note

System owners are responsible and accountable for their own projects.

The e-Government PMO will review the composition of the e-Government Review Committee prior to each meeting. The e-Government PMO will roster two e-GIF team members and five Chief ICT Officers from ministries and agencies on a rotational basis.

Frequency of Meeting

Monthly

3.7.5 Private Sector ICT Advisory Panel Terms of Reference

Roles and Responsibilities

- To solicit feedback and discuss draft versions of ICT policies and other Public Sector infocomm-related operational and implementation matters
- To solicit feedback and advice on areas where e-Government can be improved for socio-economic development.
- To establish industry linkages between the academia and the industry to better churn out skilled manpower required by the industry.

Chairperson

Director DITT/MoIC

Coordination and Support

E-Government PMO, DITT/MoIC

Members

Senior executive representatives from the MoLHR, BCCI/BICTTA, Private Sector, NGOs and Academia (10)

Frequency of Meeting

Half-Yearly

3.7.6 Programme Management Office (PMO)

Effective governance is critical to the achievement of the ICT vision and prudent management of investments in the area of ICT. The e-Gov Programme Management Office (PMO) is a key agent to drive effective governance.

The e-Gov PMO will be set up under DITT, MoIC and the office will report directly to Director, DITT. The Office will ensure smooth coordination of the committee meetings and manage effective implementation of ICT initiatives across all government agencies.

The Office will be staffed by officer from DITT with full time commitment.

Roles and Responsibilities

- i) Facilitate establishment of the e-Gov Council, the e-Gov Executive Committee, Private Sector ICT Advisory Panel, e-Gov Review Committee and any other committees when necessary.
- ii) Manage effective implementation of eGov Masterplan and other key ICT initiatives across all government agencies.
 - Workplan
 - Compile the yearly ICT workplan of all ministries and agencies for prioritization in close coordination with respective divisions under DITT.
 - Highlight to management on discrepancies of the annual workplan with the Masterplan.
 - Monitor the progress of implementation
 - Identify project issues/challenges and escalate to higher committees for necessary intervention together with PFU member of GNHC.
 - To consolidate ICT projects for submission to the e-Gov Review Committee

- To oversee and track progress of ICT projects in the Masterplan, submit progress report to the next higher level committee where applicable
 - Interface with other Divisions:
 - Application Division (e-GIF): Compile issues and recommendations submitted by the e-GIF group. The agency representative should present the issues & recommendation to the e-Gov Review Committee.
 - ICT Management Division: Compile issues & recommendations submitted by the ICT Mgmt. Division. The concerned ICT officers from agencies should present the issues to the e-Gov Review Committee and other higher committees.
- iii) Provide secretariat support to the various e-Gov committees established under the e-Gov governance structure.
- For the e-Gov Council Committee, coordinate with the secretariat of the Committee of Secretary (CoS). Request could be made from MoIC Secretary to CoS, to extend invitation to Secretary of GNHC, NLCS and NEC.
 - Depending on issues and approval of ICT projects, invite concerned Chief ICT officers for the e-Gov Review Committee
 - Prepare calendar of committee meetings and inform committee members much in advance. Ensure that Committees meet as scheduled and that the intended objective is fulfilled.
 - Keep meeting minutes and take up key decision/issues to higher committees for approval/resolve
 - As and when required by the e-Gov Council, coordinate with the Cabinet Secretariat for discussion/approval of higher issues in the Cabinet meeting
- iv) Communication and campaign support
- Plan to inform all stakeholders (sponsors/donors, partners/suppliers of ICT product and services, beneficiaries, International e-Gov benchmarking bodies) of information related to the e-Gov Masterplan i.e the rationale, benefits, impact, approach and timeline, in close collaboration with the Promotion Division, DITT.
 - Provide promotional contents to the Promotion Division to develop marketing materials.
 - Compile and share information with other agencies related to e-Gov Masterplan.

- Establish e-Gov PMO page within the DITT website for information sharing and announcements.

4. IMPLEMENTATION ROADMAP

The ICT initiatives and projects described in **Sections 3.4, 3.5 and 3.6** will be delivered over a period of 5 years from 2013 to 2017. The e-Government Implementation Roadmap presents these ICT initiatives and projects by desired outcomes against a 5-year timeline (see **Annex F**). Details reflected include the Initiative and Project Names, Target Development / Review / Completion Timeframe and Estimated Implementation Cost.

5. NEXT STEPS

This masterplan presents ICT initiatives and projects that have been validated through stakeholder engagements comprising bilateral meetings, and roundtable feedback and review sessions. It is aligned to the GNH principles, and leverages the best practices gleaned from the Singapore e-Government experience.

The Committee of Secretaries and Cabinet has endorsed the Masterplan as well as the eGov Governance Structure. It is now important to quickly put in place the e-Government Governance Structure before the start of the 11FYP. The communication plan also needs to be developed.

5.1 Formalise the ICT Governance

Effective governance is critical to the achievement of the ICT vision and prudent management of investments in the area of ICT. However, there is currently no formalised e-Government Governance for RGoB.

e-Government Governance needs to be put in place before implementation of the masterplan. This will entail the following:

- a) The set up of the e-Government Programme Management Office to support the e-Government Governance Committees in driving the implementation of the e-Government Masterplan including the management of approved ICT initiatives and projects, and allocated ICT budget;
- b) The establishment of the e-Government Council, the e-Government Executive Committee, the Public Sector ICT Advisory Panel, and the e-Government Review Committee;
- c) The confirmation of ICT initiatives and projects, and the allocation of funds for them; and
- d) The set up of ICT Divisions/Departments in ministries and agencies.

Details on e-Government Governance is in **Section 3.7**

5.2 Develop the Communications Plan

There is a need for a communications plan to inform all stakeholders of information related to the e-Government Masterplan i.e. the rationale, benefits, impact, approach and timeline. Communications has to be targeted to these different groups:

- a) Sponsors of financial assistance and/or required resources;
- b) Partners including lead and participating agencies, and suppliers of ICT products and services who will collaborate to deliver the ICT initiatives and projects;
- c) Benefitiaries in the people, business and government sectors who will gain from the implementation of the e-Government Masterplan; and
- d) International e-Government benchmarking bodies that rate e-Government maturity.

The communications plan details the delivery and execution of a communications calendar (see the ICT Promotion and Adoption Calendar in **Section 3.5.2**), and the development of necessary communication kits. The communications plan should instil a high level of awareness of the e-Governance Masterplan within Bhutan and internationally. Marketing and awareness campaigns should target all stakeholder groups – people, businesses and the Government, and feature engagement events, promotions and awards prominently. In the initial roll-out period of the Plan, when

there is a need to ramp up the adoption of e-Government, the TV and even the radio should be considered as an important media for mass ICT education and reach for e-Government. The use of this communications media should then be slowly reduced to an optimal mix between TV, radio and Internet. The aim is to portray the e-Government as one that is progressive, collaborative and engaging.

Key contributors to e-Government should also be given the opportunity to participate in the international network of e-Governments both to share and learn from best practices. Such engagements provides for exposure that is necessary for the development of e-Government practitioners.

