BHUTAN

E-READINESS ASSESSEMENT

Final Report

The Division of Information Technology
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Ministry of Communication

UNDP PROJECT BHU/02/010

Research and study conducted by:

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CONTENTS

Annexure

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Mr. Sangay Wangchuk, Offtg. Head of DIT
Dr. Ram Jakhu, Consultant, DIT
Mr. Sonam Dukda, DIT
Mr. Yangka, Joint Director, Education Department
Mr. Lhab Dorji, Dasho Dzongdag, Trongsa
Mr. Sonam Tobgay, Dy. Secretary, RCSC
Dasho Jigme, Secretary, RCSC
Mr. Karma Yezer, Project Manager, PIN
Mr. Sonam Dukda, Engineer, DIT
Mr. Tshering Dorji, General Secretary, BCCI
Mr. C.B. Chettri, Administrative Office, BCCI
Mr. Pema Wangda, Director, DEL
Mr. Tenzin Lekphel, DEL
Mr. Ugyen Norbu, Kuensel Corporation
Mr. Ugyen Wangdi, Kuensel Corporation
Mr. Chencho, Kuensel Corporation
Mr. Ed Santos, MOA
Mr. Motiraj Gurung, MOA
Mr. Tashi Norbu, Dasho Dzongdag, Haa

Mr. Phuntsho Namgyel, MOA

Mr. T.B. Rai, RNRRC, Yusipang

Dr. Ugyen Dophu, Dy Suprintendent, JDWNR Hospital

Mr. Kinley, PPD, Health Department

Mr. Sangey Tenzing, MD, Bhutan Telecom

Mr. Puspa Pradhan, DMD, Bhutan Telecom

Mr. Singye, Education Department

Mr. Pema Tshering, EDP, Bhutan Power Corporation

Mr. Karma, DMD, BNB

Mr. L.P. Giri, BNB

Mr. Nidup, Sherubste College

Mr. Graeme Foster, Sherubtse College

Mr. S.K.Rai, Punakha High School

Mr. D.K.Pradhan, Wamrong Middle Secondary School

Dzongkhag officials, Trongsa

Dzongkhag officials, Haa

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Foreword

The E-Readiness assessment study of Bhutan was contracted to the consulting firm "GMCT Information and Communication Technologies" through a competitive bidding. Mr. Gopi Pradhan, the Principal Consultant, led the e-Readiness work and its consultant, Mr. Umesh Pradhan, carried out various sector and district case studies. There was continuous support and cooperation from the Division of Information Technology. The ICT Policy consultant for the DIT (MOC), Dr. Ram Jakhu was instrumental in providing valuable advice and help. There was substantial input from the private sector IT vendor representatives. Required surveys and case studies were carried out to provide necessary data Monthly leased line fee and information.

The work was successfully completed between 28 April 2003 – 27 June 2003.

Glossary of terms

ADH	Asynchronous Digital Hierarchy
BACS	Bhutan Automated Customs System
BBC	British Broadcasting Corporation
BBS	Bhutan Broadcasting Service
BCCI	Bhutan Chamber of Commerce and Industries
BER	Bit Error Rate
BNB	Bhutan National Bank
BOB	Bank of Bhutan
BT	British Telecom
BTA	Bhutan Telecom Authority
CID	Centre of International Development
CNN	Cable News Network
CS	Community School
CSC	Computer Support Centre
DAMA	Demand Assigned Multiple Access
DANIDA	Danish International Development Agency
DIMS	Diploma in Information Management System
DIT	Division of Information Technology
DRMASS	Digital Radio Multiple Access Subscriber System
FM	Frequency Modulation
FYP	Five Year Plan
GDP	Gross Domestic Product
GNH	Gross National Happiness
HMIS	Health Management Information Systems
HSS	Higher Secondary School
ICT	Information and Communication Technologies
IDRC	International Development Research Centre
INSAT	Indian Satellite
INTELSAT	International Telecommunication Satellite
ISP	Internet Service Provider
IT	Information Technology
ITU	International Telecom Union
JOCV	Japan Oversees Cooperation Volunteers
JDWNRH	Jigme Dorji Wangchuck National Referral Hospital
Kbps	Kilo Bits Per Second
KW	Kilo Watts
LAN	Local Area Network
LSS	Lower Secondary School
M/W	Microwave
Mbps	Mega Bits Per Second
MHz	Mega Hertz
MOC	Ministry of Communications
MSS	Middle Secondary School

MTI	Ministry of Trade and Industries
MW	Mega Watts
NIE	National Institute of Education
NPB	National Pension Board
Nu	Ngultrum
NYAB	National Youth Association of Bhutan
PCM	Pulse Code Modulation
PCO	Public Call Office
PIN	Planning Information Network
PPD	Policy and Planning Division
PSTN	Public Switched Telephone Network
RC	Resource Centre
RICB	Royal Insurance Corporation of Bhutan
RIIT	Royal Institute of Information Technology
RNR	Renewal Natural Resources
SDH	Synchronous Digital Hierarchy
SME	Small and Medium Enterprises
TC	Total Connection
TIIMS	Telecom Integrated Information Management System
TU	Total Users
TV	Television
UNDP	United Nations Development Programme
UNESCO	United National Education, Scientific and Cultural Organization
UPU	Universal Postal Union
US$	United States Dollars
VHF	Very High Frequency
VHW	Village Health Workers
VOIP	Voice Over Internet Protocol
VSAT	Very Small Aperture Terminal
WAN	Wide Area Network
WLL	Wireless Local Loop
XML	Extendable Markup Language

List of Figures

List of Tables

Executive Summary

Information and Communication Technologies (ICT) have played significant role in enhancing the pace of socio-economic development in Bhutan. Radio programmes on development issues reach 90% of Bhutanese homes today. Almost one in every five literate Bhutanese read *Kuensel*, the weekly national newspaper. On average there are almost 3 phones for 100 people and computers and Internet are increasingly used in offices and work places. These developments may not have been achieved without the timely establishment of ICT infrastructures in the country. Bhutan has good broadcasting, telecommunication, Internet and printing facilities today. Every sector has started exploiting the extended benefits of computers and networks. Internet and e-mail are widely used for communication including the private sector.