The progress of the communication plan should be tabled at the e-Government Council and the e-Government Executive committee.

6. CONCLUSION

The e-Government Masterplan is the first ICT masterplan for Bhutan. It builds on existing ICT policies and strategies, and complements the 11FYP by providing a holistic view of RGOB's vision, desired outcomes and initiatives as an e-Government. The masterplan covers whole-of-government ICT initiatives that serve the Government, People and Businesses.

For successful implementation of the masterplan to meet the desired outcomes and to achieve the ICT vision, the recommended governance structure and processes must be in place. Strong governance ensures timely mitigation to manage changing priorities and needs of the country.

More importantly, there is a need for a mindset change to transition to a new knowledge-based economy. The people, businesses and the RGoB must be prepared to do things differently and adapt to new ways of and receiving and delivering public services.

ANNEX A

Telecom and Broadband Policy Strategic Action Plan

Item	Goal	Description and target	Responsible	Completion
1	Competition and Investment: Establish a light touch regulatory framework to promote competition in the market	1.1 Examine ways in which availability and affordability of broadband can be enhanced through the removal of any unnecessary regulatory constraints and financial imposts, together with re-design of schemes to encourage investment in broadband delivery. Specifically, and without limiting the generality of this item, examine the prospect of creative removal of regulatory burdens and administration from operators including the detailed approval of retail tariffs for all broadband service options.	Ministry , in conjunction with Authority and other stakeholders	By end of Q4, 2014
		1.2 Facilitate Local Loop unbundling	Ministry in conjunction with Authority	Q4 2015
		1.3 Review existing regulations pertaining to competition	Authority	Q3 2015
		1.4 Establish a system for faster approval of Right of Way	Ministry in conjunction with Authority and relevant stakeholders	Q4 2014
		1.5 Examine and determine the feasibility of improving broadband and other service delivery and take-up in Bhutan through the following additional licensing initiatives: (1) Third mobile network operator licence(domestic); (2) Mobile Virtual Network Operator licence(s); and/or (3) Reseller or other service-based licences. (4) IDD and ISP (If feasible, implement)	Ministry , in conjunction with the Authority and in consultation with industry stakeholders	Feasibility study by end of Q4, 2013, and if feasible, implementation in Q4, 2014
2	Community access	2.1 Review the operation of the Universal Service Scheme to determine whether: (a) It is meeting its objectives; (b) The current objectives need to be amended; and (c) The Community Centre program needs to be augmented by other programs for delivering broadband services to villages and local communities.	Ministry in conjunction with Authority, Local Government, Department, local government representatives and public and industry stakeholders	Commence major review of the Scheme in Q4, 2014
		2.2 Determine the minimum entry level speed for broadband from time to time to meet the changing needs of users – noting that the May 2012 entry level is a download capacity of 512	Ministry , in consultation with all stakeholders	Progressively, with annual reviews of the Plan

		Kbps		
		<p>2.3 Ensure that broadband service speeds are measured in terms of the speed experienced by the end user. Ensure that end users are informed of actual speeds and that licensed service providers implement plans to ensure that the speed delivered meets the description of the service offered.</p>	Authority	End of Q4 2013
		<p>2.4 Review the arrangements and terms of operation for the Community Centres to ensure that they are achieving the objectives for which they were established and make amendments to the arrangements in conjunction with all stakeholders.</p>	Ministry , in consultation with local government and community representatives and all stakeholders.	Commence review by Q1 2017
3	Individual availability	<p>3.1 Achieve availability of broadband at the minimum entry level or higher speeds to 80% of the people of Bhutan.</p>	Ministry , working with all other relevant stakeholders	Achieve this target during Q4 2017 at latest.
		<p>3.2 Encourage fixed and mobile service providers to include a range of price packages for broadband in their service offering schedules, and review the appropriateness and adequacy of the range on an on-going basis.</p>	Authority in conjunction with all service providers and ministerial stakeholders	Initial review by Q2 2014
		<p>3.3 Legalise application of Voice over IP (such as Skype to Skype) in Bhutan – subject to necessary consumer protections</p>	Authority	By end of Q3, 2013
4	Affordability	<p>4.1 Undertake a study into the causes of penetration (or lack of it) for broadband services, and examine responses that might assist, including ways of improving affordability.</p>	Authority in conjunction with service providers and all stakeholders	By end of Q3, 2014
		<p>4.2 An entry level broadband service option to be available to all at an affordable price, as a mandated offering in the service schedules of all licensed service providers. Once the regulated price of the mandated broadband service offering has been established for each service provider, remove price controls on other retail broadband offerings.</p>	Authority in conjunction with all service providers and ministerial stakeholders	By end of Q2 2014
		<p>4.3 In order to reduce costs of internet access:</p> <p>(a) examine the feasibility of Bhutanese ISPs peering on a non-paying basis and without having to use other networks; and</p> <p>(b) examine the feasibility of establishing internet termination points in India, either instead of or as well as, the current locations.</p>	Ministry in conjunction with ISPs	Completion of feasibility study by end of Q4, 2013, and, if feasible, complete detailed implementation plan for implementation during, 2014
5	Broadband penetration	<p>5.1 Within the overall availability target of 80% by 2017, determine the penetration target that shall apply within each Gewog for each year of the Plan</p>	Ministry , in consultation with Authority and industry stakeholders	Determine intermediate targets by Q4 2013
		<p>5.2 Monitor service take-up by Gewog, and examine patterns to determine if there are applications or implementation arrangements that, if adopted more broadly, will facilitate greater and speedier take-up of services.</p>	Ministry in consultation with Authority and industry stakeholders	Initially by end of Q3, 2014 and then ongoing implementation

		5.3 Examine and implement incentives for broadband service take-up by individuals and households and incentives for service providers to set and achieve challenging targets for penetration, including collaborating with service providers to provide free Wi-Fi spots in public areas.	Ministry , in consultation with Authority and industry stakeholders	By end of Q3, 2014
6	School access and education	6.1 All primary , secondary schools and youth centres to have broadband access	Ministry of Education	Development of a programme by end of Q3, 2013 and for delivery progressively with 90% or more completion by the end of the Plan (2017)
		6.2 Establish Bhutan’s research and education network (DrukREN)	Ministry in conjunction with RUB	By Q4, 2015
		6.3 Primary and secondary school syllabuses to be formatted for complete delivery, as necessary, via broadband means. Promote the use of digital content for learning and teaching in schools, through the development of appropriate enriched content for broadband delivery.	Ministry of Education	Progressively, with completion by end of December 2017
		6.4 Primary, middle and secondary school teachers to be trained in the effective operation of relevant broadband applications and delivery of approved syllabuses by accessing broadband services, as part of the ChigpenRigphel II program.	Ministry of Education	Development of a programme by end of Q1, 2013 and for delivery progressively with 90% or more completion by the end 2017
7	Transactions with Government	7.1 Coordinated examination within each Ministry of relevant transaction processes and development of a prioritised e-Government programme for implementation, with initial applications being determined on the basis of their likelihood to encourage broadband service take-up.	Ministry , in conjunction with all ministries	Completion of review by the end of Q3, 2013
		7.2 Digitisation of government records for archive and efficient access and retrieval.	Ministry , in conjunction with all stakeholders	End of Q4 2015
8	Lead applications in Government programs	Addition to above, Government to develop a range of lead applications for delivery of new, enhanced or extended services online using broadband in Health, Education, Tourism, Finance, Foreign Affairs and Agriculture, specifically.	Ministry , in conjunction with all ministries	Develop and monitor a detailed set of milestones by Q3, 2013 for progressive implementation to completion in Q4, 2017
		8.1 100% of hospitals and health units to be connected to broadband for remote diagnostic and supervisory support – covering: (a) Referral Hospitals (b) District Hospitals	Ministry of Health , in conjunction with MoIC	(a) Q4, 2014 (b) Q4, 2015

		(c) Basic Health Units		(c) Q4, 2016
		8.2 Develop comprehensive patient data bases to enable all Bhutanese to be provided with the best possible care and attention wherever they present with health issues in Bhutan – possibly with specific patient groups with chronic conditions involving high-cost treatment to be covered initially.	Ministry of Health , in conjunction with MoIC	On-going Implementation
		8.3 Tourism planning and information on broadband availability for tourists and tourist organisations, via Tourism Council and tourist operator websites	Tourism Council	End Q3 2013, then on-going
		8.4 Develop detail plan for overall RNR statistics system for decision making and provision of clearances	Ministry of Agriculture and Forests	End Q3 2013, then on-going
		8.5 Enable online payments: a) Identify enabling policy requirements to be adopted b) Develop online payment gateway in relation to payment to be made to Government for fines, permits, taxes, passports and other services.	Ministry of Finance , in conjunction with RMA and financial institutions	End of Q4 2013 for development of a detailed plan showing milestones for implementation thereafter
9	Recognition of ICT Champions	9.1 Design and implement a scheme for the identification and public recognition of outstanding leadership and entrepreneurship in the application of broadband to advance Bhutan's society and/or economy.	Ministry , in conjunction with relevant other ministries and public stakeholders	By end of Q3, 2013, and implement as an annual event
10	Data collection to measure broadband progress	10.1 Review existing arrangements, and, if necessary, design and implement enhanced data collection and reporting arrangements to enable baseline and progress to be understood and for achievement of the Policy and Plan goals to be measured and communicated.	Ministry , in conjunction with relevant other ministries and public stakeholders	Design by end of Q3, 2013, for quarterly collection and analysis thereafter.
11	Universal Access	11.1 Implement the sustainability of universal services through USF and PPP mechanism	Ministry in conjunction with Authority	On-going implementation
		11.2 Mandate operators to contribute a percentage of their annual gross revenue towards the USF	Authority	Implement by Q4 2013
12	Consumer Protection	12.1 Establish a consumer protection framework to be adopted by the telecom operators based on consumer protection Act 2012	Ministry in conjunction with Authority	Establish framework by Q4, 2014 and on-going implementation
		12.2 Conduct consumer awareness campaign	Ministry in conjunction with Authority	Implement by Q1 2015 and on-going annually
13	Security and QoS	13.1 Develop minimum QoS framework to be adopted by the operators	Authority in conjunction with MOIC	Q4, 2015
14	NGN and IPv6	14.1 Establish Telecommunications and Broadband committee to specifically look after NGN development in the country and the overall implementation of the policy.	MOIC in conjunction with Authority telecom operators and other stakeholders	Q4, 2013

		14.2 Develop IPv6 migration plan	MOIC in conjunction with the NGN committee	Q4, 2014
15	Green Telecom	15.1 Enforce infrastructure sharing rules	Authority	On-going Implementation
		15.2 Minimize use of fossil fuels for telecom equipment	Ministry in conjunction with Authority and the Telecom Operators	On-going Implementation
		15.3 Encourage use of energy efficient devices	Ministry in conjunction with Authority	On-going Implementation
16	Disaster communication	16.1 Establish single hotline number	Ministry in conjunction with relevant stakeholders	Q3, 2015
17	Skills Development	17.1 Develop a comprehensive skill development plan to meet HR requirements in new technologies	Ministry	Framework by Q4, 2013 and implementation on-going
18	Telecom Division	18.1 Establish a Telecom Division within the Department of Information Technology and Telecom	Ministry	Q3, 2013

ANNEX B

List of 135 G2C Services to be Electronically Enabled

S/N	Services	Agencies	Status
1	Birth Registration	Department of Civil Registration & Census, Ministry of Home & Cultural Affairs	Live, CC
2	Duplicate Birth Certificate		Live
3	First Time CID/SRP Card Issuance		Live
4	Replacement of CID/SRP Card		Live
5	Death Registration		Live, CC
6	Duplicate Death Certificate		Live
7	Census Transfer (Inter/Intra Dzongkhag & Inter Gewog)		Live, CC
8	Name / DOB Change		Live
9	Census Upgrade/Downgrade		Live
10	Naturalization/Regularization		Live, CC
11	Household Information		Live
12	Citizen Individual Info Request		Live
13	Issuance of Nationality Document for Minors		Live
14	Change of Citizen Information		Live
15	Change of Spouse Information		Live
16	Change of Head of Household		Live
17	Nationality Document Service		Live
18	Approval for Construction of Religious Structure	Department of Culture, Ministry of Home & Cultural Affairs	Live, CC
19	Approval for Renovation of Religious Structure		Live, CC
20	Search for Monument		Live, CC
21	Approval for Explosive Purchase	Bureau of Law and Order, Ministry of Home & Cultural Affairs	Live, CC
22	Approval for Explosive Destruction		Live, CC
23	Approval for Explosive Transfer		Live, CC
24	Explosive Purchase at Agencies		Live
25	Explosive Usage Reporting		Live, CC

S/N	Services	Agencies	Status
26	Issuance of Passport	Department of Protocol, Ministry of Foreign Affairs	Live, CC
27	Machine Repair and Maintenance Service	Department of Agriculture, Ministry of Agriculture and Forestry	Live
28	Farm Mechanization Service		Live
29	Machine Installation Service		Live
30	Plant Protection Service		Live
31	Plant Protection On-Demand Service		Live
32	Pest Reporting Service		Live
33	Soil Service		Live
34	Supply Seed Seedling Fertilizer Service		Live
35	Input Supply of Livestock	Department of Livestock Services, Ministry of Agriculture & Forestry	Live
36	Input Supply of Feed & Fodder		Live
37	Animal Health		Live
38	Rural Timber Permit	Department of Forest & Park Services, Ministry of Agriculture & Forestry	Live, CC
39	Firewood Permit		Live, CC
40	Non-wood Forest Products Permit		
41	Permit of Removal of Forest Products from Private Land		
42	Issuance of Small & Cottage Scale Industrial Licenses for 42 locations clearance exempted activities and other new activities	Department of Cottage & Small Scale Industries, Ministry of Economic Affairs	Live, CC
43	Renewal of Small & Cottage Scale Industrial Licenses for 42 locations clearance exempted activities and other new activities		
44	Issuance of Duplicate Industrial License		
45	Change of License		
46	Revoke License		
47	Cancellation of Industrial License		
48	Issuance of License for 17 Delegated Activities		Live, CC
49	Renewal of EC		
50	Micro Trade Registration	Department of Trade,	Live, CC