ICT is slowly leading to a better quality of life for the normal citizens. This basic objective is also getting ingrained in all ICT activities, plans and policies. E-education will gain popularity and students in towns and villages should be able to acquire wholesome education where ICT plays the key role of a facilitator. This has long been the aspiration of His Majesty. Health services will be improved through e-health and will result in low mortality rates and better and healthier lives for people. Bhutanese farmers will slowly but indirectly benefit from increased access to information on farming and markets and there will be significant increase in farm productivity. The private sector has grown but ICT is used minimally in the industry sub-sector. But the pace of ICT growth in the private sector provides room for immense optimism. Tourism can be promoted through professional and quality regulation of ICT online services. Volume of manual works in factories may be cut down but jobs can be created through mooting of ICT entrepreneurial ideas on youths. With right type of knowledge and skills, the huge number of unemployed youths can start interesting and innovative ICT business employing themselves and their friends. E-government initiatives are taking place and it will lead to more efficient and a transparent governance. In fact ICT will rightly compliment the democratic process in Bhutan. The financial system uses ICT applications but needs urgent revamping to play any supportive role in national e-economy. Foreign transaction policies have to accommodate and facilitate other national policy initiatives.

The most urgent and important concerns today are affordability and accessibility of ICT services. The Internet connectivity costs may not be highest in the world in Bhutan but this is not a justification. Per hour cost of Internet use is almost double the per hour salary of normal Bhutanese office worker. Surveys found that Bhutan's private sector is vying to use Internet but the only factor that keeps them away is the cost. IT training and awareness equally play their own important roles but due to high cost of Internet and telephone, IT training programmes hardly use online resources. These all indicate that there is a need for a national policy in support of universal access to ICT services.

The benefits that ICT can still bring in Bhutan are tremendous. The need of the hour is a proper direction and a central guiding entity. This E-Readiness report is the study of factual ground situation. This document provides a basis for the drafting of the ICT Policy and thereafter the ICT Act to finally lay National Legislations to guide various sectors in their ICT activities. Our politicians and leaders have to make an effort to grasp the basic knowledge on ICT so that vital decisions are ultimately made based on the broad knowledge-based debates.

1 Country Background

1.1 History and demography

Bhutan is a mountainous country in the middle of the eastern Himalayas with a population of about 800,000 covering an area of 46,500 square kilometers. It is bordered by India and China. Within an aerial distance of about 200 kms the land rises from about 100 meters above sea level in the south, which is moderately hot and humid to over 7,000 meters in the north that is extremely cold and mostly uninhabited. Bhutan remained an isolated country till the sixties with modern planned development starting only in 1961 when the first five-year plan was introduced.

1.2 Socio Economy

Bhutan is primarily an agrarian country and agriculture contributes 62% to the GDP[1]. The currency is Ngultrum (Nu) and is pegged at par with the Indian rupees. Bhutan has a per capita income of US$ 1,412[2] and ranks 140 in the United Nation's Human Development Report, 2002. Since the 9th Five Year Plan (1992-2002), the Government has significantly prioritized private sector development. This sector is becoming a major entity to take stock of unemployment that stands at 1.4%[3]. The civil service is a major employer. Hydropower is the major source of revenue and major projects like Chukka, Basochhu, Kurichhu and Tala, will substantially increase energy generation in the future. It is estimated that Bhutan's rivers have a capacity to generate 30,000 MW of hydropower and with India as the major market this sector is very promising. Balance of payment problem persists with India due to heavy reliance for most domestic, agriculture and industrial imports. Diversification of exports and imports, increased revenue from hydropower exports and the flow of foreign aid will ease this.

[1] Central Statistical Organization, Bhutan, 2001

[2] United Nations Human Development Report, 2002

[3] Unemployment figure is for 1999.

1.3 Legal and Institutional framework

The King is the head of state. The National Assembly, which was established in 1953, has 150 members. 105 are *chimis* (peoples' representatives) who are elected directly by the public for a tenure of 3 years, 10 elected representatives of the clergy, and 35 representatives of the Royal Government of which 29 are nominated by the King and six are elected Cabinet Ministers. Each year the position of Prime Minister is rotated among the ministers. With the recent restructuring of the government, there now 10 Ministries. The judiciary is an independent entity. The High Court is the highest court of justice and the Throne is the ultimate institution of redress and clemency. There are twenty districts in Bhutan and the district administrator called *Dzongdag* is the administrative head of each district. Districts also have their own district courts. The *Dzongkhag Yargay Tshogchung* (District Development Committee) established in 1981 coordinates development activities in districts. With increasing decentralization, the 202 *Geog Yargay Tsongchung* (Block Development Committees) handle development programs at block level. These Committees are the lowest political establishments in the country and are headed by G*ups* (village head). After the implementation of the decentralization policy they have been holding substantial financial and administrative authorities.

All National Acts are debated and adopted by the National Assembly. Private legal practice is also gaining momentum where certified practitioners called *Jabmis* run legal businesses. The Constitution Committee is drafting Bhutan's first written Constitution and will be debated soon for adoption. The Judiciary Bill, the Election Commission Act and People's Representation Act will also be prepared. These democratic instruments will work within the structure of an established and historical hereditary monarchy.

Regulatory and policy activities in information and communication technologies are carried out by two principle organizations within the Ministry of Communication. The Bhutan Telecom Authority (BTA) is the telecom and broadcasting regulator that oversees tariff and licensing policies. The Division of Information Technology (DIT) oversees capacity building, promotion, certification and standardization of ICT activities. A number of regulatory reorganization is expected due to the recent creation of various regulatory divisions within the new Ministry of Information and Communications. The Department of Information Technology will soon prepare an ICT Act. Bhutan Telecom is a state-owned telecom service

provider and has a Board of Directors. Druknet, an entity fully owned by Bhutan Telecom, provides Internet services.

1.4 Government

There are six Ministries namely: 1) Ministry of Health and Education, 2) Ministry of Agriculture, 3) Ministry of Home Affairs, 4) Ministry of Foreign Affairs, 5) Ministry of Trade and Industries and 6) Ministry of Communications. But four new Ministries have been created mostly through the bifurcation of the current Ministries. The new Ministries are 1) Ministry of Information and Communications, 2) Ministry of Public Works and Human Settlement 3) Ministry of Labor and Employment 4) Ministry of Industries. Each ministry has a number of departments and independent agencies under them. Many service departments have been deregulated as state-owned corporations. The working relation between the various ministries and districts are quite complex. District administrators supervise all respective district sector heads. The district administrators report to the Ministry of Home Affairs and respective ministries monitor individual sector activities in districts. Therefore, the district activities are performed in an integrated and coordinated manner.

1.5 Development Approach – GDP vs GNH

Policy makers in Bhutan believe that socio-economic development and its indicator, Gross Domestic Product or GDP measures economic well being of citizens. It does not measure the satisfaction or happiness in people. This is not a development objective in Bhutan. While GDP is certainly considered an important aspect of such a measure, the fundamental issue in any development plans or strategies should be to address the length it goes to satisfying the beneficiaries on all aspects. Besides mere economic outcomes, it includes their social, cultural, environmental and religious satisfactions. The aggregate measure of such achievement is Gross National Happiness (GNH). It addresses the Bhutanese culture, its pristine environment and its religion and has been adopted as Bhutan's long-term development strategy.

An excerpt on Media and Information Technology from the "Development towards Gross National Happiness" reads as:

> *"The new world of information technology is both a promise and a challenge. The Royal Government has identified information technology as one of the tools to develop efficient administration and economy. It will influence education, production and marketing and make decentralization more feasible. Media is developing rapidly; newspapers, radio and television (publicly introduced in June 1999) services can offer tremendous potential in all areas of our national life. Both IT and the media are going to bring changes to our culture and daily life, which can now only be dimly discerned but which we must consider and for which we need to prepare."*

2 Project background

2.1 The DIT

The Department of Information Technology, DIT falls under the administrative umbrella of the Ministry of Communication[4]. In cooperation with the Bhutan Telecom Authority, BTA, it overlooks all ICT activities with special emphasis in supporting the development and promotion of IT in the private sector. The DIT plans, implements and overlooks ICT activities throughout the country. It is the central agency for standardization of networks, applications and equipment. Some of its major activities are the preparation of an ICT policy and regulation, implementation of national ICT activities, capacity building and cross-sectoral promotion of ICT in the country. After the liberalization and deregulation of all computer-based businesses, the activities of the CSC were slowly terminated and the CSC office itself was closed. However, DIT was established to carry on ICT regulation and equipment standardization in the country that was major activities of the erstwhile CSC.

2.2 The project

There is an increased emphasis on the critical role that ICT should play in Bhutan's development. This is indicated in Bhutan Vision 2020 document. To compliment such national objectives, the United Nations Development Programme[5], UNDP extended financial support to the Ministry of Communications to implement the project on "**ICT Institutional**

[4] When referring to Ministry of Communication, we are referring to MOC before bifurcation.

[5] http://www.undp.org.bt

capacity building and Policy Support for the Ministry of Communications". The DIT is implementing this project. Important objectives of this project are:

- Develop an ICT policy and an ICT Act.
- Establish a LAN system at the Ministry of Communication and a Management Information System.
- Capacity building at MOC (PPD, DIT, BTA).

The E-readiness study is being undertaken as a sub-component of the policy support to provide a reference and baseline for the actual drafting of the policy.

2.3 What is E-readiness?

E-readiness was generally defined as the extent of readiness in access to network infrastructures and technologies. In most countries including Bhutan, it goes beyond this generic definition to include various other factors. This evolves from the importance given to basic infrastructures in the eighties and nineties to more emphasis on the socio-economic dimensions of technologies today. Societies at large are increasingly empowered in decision-making processes and such achievements may not have been achieved without timely introduction and use of such technologies. Since the Maitland Report on the "Missing Link", countries have in fact seen the evolution and passage through such important debates as the Global Information Infrastructure, GII and to the issue of Digital Divide within the short span of twenty years.

Bhutan has experienced all of these three phases, each time making a positive development in each of the areas. During the mid-eighties, there was lack of adequate networks and services. Only a few people could call outside the country. The regions were virtually isolated from each other and most of the people had not even seen a telephone. This prompted the establishment of the first microwave radio link outside the country in 1985. A national digital network and an international switching exchange were established and Bhutan truly became a member of the global information family. Today there is more focus in narrowing the digital divide within the different sections of the Bhutanese society itself. But this new realization has to be supported through appropriate ICT policies and regulations so that development

activities are implemented effectively and efficiently. To enable such frameworks, an assessment needs to be done to see the real magnitude of requirements in the field of ICT.

E-Readiness is about readiness in human capacities, political leadership, institutional frameworks, supportive policies, complimentary regulations, business environment, investment opportunities, and public-private partnerships in technologies. All these factors play their own corresponding roles in Bhutan. The underlying concepts on the above issues are the mutually complimentary issues of e-economy and e-society.

This e-Readiness assessment report will provide a guidance and reference to cross-sectoral ICT developments. It is a comprehensive documentation of all e-activities in the country and is a robust and in-depth analysis of the current ICT situation. It provides a subjective analysis of the strengths, weaknesses, opportunities and threats. Ultimately, it shall provide a subjective demonstration of Bhutan's e-Readiness position according to the standard method of assessment developed by Harvard University's Centre of International Development. This method is very suitable and is widely used in assessing e-Readiness in the leased developed countries. However, there is substantial change in the approach we made. For example, we did not find it much of relevance to provide scores for each of the parameters.

As it is evident from the schematic illustration, e-readiness is built upon a number of conceptual steps in the country[6]. In Bhutan it starts with a range of ready parameters such as an IT literate user base with the right kind of attitude. There should be a national drive to promote ICT activities and uses with adequate resources in place. More important the Bhutanese economy, which is still in a very early stage of development, should be ready and geared towards embracing information technologies. The governance structure has to be molded to suit such objectives with a strong political will.

[6] This approach is designed by Mr. Gopi Pradhan, GMCT Consulting (gopi@apdip.net) and may not be reproduced without prior permission or visible reference of source.

The schematic process of such readiness is illustrated below.