S/N	Services	Agencies	Status	
51	Issuance of Duplicate Micro Trade Registration Certificate	Ministry of Economic Affairs		
52	Micro Trade Registration Renewal			
53	Retail Trade License Issue		Live, CC	
54	Retail Trade License Renewal			
55	Cancellation of Retail Trade License			
56	Issuance of Duplicate Retail Trade License			
57	Wholesale Trade License Issue		Live, CC	
58	Wholesale Trade License Renewal			
59	Cancellation of Wholesale Trade License			
60	Issuance of Duplicate Wholesale Trade License			
61	Ownership Transfer in License			
62	Establishment Name Change			
63	Location Change			
64	Upgradation&Downgradation of scale of business			
65	Import House Registration			
66	Issuance of Import License			
67	Issuance of Letter for Hard Currency			
68	FDI Project Approval		Department of Industries, Ministry of Economic Affairs	Live, CC, Anywhere
69	Medium & Large Domestic Project Approval			
70	Issuance of FDI & Other Medium & Large Industries License			Live, CC
71	Renewal of FDI & Other Medium & Large Industries License			
72	Duplicate License			
73	Change of License			
74	Renewal of EC			
75	Company Name Search	Live, CC, Anywhere		
76	Company Name Reservation	Live, CC		

S/N	Services	Agencies	Status
77	New Company Registration		Live, CC
78	Company Name Change		Live, CC
79	Submission of Quarterly Information (Industry Information System)		Live
80	Registration of Competent Person	Drug Regulatory Authority	Live, CC
81	Renewal of Competent Person		Live, CC
82	Registration of Medical Products		Live, CC
83	Renewal of Medical Products		Live, CC
84	Technical Authorization		Live, CC
85	Renewal of Technical Authorization		Live, CC
86	Change of TA Details/Market Authorization Holder		Live, CC
87	Import Authorization for Drug		Live, CC
88	Export Authorization for Drug		Live, CC
89	Audit Clearance System		Royal Audit Authority
90	Security Clearance System	Royal Bhutan Police	Live, Anywhere
91	Benefit/claim by spouse/children/dependent on death of the pensioner	National Pension & Provident Fund	11FYP, Anywhere
92	Creation of Central Vehicle Registry and Tracking of Vehicle Licenses by SMS System	Road Safety & Transport Authority, Ministry of Information & Communications	11FYP
93	Issuance of Duplicate Examination Document	Bhutan Council for School Examination & Assessments, Ministry of Education	11FYP, Anywhere
94	Issuance of Re-placement Documents		11FYP, Anywhere
95	Issuance of English Language Proficiency Certificate		11FYP, Anywhere
96	Clerical Re-check of Papers		11FYP, Anywhere
97	Service Fee Calculator		11FYP, Anywhere
98	Online Submission & Selection of Scholarship	Department of Adult & Higher Education, Ministry of Education	11FYP, Anywhere
99	Creation of BSA / Local Chapter		11FYP, Anywhere
100	Registration of Tertiary Students & BSA Members		11FYP, Anywhere
101	Payment of Scholarship Fees/Stipend		11FYP, Anywhere

S/N	Services	Agencies	Status
102	BSA Proposal		11FYP, Anywhere
103	Upload Transcript		11FYP, Anywhere
104	Expense Reimbursement		11FYP, Anywhere
105	Registration of New Contractor	Construction Development Board, Ministry of Work & Human Settlements	11FYP, Anywhere
106	Renewal of License		11FYP, Anywhere
107	Upgradation of Contract License		11FYP, Anywhere
108	Name, Ownership & Location Change of Contractors		11FYP, Anywhere
109	Registration of Architects		11FYP, Anywhere
110	Registration of Consultant (NEW)		11FYP, Anywhere
111	Addition of Category for Consultant (NEW)		11FYP, Anywhere
112	Registration of Specialized Trade (NEW)		11FYP, Anywhere
113	Addition of Category of Contractors (NEW)		11FYP, Anywhere
114	Building Construction		ThimphuThromdey, Ministry of Work & Human Settlements
115	Building Occupancy Certificate	11FYP	
116	New Water Line Connection	11FYP, Anywhere	
117	Water Pipeline Shifting	11FYP, Anywhere	
118	Water Pipeline Main Shifting (NEW)	11FYP, Anywhere	
119	Disconnection & Reconnection of Water (NEW)	11FYP, Anywhere	
120	Replacement of Water Meter (NEW)	11FYP, Anywhere	
121	Upgradation / Downsizing of Water Connection Capacity (NEW)	11FYP, Anywhere	
122	Sewer Connection to Main Sewer Line	11FYP, Anywhere	
123	Vacant Tanker Service	11FYP, Anywhere	
124	Submission of Miscellaneous Applications	11FYP, Anywhere	
125	Land Registration	11FYP	
126	Property Transfer (NEW)	11FYP	
127	Grievance, Water Compliant	11FYP, Anywhere	
128	Issuance of Plot Site Plan	11FYP, Anywhere	

S/N	Services	Agencies	Status
129	Survey		11FYP, Anywhere
130	Demarcation		11FYP, Anywhere
131	City Library		11FYP, Anywhere
132	HR System		11FYP
133	Construction Approval for Building	Department of Engineering Services, MoWHS	11FYP, Anywhere
134	Job Portal	Department of Employment, MoLHR	11FYP, Anywhere
135	LabourNet	Department of Labour, MoLHR	11FYP, Anywhere

ANNEX C

List of 119 G2B Services to be Electronically Enabled

S/N	License	Licensing Bodies
1	Approval for allotting mushroom billets	Ministry of Agriculture and Forests, Forest Protection and Enforcement Division
2	Permit for standing trees/burr for handicraft items	
3	Permit for Timber Allotment	
4	Timber Transport Permit/ITMO	
5	Approval for Establishment of Day Care Centre/ECCD Centre	Ministry of Education, Department of School Education
6	Approval for Establishment of Private Schools	
7	Approval for Establishment of Training Providers(TVET)	Ministry of Labor and Human Resources
8	Registration of Training Providers (TVET)	
9	Approval for the Establishment of Private Colleges	Ministry of Education, Department of Adult and Higher Education
10	Clearance for Establishment of Educational Consultancy and Placement Firm	
11	Authorization for Establishment of Dairy Farm, Poultry Farm, Piggery and Fishery	Ministry of Agriculture and Forests, Department of Livestock
12	Authorization for Manufacture of Medicinal Products	Drug Regulatory Authority, Registration and Pre-marketing Control Division
13	Clearance for change of ownership	
14	Registration Certificate for Medicinal Products	
15	Registration of Competent Person	
16	Authorization of Money Changers	Royal Monetary Authority
17	Business License	
18	Commercial Banking License	
19	License for Broker firm, Brokers and Broker's Rep	
20	Authorization to Sell or Distribute Medical Products by	Drug Regulatory Authority,Licensing Unit

S/N	License	Licensing Bodies
	Retail/Wholesale Trade	
21	Technical Authorization for Import/Export of Medical Products for License Holders	
22	Bowling Alleys	
23	Broadcasting License	
24	Cable Television License	
25	Discotheque License	
26	Drayang	
27	ICT Equipment Dealership Certificate	
28	ICT Facility License	
29	ICT Service License	
30	International Filming Permit	
31	International Journalist Accreditation	Bhutan Infocom and Media Authority
32	Journalist Accreditation (National)	
33	Karaoke	
34	Local Film Certificate for Public Exhibition	
35	Movie Hall	
36	National Filming Permit	
37	Printing License	
38	Publishing License	
39	Radiocommunication Spectrum License	
40	Snooker License	
41	Technical Clearance for Import of Communication Equipment	

S/N	License	Licensing Bodies
42	Video/Computer Gaming	
43	Certificate for Brokers	Royal Securities Exchange of Bhutan
44	Certificate for Export of Livestock Products	Ministry of Agriculture, Bhutan Agriculture and Food Regulatory Authority
45	Food Establishment Clearance	
46	Food Handlers Certificate	
47	Food Handlers License	
48	Import Permit for animal slaughter	
49	Import Permit for dressed chicken, pork, mutton, fish & crustaceans	
50	Import Permit for Processed Livestock Products	
51	Import Permit for Seeds, Seedlings and Ornamental Plants	
52	Import Permit of Livestock Breeding and Rearing	
53	Import Permit of Pet Animals	
54	In-country Movement Permit	
55	Phytosanitary Certificate	
56	Certificate of Incorporation of Companies	Company Registry Division, Department of Industry, Ministry of Economic Affairs
57	Certificate of Registration for Foreign Workers Recruitment	Ministry of Labour and Human Resources, Department of Labour
58	Work Permit Approval	
59	Certificate of Registration of Precursor Chemicals	Bhutan Narcotic Control Agency
60	Import Authorization for Precursor Chemicals	
61	Citizenship ID Card	Ministry of Home and Cultural Affairs, Department of Civil Registration & Census
62	Clearance for Government Reserved Forest Land for Lease	Ministry of Agriculture and Forests, Divisional Forest Office
63	General Forest Produce Movement Order	

S/N	License	Licensing Bodies
64	Permit for collection of NWFPs	
65	Permit for surface collection	
66	Permit for Timber/Firewood/Poles/Fencing/Support Post (rural)	
67	Clearance for Government Reserved Land for Lease	National Land Commission
68	Clearance Letter for Tour Operators	Tourism Council of Bhutan, Services Division/Operation Division
69	Recommendation of Hotel License	
70	Construction Consultancy Firm Registration	Construction Development Board
71	Construction Development Board Registration Certificate	
72	Registration of Individual Architects	
73	Specialization Registration	
74	Construction material Brand Approval Certificate	Bhutan Standards Bureau
75	Entry Permit	Ministry of Home and Cultural Affairs, Department of Immigration
76	Special Permit	
77	Visa	
78	Work Permit	
79	Environmental Clearance	Local Admin. and NEC, Environment Sections of local administration
80	FDI Approval	Ministry of Economic Affairs, Department of Industry
81	General Certificate of Origin	Ministry of Economic Affairs, Department of Trade
82	Generalized System of Preference (GSP) Certificate of Origin (Outside SAFTA)	
83	Import House Registration Certificate	
84	Import License	
85	SAFTA Certificate of Origin	

S/N	License	Licensing Bodies
86	Guide License	Tourism Council of Bhutan, Services Division
87	Recommendation of MoLHR (Chef, Consultant, Experts, Labour related to Hospitality Business)	
88	Import Duty Exemption Certificate	Ministry of Finance, Department of Revenue and Custom
89	Liquor Shop License	
90	Recommendation of Courier Service	
91	Recommendation of Customs Clearing Agent	
92	Registration of Courier Service	
93	Registration of Customs Clearing Agent	
94	Sales Tax Collecting Agent Registration	
95	Sales Tax Exemption Certificate	
96	Tax Payer Number	
97	Transit Permit	
98	Industry License for Contract	Ministry of Economic Affairs, Regional Trade & Industry Office
99	Industry License for Production and Manufacturing Activities	
100	Industry License for Service	
101	Micro Trade Registration Certificate	
102	Retail Trade License	
103	WholeSale Trade License	Ministry of Economic Affairs, Department of Geology & Mines
104	Leasing of Mine and Quarry	
105	Permit for collection of minerals	Bhutan Electricity Authority
106	License to construct Hydropower plant	
107	License to distribute electricity	

S/N	License	Licensing Bodies
108	License to generate electricity	
109	License to transmit electricity	
110	Permit to Survey	
111	Location Clearance	Local Administration or Thimphu City Corporation
112	Medical Fitness Certificate	Ministry of Health, JDWNRH
113	Medium and large scale Industrial Project Approval (domestic proposals)	Industrial Development Division, Department of Industry, Ministry of Economic Affairs
114	Name Clearance	Ministry of Economic Affairs, Intellectual Property Division
115	Registration of Industrial Property Agent	
116	Passenger Transport Route Permit	Ministry of Information & Communication, Road Safety and Transport Authority
117	Professional Driving License	
118	Permit for Artifacts	Textile Museum
119	Registration as Medical Equipment Supplier	Ministry of Health, Drug, Vaccine & Equipment Division
120	Security Clearance	Ministry of Home and Cultural Affairs, Bureau of Law & Order
121	TROCCO (Timber Release Order cum Certificate of Origin)	Natural Resource Development Corporation Limited

ANNEX D

Functions of the National e-Payment Gateway

The National e-Payment Gateway will provide the following functionalities/features:

i) User Interface

The e-Payment Gateway will enable citizens to make payment for their e-service transactions. When the e-service requires payment to be made, it will provide a web-based user interface to display the total amount payable and allow the payer to select the mode of payment (e.g. credit card/debit card or debit from bank account).

ii) Credit Card/Debit Card Payment

For credit card/debit card payment, the e-Payment Gateway will be redirected to the gateway of the bank providing the Merchant Acquiring Service. The bank's gateway will prompt the payer to enter credit card/debit card number, name of the cardholder, month and year of expiry date and Card Verification Value (CVV) for on-line verification and authorisation. The bank's gateway will display the payer and inform the e-service of the status (successful or unsuccessful) of the payment transaction. If successful, the date and time of the transaction, the transaction amount and a unique reference code of the payment transactions to facilitate future reference.

iii) Debit from Bank Account

For debit from bank account, the e-Payment Gateway will prompt the payer to enter the bank account number for off-line verification and authorisation. The e-Payment Gateway will consolidate all the transactions related to debit from bank account and send to the bank for settlement at the end of the day.

iv) Daily Settlement

As part of the daily settlement process, the bank will credit the funds into the Government bank account the next working day and provide the transaction and settlement details to the e-Payment Gateway and MoF/RMA via secure file transfer.

v) Report Generation

The e-Payment Gateway will provide the following data/report online for management information and processing by back-end applications.

a) Transaction summary

This summarizes the number of successful and unsuccessful payment transactions.

b) Transaction Status

This serves as an audit log of the payment transactions and will be useful for handling of payment dispute cases.

c) Settlement Status

This provides the payment transactions that are successfully settled by the bank.

d) Discrepancy Summary

This highlights the credit card/debit card transactions that are considered successful by the bank's payment gateway but not treated as successful transactions by the e-Payment Gateway (e.g. due to unexpected failure in the delivery of transaction status to e-service) for follow-up actions.