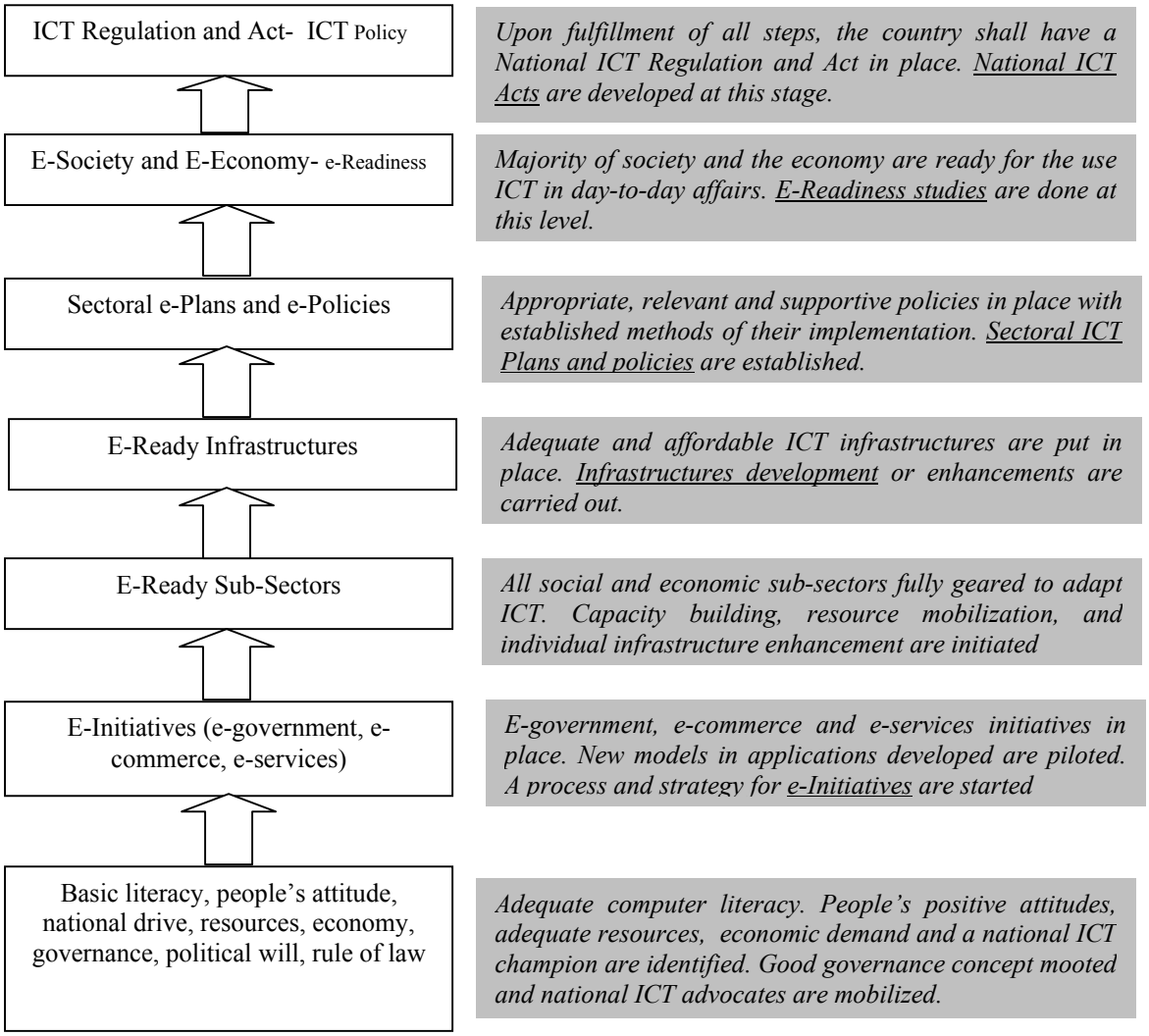

Figure 1- The E-readiness Bottom-Up process

Such setup should lead to a number of initiatives in governance, commerce and trade and in the services sectors. Government has to prepare innovative and practical e-government projects. The private sector has to be encouraged to adapt electronic commerce and the services sector needs to be aligned towards providing online services. Such initiatives will then prepare e-ready sectors in all areas including education, RNR, health, etc. Then there should be an assessment on the extent and appropriateness of infrastructures. Such assessment should result in a proper planning and recommendations on additional networks, hardware and systems to be put in place. Based on these assessments, Bhutan should come up with proper policies and legislations to support overall e-development. This should then result in a vibrant and working e-society that is literate and adaptable to ICT solutions and services and an e-economy that creates opportunities and enhances businesses.

2.4 Approach and methodology

A customized framework of bottom-up approach basically guides the E-assessment study. Study started with the review of all related documents from various sectors. National policy documents were also studied. Web and print sources were used to obtain country's socio-economic and other information. A number of previous studies of such nature and documentations were reviewed. All these reports were valuable resources of information and perspectives from a broad spectrum of stakeholders. They provided technical, social, economic and political viewpoints in their own environment from across different political and socio-economic angles.

A list of interviewees was prepared. They included government, quasi-government, private sectors, academia and non-government agencies.

E-readiness study tools were reviewed and the Harvard University's CID method was found to be the most relevant for e-readiness study in Bhutan. But this method was modified to suit our study approach.

The study also includes e-readiness assessments in six districts in Bhutan. The district sample reports present a comparative view of the national and the district assessments. Fruitful discussions and meetings with the management of DIT and the MOC provided good feedback and inputs to the report. Private sector survey on the subject of ICT activities was carried out at Thimphu and the 6 districts. Fifty firms and individuals were selected at random to acquire their perspective on ICT. An IT vendor survey was also conducted during the Vendor meeting in relation to ICT policy on 26th May 26, 2003.

3 ICT situation in Bhutan

The development of information and communication technologies can be divided into three major components in Bhutan.

3.1 Policy and regulation

There were no regulations and policies in the past in the use of telecom systems or computers. Activities were implemented as and when resources were available and in many case on ad-hoc basis depending on the availability of external project funding.

The Bhutan Telecom Act and the Frequency Regulations adopted in 1999 are the first ICT-related policy documents produced. In the new structure the Bhutan Telecom Authority probably will be reorganized as Bhutan Communication Authority to include media and postal regulations in addition to telecom and radio regulations activities. Various Acts and Regulations in the Ministry of Communications provide very effective and useful guidance for ICT development. Rampant use of frequencies have been streamlined now as a result of the Frequency regulation. The Ministry of Communications is planning to prepare Media Legislation within the 9th Five Year plan period[7] and will provide regulatory and legislative guidance and framework in areas of print, broadcast, multimedia, audiovisual and films. An ICT Policy and an ICT Act will also be in place soon to support the development of information and communication technologies in public and the private sector. Other policy guidelines and regulations such as online content regulations, information management and a national e-Commerce Policy and Act should also be prepared. The Civil Aviation Act, 2000 provides policy and regulatory support to the activities of the aviation sector. The Department of Civil Aviation administers this Act and is the key aviation organization that coordinates with the International Civil Aviation Organization.

The Ministry of Communication has been bifurcated into two Ministries i.e. "Ministry of Information and Communications" and "Ministry of public works and Human Settlement"[8]. This plan is based on realization on the extent and importance that information and communication technologies play. It is also to compliment an information-rich and knowledge based Bhutanese society. The success of such a move will ultimately be measured by the extent of socio-economic benefits that people of Bhutan have reaped through the use of ICT in their daily lives.

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[7] 9th Plan period is July 2002 – June 2007

[8] *Enhancing Good Governance: Promoting efficiency, transparency and accountability for Gross National Happiness* – Cabinet Secretariat, 1999

3.2 Infrastructure

Information and communication technologies have a very short history in Bhutan. The first telephone lines were established in 1963 and computers were brought only in the eighties. By 1985, there were approximately 530 kms of overhead telephone cables carrying 12 pairs of copper cables, each pair used for one voice circuit. While there was hardly any major use of long-distance trunk lines, the maintenance of the physical networks was very difficult and laborious. Making telephone calls outside Bhutan was not possible. An analogue microwave system was established in 1985 connecting Thimphu and Phuentsholing to some Indian border towns. This was a very significant development as people, at least in the western region, could then make limited calls to India. The first digital switching exchange and an INTELSAT satellite earth station were commissioned in 1990. International telephone calls were routed via the Madlay's station in the UK. The volume of international traffic remained substantially low for the initial period, as telecom network was not available outside Thimphu. The state of telecommunication development however changed after the establishment of the domestic telecom network. This was the result of the Telecom Master Plan developed with financial and technical assistance of the UNDP and the ITU in 1989.

The Government of Japan funded the implementation of the Master Plan in three phases between 1992 and 1999. During the first phase of the project a 34 Mbps backbone digital microwave radio link was established between Thimphu in the west and Trashigang in the east. Installation and commissioning of digital telecom systems in other districts and towns were fulfilled in subsequent phases. All districts and urban centers in the country are interconnected into the telecom network.

There is an estimated 21,500[9] telephone users today with total exchange capacity of 26,000. The table provides list of major telecom infrastructures in the country.

[9] Source: Bhutan Telecom

Though this amounts to an overall teledensity of 2.90%, it can hardly be representative of the actual scenario. Most of the rural areas still do not have access to a telephone Three major towns: Thimphu, Phuentsholing and Paro contribute about 65% of total users. Compared to telephone and Internet, the reach of broadcasting and print media is much broader in the society. The number of telephones provided to rural and remote locations is also increasing. Recently two new telephone exchanges have been established at Dremtsi and Bartsam in eastern Bhutan while the capacity of the Kanglung exchange has been increased.

Satellite Station Type 'A'	1
VSAT/DAMA	16
International switch	1
Local digital switch	8
Remote Line Units	12
M/W Active Repeaters	13
M/W Passive Repeaters	13
DRMASS repeaters/base	25+9
DRMASS terminals	36
VOIP Stations	2
Home access line facilities	26,000

Table 1 - Telecom infrastructure information

The DIT will implement a Dzongkhag Network Project to facilitate storage and use of information in district planning processes. The Planning Commission is also implementing its own planning network in the district offices.

3.3 Computers and Mass Media

Computers were first brought into the country in the early eighties. One important reason for this late entry of computers was the lack of a stable power supply then. Chukka hydropower project was completed in late-eighties and Bhutan until then, did not have any reliable source of electricity. A diesel-generator was used to light up Thimphu before that. The Computer Services Centre, CSC was the first government initiative to deal with computer imports, installations and maintenance. This center does not exist now. The government remained the major importer and user of computers and private individuals and companies hardly bought computers.

At present there are 16 IT-based firms in the country. They include suppliers, services and maintenance centers. Though the number may be large, a few prominent firms dominate the computer market. There are 18 computers training institutes that include only one government institute.

Kuensel is a very important source of information and news in Bhutan. It publishes the weekly paper in three languages, Dzongkha, English and Nepali. Every week it produces about 20,000 copies in these three languages. The English version has the maximum subscription and the Dzongkha and Nepali publications are predominantly popular in rural and remote areas. Though the volume may be low, Dzongkha edition is by far the most penetrated paper. One of the constraints of the publication is the long time that it takes to reach the remote districts. In some instances, it takes as long as a week. This is attributed to the poor transportation network. Given these physical constraints, ICT would play an important role in the print media.

Though Kuensel readership is about 1:14 given the literacy rate of 54%, the percentage of people who read Kuensel is far too high. This is based on the general habit of Bhutanese to share and read mainly in rural areas. For example, a copy of Kuensel in a Gup's office would be read by a number of people visiting the office. This is further compounded by the fact that Bhutanese generally have large family size and a household would normally subscribe to a copy of the paper. Thus it can be said that the readership of Kuensel is very high among the literate population in the country.

Radio broadcasting was started in 1974 as a hobby by group of youths. The short-wave broadcasting was called National Youth Association of Bhutan (NYAB) radio. This broadcast mainly focused on entertainment programmes and there was no regular news programmes. Daily news and development-related programmes are aired everyday for 12 hours today. Due to technical enhancements and upgrades, the SW radio programmes can now be received all over the country. It broadcasts in four languages, Dzongkha, Nepali, Sharchop and English. BBS has introduced very relevant and useful programmes like "Gowa", a discussion forum on important development issues. FM programmes network is being expanded to cover the whole country.

3.4 The digital divide scenario

About 80% of Bhutanese live in rural areas spread over 201 geogs (village blocks) or approximately 2,000 villages in the 20 districts. However, this mass of society takes less than 10% of total telephone connection and less than 1% of Internet connectivity in the country.

This figure also raises the question of how "rural" is defined. There is no basis for such evaluation either. However, from the general observation of the categorization, "rural" can be understood as any place that is away from the district headquarters and commercial centers. The other way to understand is to separate established municipalities from villages. Whatever understanding one may have, the extent of telephone and computer penetrations into rural and remote areas is very poor in Bhutan. However, this is not true for radio broadcasts. The national teledensity is 2.86% but in real terms it is much lower in rural or semi-urban areas. If the three major towns of Thimphu, Phuentsholing and Paro were excluded, teledensity would be 1.39% only. This is a significant influence of these commercial towns. There are some uses of computers in the districts but Internet is still used minimally even at the sector officials levels and it is estimated that about 90% of all homes in Bhutan listen to BBS radio.