ANNEX E

e-Government Interoperability Framework (e-GIF)

1. E-Government Interoperability Framework (e-GIF)

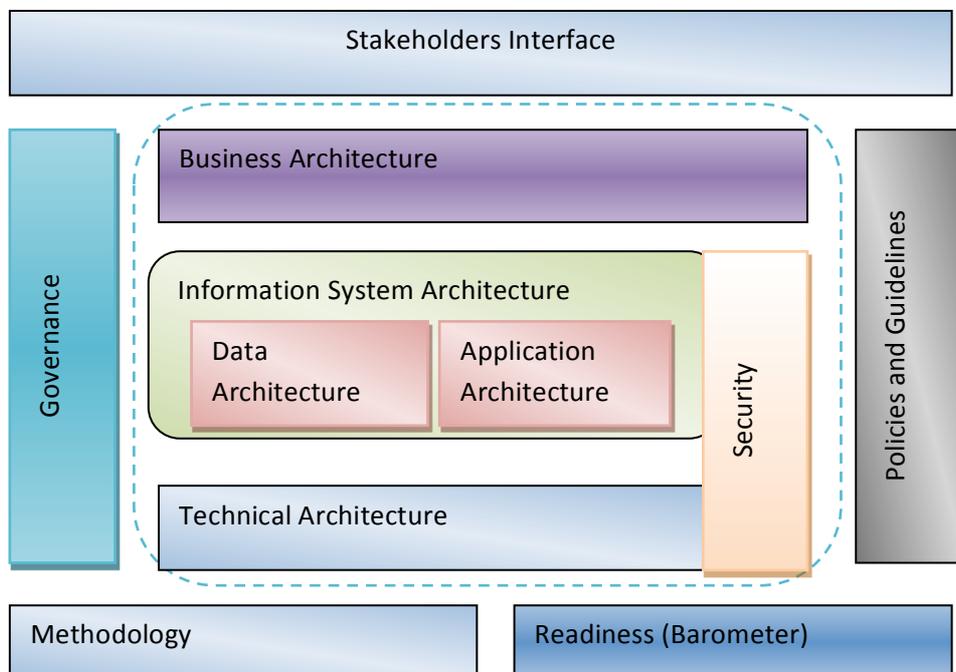
The electronic government interoperability framework, in its broad sense, is government enterprise architecture to define technical standards and best practices to enable ICT systems to integrate and interoperate across the RGoB. It institutes set of standards and guidelines that government agencies must adopt to enable better sharing and collaboration within government agencies. It will help the adoption of standards that will enable diverse government application systems to exchange data and use the data that has been exchanged meaningfully using standardized technologies, data and applications.

For a detailed background, objectives and benefits of e-GIF, visit

<http://e-GIF.moic.gov.bt/e-GIF/public/index>

2. E-GIF Architecture

The overview of the framework is as provided below:



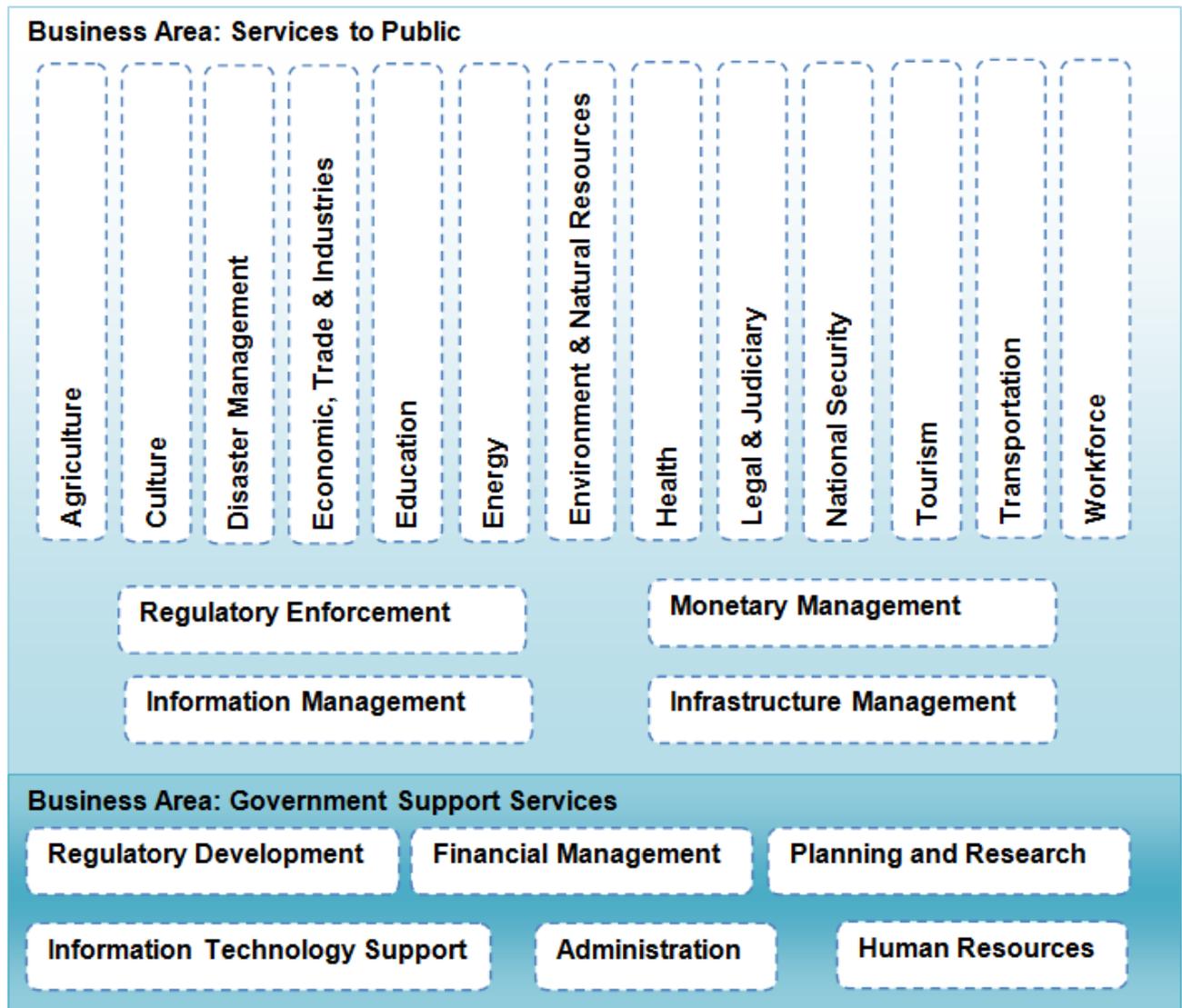
3. Business Reference Model (BRM)

The BRM defines and provides detailed description of the business areas, government-wide lines of business, their associated government functions and services performed by the RGoB. It ensures strategic alignment of business functions and services to the objectives of the government, and promotes collaboration amongst agencies in delivering government functions around common business areas.