Major urban centers are located in the western region that is closer to India with majority of commercial activities. Thimphu, Phuentsholing and Paro contribute to 63% of telephone subscription and the rest of the country share the remaining 37%. If the remaining 18 district headquarters are also to be excluded (Phuentsholing is not a district headquarter), the percentage contribution from rural places becomes extremely low. One way to look at this disparity is the influence of trade and commerce on telephone usage. Telephone usage has been very popular in commercial hubs. There are hardly any justifications to indicate that government activities and physical distance have any influence on telephone usage in Bhutan. This may also be due to access to infrastructures. Likewise, e-readiness would have a mixed representation in Bhutan. A small group of vibrant and economical well-off population may be aspiring to use ICT on a major scale but the majority of population is still vying for a telephone connection. This segregation has to be seriously taken into consideration in policy formulations.

Bhutan's rural people have seldom used computer and most have not even seen one. The government is making every effort to narrow this gap. The ninth plan explicitly emphasizes rural telecommunications and the popular use of ICT applications, particularly e-government systems. By end of the period, every geog will (or should) have at least ten telephones and every geog office will be computerized. Information technology is also a very important agenda for the Education sector. Such initiatives are just starting in the level of tertiary education and it will take a long time to cover all sections of the society. This incubation

period will further deteriorate the extent of digital gap unless rapid programmes and activities are implemented on a homogenous basis commensurate to population density and social needs. This can only be achieved through collective approach and resource pooling.

4 Sectors Studies

4.1 Radio and TV Broadcasting

Bhutan Broadcasting Service (BBS) is the only broadcasting agency for radio programmes in the country. It was started by a group of young volunteers and the historic first broadcast was made on 11 November 1973. This broadcasting group, NYAB was formally renamed as Bhutan Broadcasting Service in 1986 and regular three-hours programmes were started initially. BBS introduced TV broadcasting in June 1999 and it airs twelve hours of programmes today. There is also simultaneous FM broadcasting. A DANIDA project is being implemented to provide FM services in all major towns and urban centers in the country. This nation-wide coverage will be achieved within the 9th five-year plan.

The Short-wave transmitter uses 50KW of transmission power and this signal is received across the country. It operates at 49 meters band 6035 kHz. The Frequency Modulation (FM) services are operated in a number of frequencies within 88.1 MHz to 98 MHz. Bhutan Broadcasting Service television uses a Thomcast transmitter with 1 kW of transmission power at the channel 5, (174-181) MHz frequency.

It is estimated that 90% of Bhutanese listen to BBS radio today. This has largely been made possible due to an efficient SW transmission. One other feature of such penetration is the initiative of the organization to distribute free radio receivers to people and households who cannot afford. A DANIDA and UNESCO funded project enabled BBS to freely distribute 1,600 radio receivers in five districts. New programmes like “Internet Radio” have made radio and TV programmes interactive.

A survey was carried out for selected places on BBS radio and TV programmes in western region in 2002 indicated the following[10]:

- 77% of BBS radio listeners fell in the age group of 15-35 years, 16% in 36-45 years and 7% for 46 to 65 years group.
- 60% surveyed had higher secondary education and only people with primary education contributed to only 17% of radio listeners.
- Majority of radio listeners, 74% were office workers and businessmen. Students contributed to only 20%.
- 95% of TV viewers owned their own television sets and 54% preferred programmes in Dzongkha even though only 7% of surveyed had studied Dzongkha particularly.
- Most of the respondents watched BBS TV from 7-9 in evening.

The BBS has a 64kbps-leased line with Druknet. This bandwidth is used for website access and internal use by employees who are within the network. Recently there have been some criticisms on the BBS website access and content. There is a need to upgrade the content management of BBS website, given the number of Internet users who would prefer to surf news online. The Internet bandwidth to BBS website can be increased and even after doing so, major chunk of the bandwidth needs to be completely dedicated to the news site. Only 30% of the organization employees are technical people and majority of employees are in administration. If BBS has to enhance its radio penetration through FM system, increase TV viewership through a satellite network (only feasible solution for nationwide coverage), then the number of technical staff needs to be drastically increased and trained.

There are a few cable TV operators who provide entertainment TV channels in major cities. Thimphu has the highest number of cable TV subscribers. Survey shows that in Thimphu, Phuentsholing and Paro. 89% of households have access to cable TV and the most popular channels being BBC and CNN news channels. People still look upon entertainment as the main source of acquiring television. This indicates an important strategy for the Bhutan Broadcasting Service in its future programme planning. This need particularly becomes important if privatization is a long-term plan for the organization.

[10] Reproduced with permission of BBS

4.2 Telecommunications

Bhutan Telecom has seven administrative and operational Areas. They are 1) Thimphu Area, 2) Trongsa Area, 3) Trashigang Area, 4) Samdrup Jongkhar Area, 5) Gelephu Area, 6) Phuentsholing Area and 7) Paro Area. Each of the Areas covers a number of districts. These areas were identified taking note of the technical maintenance aspects of the networks.

The installed capacity of telephone exchanges under Bhutan Telecom is around 26,000[11]. This number may be small but this is a ten-fold increase over a period of ten years.

Area	1997		1998		1999		2000		2001		2002	
	TC	TU	TC	TU	TC	TU	TC	TU	TC	TU	TC	TU
Area 1	4,096	4,026	6,752	4,609	6,868	6,093	7,688	7,020	9,224	8,119	11,308	9,362
Area 2	756	377	656	435	824	521	824	701	932	870	1,333	975
Area 3	1,024	431	1,024	510	1,028	671	1,240	985	1,440	1,080	1,568	1,289
Area 4	736	370	736	414	772	552	828	715	1,004	844	1,276	971
Area 5	1,048	502	1,048	608	1,054	745	1,094	885	1,270	1,114	1,730	1,298
Area 6	1,000	984	2,680	1,366	2,680	2,246	2,792	2,748	3,700	3,374	4,300	3,905
Area 7	200	191	1,480	926	1,480	944	1,480	1,126	1,988	1,517	2,116	1,804
TOTAL	**8,860**	**6,881**	**14,376**	**8,868**	**14,706**	**11,772**	**15,946**	**14,180**	**19,558**	**16,918**	**23,631**	**19,604**

Table 2 - Total connection (TC) and total users (TU)

The total user capacity has now reached 21,500 with total exchange capacity at 26,000. Thimphu Area contributes about 50% of all telephone subscription. The capacity demand in Thimphu exchange is particularly high. The exchange capacity will further be increased with the planned installation of a new 5,000-line capacity switching exchange. The Thimphu exchange was bifurcated into two main switches i.e. Simtokha and Dechencholing by using PASOLINK. Within 2 years, these two exchanges are full.

[11] Figure is updated till June 2003

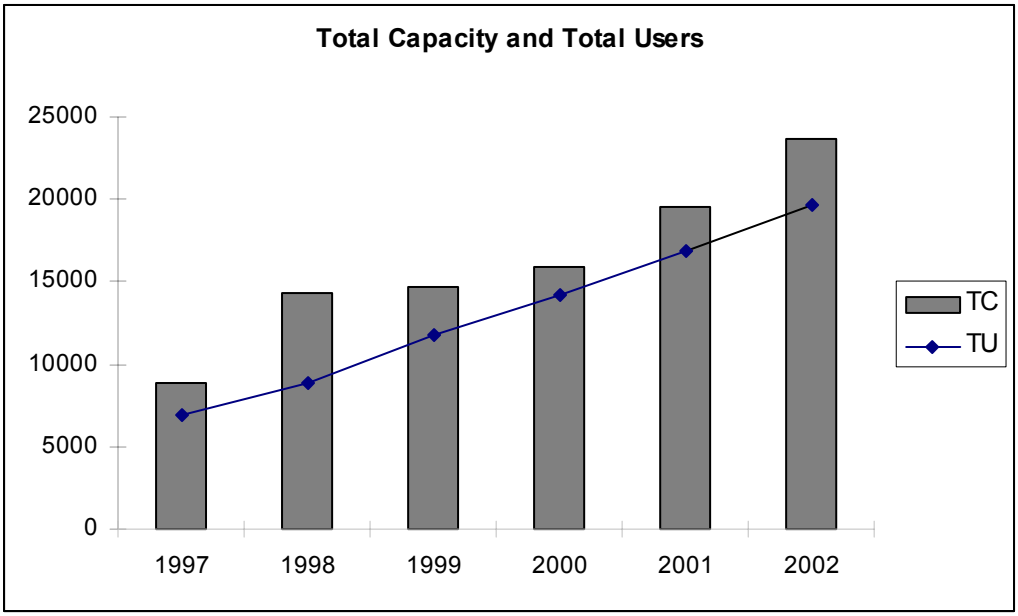

Figure 2 - Total connection vs Total users

There is a matching relation between total capacity and total users as can be seen from the graph. In fact, Bhutan Telecom has always maintained an appreciable gap between the total capacity and total users so that situations of emergencies are avoided.

There is a very good digital telecom backbone network in the country covering all 20 district headquarters and major towns and commercial hubs. Telephone connections in all these locations can be used for data purposes especially for Internet and e-mail. Bhutan Telecom is also implementing a number of other smaller networks to provide access to remote locations. Choice of technology is a big issue in doing so. Due to the terrain and varied climatic conditions, a system in one place may not work in another place with different conditions. There are 16 DAMA (demand assigned multiple access) stations located in remote parts of the country. Motorola's IRIDIUM phones are also used and Bhutan Telecom is the sole distributor of these phones in the country. There are however, no adequate maintenance and service facilities for these kinds of satellite terminals.

Bandwidth

The digital microwave network is a very important backbone network for ICT applications in Bhutan. Besides the routine telephone traffic, this network also caters to other sectoral communication facilities. In fact, there is no other high bandwidth radio network in the

country. Various sectors use customized applications and services by using the telecom network. There are 67*2Mbps PCM channel bandwidths across the different telephone exchanges in Bhutan.

Though bandwidth utilizations between exchanges are minimal, there is a plan to upgrade the network capacities in future between some high traffic segments to meet the growing need for voice and data. The current capacity of 3*2 Mbps PCM (90 circuits) between Thimphu and Phuentsholing will have an additional optical fibre network in future that will probably be connected to the Indian fibre optic network that passes through Hashimara.

International voice circuits are given below:

From	To	Voice Circuits	Remarks
Thimphu	London	14	
Thimphu	Singapore	14	
Thimphu	Japan	6	
Thimphu	India	90+30	Hashimara + Siliguri

Table 3 - International voice circuits

4.2.1 Rural Telecommunications

The government has an ambitious plan to provide telephone to every village in the country. However, such projects are technically challenging and would need huge investments. Robust systems that have possibilities of wide coverage are required. One option would be to hire satellite transponder that has a footprint on Bhutan. Possibility with the Indian communication satellite, INSAT II was once explored but dropped due to resource problem. There will be hardly any interest in such investments from private sector due to the imminent condition of low return on investment and internal loan schemes have very high costs of borrowing. If the ongoing discussion on soft loans goes through, limited rural communication could possibly be implemented.

The objective of the 9th Five-year Plan for the telecom sector is to provide at least 10 phones per geog. Technical survey estimates a total of 6,250 rural telephone lines by the end of the plan period. So far 76 of the 201 geogs (or 37%) in Bhutan have access to telephone lines . The minimum number of telephone lines in each of these geogs is 4. Bhutan Telecom is planning to cover all the remaining geogs through its Rural Telecommunications Project.

This project is being finalized and will be implemented through Mixed Credit scheme of the Government of Denmark. A total budget of approximately US$ 20 million will be required for the project. Technologies such as Wireless Local Loop (WLL), Voice Over Internet Protocol (VOIP) and Very Small Aperture Terminals (VSAT) will be used. Currently there are 3 standards VSAT with Intelsat. The 3.8m-dish standard (F1) is used in 9 locations each providing 12 circuits. These VSAT also serves as backup to the telecom network. There are two standards of 2.4m-dish VSAT (H2 and H3) are use for rural telephones and they provide 4 circuits each.

The cost of providing a telephone in rural areas is estimated to be in the range of US$ 2,500 and US$ 5,000 when cheaper technologies like VHF, VOIP or WLL are used. Bbut with VSAT the cost per line goes up to US$ 17,500 with full power supply. This is extremely high cost of connectivity. The cost of connectivity from DAMA satellite phones is approximately US$ 0.22 per minute or Nu 10 per minute. This cost is applicable even for a local call as long as the DAMA station is use. With additional charges, the cost for local calls using such technologies could go as high as Nu 15 per minute. However, Bhutan Telecom charges only Nu 8.00 for such calls thus subsidizing substantially.