For Scope, Definitions, Target audiences and Design principles, refer: <http://e-GIF.moic.gov.bt/e-GIF/public/brm>

The components of the BRM are the Business areas, Government-wide lines of business, the Government functions under each of the Government-wide line of business, and Services under each Government functions. For details, refer <http://e-GIF.moic.gov.bt/e-GIF/admin/brm>

- Business Structure - The BRM has four-level hierarchy structure to describe the business of the RGoB, which are Business Area, Lines of Business, Government Functions and Government Services.



For definition of each hierarchical structure, refer: <http://e-GIF.moic.gov.bt/e-GIF/admin/brm#brm8>

- Lines of Business – For more information, visit: http://e-GIF.moic.gov.bt/e-GIF/admin/brm_lineofbusiness.php
- Government Functions – For more information, visit: http://e-GIF.moic.gov.bt/e-GIF/admin/brm_governmentfunction.php
- Government Services – For more information, visit: http://e-GIF.moic.gov.bt/e-GIF/admin/brm_service.php

4. Application Reference Model (ARM)

ARM defines the detailed description of the application systems used within the RGOB. These application systems are needed to manage the data and support the line of businesses, government functions and services. It also documents a list of reusable application components of these application systems. The objectives of this reference model are to facilitate interoperability between application systems, identify reusable application components and facilitate application maintenance.

ARM is divided into two major categories: Application System and Application Component. For Scope, Definitions, Target audiences and Design principles, visit: <http://e-GIF.moic.gov.bt/e-GIF/public/arm>

- Application Structure - Most of the government agencies have used application system(s) to support their functions and services. Using application system improves the efficiency in delivering these functions and services to the public. However, having integrated systems has been a challenge within the RGoB since agencies have developed application systems to cater only to their specific needs.

ARM classifies application system to relevant Government Functions so as to align them to the overall objectives and strategies of the RGoB. This will help identify common and reusable application systems and application components that have a potential to be used by other government agencies.

For more details on Application system definition template, Application Component Definition template and Classification Types, visit: <http://e-GIF.moic.gov.bt/e-GIF/admin/arm#arm8>

- For Application System Summary (Application Portfolios) and Application Component Summary, refer: http://e-GIF.moic.gov.bt/e-GIF/admin/arm_systemdefination and http://e-GIF.moic.gov.bt/e-GIF/admin/arm_componentdefination

5. Data Reference Model (DRM)

Data Reference Model (DRM) defines standards to describe, share, structure and classify data. It identifies the common data for data integration and institutes standardised data management practices. The objectives of this reference model is to facilitate information sharing, data reuse and enhance the accessibility and integrity of the data, with due considerations placed on data protection.

The reference model describes data through the use of data dictionary, conceptual data modeling and standardised naming convention to provide consistent documentation.

For Scope, Definitions, Target audiences and Design principles, visit: <http://e-GIF.moic.gov.bt/e-GIF/public/drm>

- Data Structure - Every government agency uses data to support their government functions and services. The use of accurate data improves public service delivery. Currently, multiple agencies maintain data of the same person, collected for different services at different time. As a result, the data may be inconsistent and it is difficult to maintain same data kept at different locations. There is also duplication of effort and potential for mistakes since each agency has to manually enter the same person's information.

Considering the above challenges, there is need to adopt a consistent approach in capturing data and to consolidate common data. The data structure describes data by standardising the use of data dictionaries, conceptual data models, naming convention and data classification.

For more details on data dictionary template, data model, naming convention and data classification, refer the following links: <http://e-GIF.moic.gov.bt/e-GIF/admin/drm#drm8>

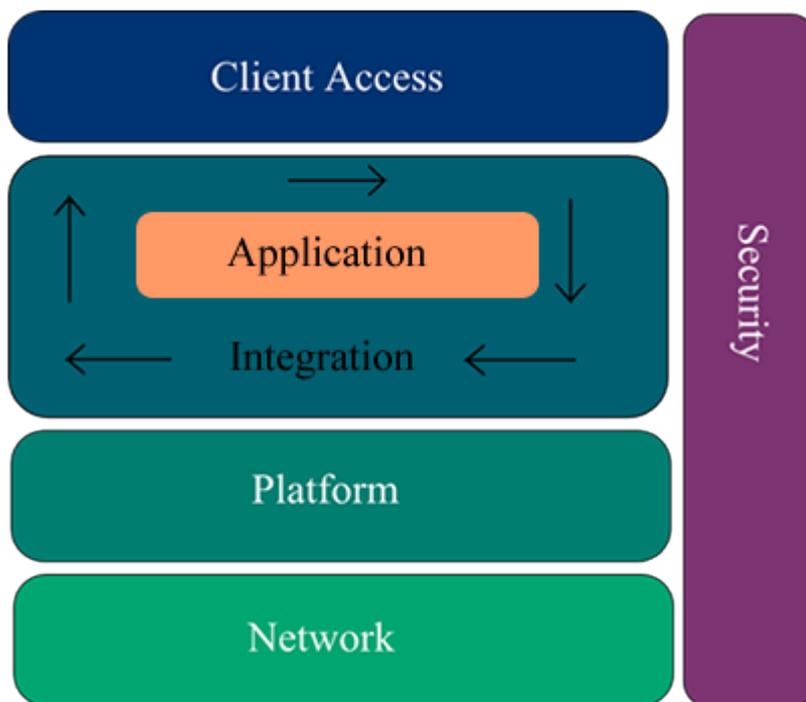
and <http://e-GIF.moic.gov.bt/e-GIF/images/datadictionary.pdf>

- People data dictionary – This provides identified common people data with standardised structure, definition, owner and classification. For more detail, refer the following links:
<http://e-GIF.moic.gov.bt/e-GIF/admin/drm#drm40> – Current Architecture
<http://e-GIF.moic.gov.bt/e-GIF/admin/drm#drm41> – Target Architecture

- Code Tables – The code tables provides standardised codes related to people data. For more details visit: <http://e-GIF.moic.gov.bt/e-GIF/admin/drm#drm41> and <http://e-GIF.moic.gov.bt/e-GIF/admin/drm#drm31>

6. Technical Reference Model (TRM)

Technical Reference Model (TRM) defines the minimum set of specifications and standards that are required for systems, applications and devices to interoperate and work seamlessly in an efficient manner. The objectives of this reference model are to ensure interoperability, scalability and adoption of open standards. The TRM is divided into five domains as shown below:



For Scope, Definitions, Target audiences and Design principles, visit: <http://e-GIF.moic.gov.bt/e-GIF/public/trm>

- Technology Structure - It defines how technology standards will be recorded and classified to facilitate the government agencies in planning, procurement and deployment. For more details on Technology Portfolio Definition Template, Technology Standard Definition Template, Classification of Technology and Technology Status, refer <http://e-GIF.moic.gov.bt/e-GIF/admin/trm#trm6>

- Technology Portfolio - This lists out technology products and solutions in use currently in the RGoB. To see all the technology products and solutions, refer http://e-GIF.moic.gov.bt/e-GIF/admin/trm_technologyportfolio.php
- Technology Standards – It documents standards protocols under five domains: Network, Platform, Application, Integration and Client Access. For specific standards, refer the following links:
Network - http://e-GIF.moic.gov.bt/e-GIF/admin/trm_network
Platform - http://e-GIF.moic.gov.bt/e-GIF/admin/trm_platform.php
Application - http://e-GIF.moic.gov.bt/e-GIF/admin/trm_application.php
Integration - http://e-GIF.moic.gov.bt/e-GIF/admin/trm_integration.php
Client Access - http://e-GIF.moic.gov.bt/e-GIF/admin/trm_ca.php
- Best Practices – It provides best practices existing within RGoB and some internationally adopted best practices under five domains so that it may serve as a reference for adoption. For more details, visit: <http://e-GIF.moic.gov.bt/e-GIF/admin/trm#trm19>
- Central Services - A number of central services to the RGoB are identified and documented so that agencies, who intend to utilise or establish such services, can avoid duplicating the development effort and avail these existing services. This helps Government save in terms of reducing expenditures for development of systems and infrastructure and focus the utilisation of scarce ICT human resources in areas where they are more needed. Smaller agencies could also turn to these central services for cost effectiveness. For details, refer <http://e-GIF.moic.gov.bt/e-GIF/admin/trm#trm25>

Note: All the links are not publicly available and if any officials of the Government agencies need access to information through those links, they need to contact ICT head/e-GIF focal person of their agency or e-GIF working group of DITT.

ANNEX F

e-Government Implementation Roadmap

Initiatives/Projects	Yr1	Yr2	Yr3	Yr4	Yr5	Budget	Lead Agency
Outcome1: ICT for Good Governance							
Networked Government							
P1. National Broadband Network (lastmile)							DITT/MoIC, Telcos
P2. Government Intranet (TWAN)						Nu. 190m	DITT/MoIC
P3. Bhutan CIRT						Nu. 25m	DITT/MoIC
ICT Policy and Legal Framework							
P4. e-Government Policy						Nu. 2m	DITT/MoIC
P5. Implement Telecom & Broadband Policy						Nu. 20m	DITT/MoIC
P6. Amend ICM Act						Nu. 1m	DoIM/MoIC
ICT Capability Development							
P7. Parenting of ICT Professionals						Nu. 267m	DITT/MoIC
P8. Development of Leadership and Non-ICT Professionals						Nu. 1000m	DITT/MoIC, ChiphpenRigpel
ICT for Sectorial Transformation							
P9. ICT Masterplan for MoE							MoE
P10. ICT Masterplan for MoF							MoF
P11. ICT Masterplan for MoAF							MoAF
P 12. ICT Masterplan for Health							MoH
P 13 ICT Masterplan for Tourism							TCB
Whole-of-Government Shared Services							
P12. e-GIF						Nu. 42m	DITT/MoIC
P13. Common Data Hubs						Nu. 50m	DITT/MoIC
P14. Common Systems (Govt.email, e-procurement, National Spatial Data Infra, eAuthentication, National ePayment Gateway, Personal Information Sys)						Nu. 124.1m	Respective System Owners
P15. Government Data Centre						Nu. 120m	DITT/MoIC
Electronic Services							
P16. G2C Services						Nu. 100	G2C office, DITT/MoIC
P17. G2B Services							MoEA
Ministry or Agency Specific ICT Initiatives							
P18. Natl. e-Commerce Framework							MoEA
P19. Financial system (Public Financial Mgt. Sys, Online Tax filing sys, Info sys on State Owned Enterprises, Govt Inventory Sys, improvement of existing MYRB, PEM, PLAMS)						Nu. 129.65m	MoF
P20. E-Medical Records, Web-based Health Mgmt Info Sys, Telemedicine						Nu. 60.5m	MoH
P21. Civil Registration System (Enhancement)						Nu. 25m	DCRC/MoHCA
P22. Labornet, Job Portal (Enhancement)						Nu. 3.7m	MoLHR
P23. GIS Digitised Road Network Map& Human Settlement Map						Nu. 2m	MoWHS
P25.Intelligent Transport System						Nu. 15m	RSTA

P26. Corruption Compliant Mgmt System							Nu. 0.5m	ACC
P27. Terrestrial Network							Nu. 525m	BBSC
P29. Audit Information Mgmt System							Nu. 24.7m	RAA
P31. e-Filing Sys for Judiciary							4.1	Royal Court of Justice
Outcome2: ICT for Bhutanese Information Society								
Education as Foundation								
P1. ICT Masterplan for Education								MoE
P2. DrukREN							Nu. 100m	DITT/ MoIC
P3. ICT Manpower Council								DITT, RUB, MoLHR
Enhance Service Access Channel								
P4. Community Centre & Subsidies							Nu. 237m	DITT/ MoIC
P5. Mobile Services							Nu. 153m	DITT/ MoIC
P6. ICT awareness & Adoption							Nu. 20m	DITT/ MoIC
Promotion of Culture								
P7. National Digital Archive							Nu. 39.7m	MoHCA
P8. Support the Creative Industry							Nu. 543.55m	DoIM/ MoIC
P9. Enabling ICTs in Dzongkha								DDC
Reduce e-Waste								
P10. Implement e-Waste Regulation							Nu. 20m	DITT/ MoIC
Outcome3: ICT as a Key Enabler for Sustainable Economic Development								
ICT Adoption in Financial Sector								
P1. National e-Payment Gateway								RMA
P2. E-Commerce Framework and Portal							IFC	MoEA, BICTTA
ICT Adoption in Tourism Sector								
P3. Hotel Monitoring System								TCB
P4. Natl. Recreational Visit Permit Processing Sys								TCB
P5. Enhanced Tourism Web Portal							Nu. 0.69m	TCB
ICT Industry Development								
P6. Incentives and Grants								MoF, MoIC, MoEA
P7. Strengthen the Bhutan ICT and Training Association								MoIC, DHI, BICTTA
P8. Develop Bhutan Tech Village							Nu. 250m	MoIC, MoLHR, RUB
P9. ICT Manpower								MoLHR
National ICT Infrastructure and Services								
P10. Intl Telecom Gateway via Bangladesh.							Nu. 20m	ISP/Telecos
P11. Emergency Communication Network							Nu. 30m	DDM/BBSC
P12. BBS Terrestrial Network							Nu. 525m	BBSC