4.2.2 Tariff Structure

4.2.2.1 Domestic long distance

Peak (Nu)	Economy	Discount	Detail
7.5 per minute	6 per minute	4 per minute	One area to another
5 per minute	3.5 per minute	2.5 per minute	One district to another in same area
2 per minute	1.5 per minute	1 per minute	Between exchanges same area
Nu 1.0 per unit (1 unit is 3 minutes for voice and 1 unit is 4 minutes for data/Internet)			LOCAL
Nu. 8.0 per minute irrespective of time and place			DAMA

Table 4 - Domestic long distance tariff structure

Telephone tariff is based on calls made from one area to another or from between districts within the same area and between exchanges within district of the same area. The PSTN tariff for data services mainly for Internet has been reduced by 25% recently.

4.2.2.2 International

Charge Bank	Peak rate	Off Peak rate
India	Nu 19 per minute	Nu 15 per minute
SAARC	Nu 32 per minute	Nu 29 per minute
Group I countries	Nu 45 per minute	Nu 41 per minute
Group II countries	Nu 55 per minute	Nu 50 per minute
Rest of the countries	Nu 65 per minute	Nu 59 per minute
Thuraya phones	Nu 72 per minute	Nu 65 per minute
Iridium phones	Nu 72 per minute	Nu 65 per minute
Inmarsat phones	Nu 100 per minute	Nu 90 per minute
Other satellite devise	Nu 100 per minute	Nu 90 per minute

Table 5 - International tariff structure

The countries in Group I and Group II are defined by Bhutan Telecom based on the volume of tele-traffic between the countries. The group of countries can be availed from the website of Bhutan Telecom (www.telecom.net.bt).

4.2.3 Bhutan Mobile

A mobile phone project is currently been implemented. Completely owned by Bhutan Telecom, this project will provide various services such as mobile to fixed, international calls, SMS, fax mail and other features. Tariff will substantially be higher than the PSTN arrangements. Given the possible high call charges and as well the high security deposits required for such facilities, mobile phones would hardly address the affordability concerns of telephone services in Bhutan's rural population. One important feature of the mobile phone is however, its mobility. It is this feature that will help villagers or government officials working in remote villagers to be able to use telephones for their work.

4.3 Internet

The circuit and bandwidth details for Internet traffic is shown below:

From	To	Bandwidth	Remarks
Bhutan	KDDI, Japan	1 Mbps	
Bhutan	BT, London	1 Mbps	
Bhutan	North America	640 kbps	Via Germany Intelsat Station
Bhutan	Singapore	64 kbps	For SITA

Table 6 - International data bandwidths

There are approximately 1,600 Internet dial-up account holders with Druknet and 26 leased lines. No private sector companies, besides their size of business, have subscribed to leased line.

The number of leased lines for Internet is 26, all of which are used by government, semi-government or international agencies. Not a single private company has a leased line access.

The number of dial-up users does not represent the number of Internet users from Internet Cafes who would not necessarily have dial-up accounts. It is also estimated that as much as 1,050 computers are connected to the Internet using these leased lines. The list of organizations with leased line and the corresponding bandwidth is given below:

Sl. No	Leased Line	Bandwidth
1	UNDP	128 Kbps
2	Telecenter	64 Kbps
3	Netherlands Development Agency, SNV	64 Kbps
4	Convention Centre	128 Kbps
5	Ministry of Finance	128 Kbps
6	Royal Civil Service Commission	64 Kbps
7	Kuensel Corporation	64 Kbps
8	National Environment Commission	64 Kbps
9	Bhutan Power Corporation	64 Kbps
10	Ministry of Trade and Industries	128 Kbps
11	Royal Institute of Management	64 Kbps
12	Ministry of Agriculture	128 Kbps
13	Health Department	64 Kbps
14	JDW National Referral Hospital	64 Kbps
15	Bhutan Broadcasting Corporation	64 Kbps
16	Division of Information Technology	64 Kbps
17	Royal Monetary Authority	64 Kbps
18	Royal Audit Authority	64 Kbps
19	World Health Organization	64 Kbps
20	Ministry of Communication	128 Kbps
21	Japan International Coo. Agency	128 Kbps
22	Bhutan Telecom	256 Kbps
23	Sherubtse College	128 Kbps
24	Mongar Hospital	64 Kbps
25	UNICEF	64 Kbps
26	Royal Bhutan Institute of Technology	64 Kbps

Table 7 - Leased line subscribers in Bhutan

4.3.1 e-Services

With the optic fibre backbone coming into implementation between Thimphu and Phuentsholing from the end of 2004, BT is exploring new usages. It can easily support the transmission of Video, Radio, cable TV etc. signals. Based on its success, similar projects may be undertaken to link to Gelephu and the East.

4.4 Health

Health Department has provided computers in all 29 Dzongkhag hospitals. A database application Health Management Information System (HMIS) is used to record the infrastructure and staff, patients and diseases. The hospitals in Mongar, Gelephu and Thimphu have started a telemedicine project, which includes attaching X-Ray, Ultrasound and ECG images and transferring them via e-mails. IT focal point receives the mail and talks to the concerned doctor/specialist for advise. The focal person then types the diagnosis and prescription and sends to the originating hospital. About 4-5 such mails are being exchanged per week through the focal person.

Hospital in Thimphu is equipped with a local area network, leased Internet connection and good number of computers. Computers are housed in a common place and are accessible to the doctors. The expansion of telemedicine, tele-radiology and initiating e-health education is high priority. This will enable accessibility by doctors to the literatures of discussions in Thimphu hospitals as well as be able to communicate and access information from hospitals outside the country. A brief study to connect to hospitals in Thailand has been unsuccessful.

A hospital management system at the JDWNR Hospital is a most urgent requirement. This could be used to register and schedule appointments of the patients. It could avoid the long queues at the Reception and Doctors' chambers. This will help the patient as well as the doctor to plan the day. After the first visit, every patient will have his/her history available in the database for future reference. Officials at the hospital are skeptical of such a systems and its maintenance mainly due to lack of guidance and idea on such implementations. DIT has agreed to assist them in understanding and implementing a simple system.

4.5 Education

The education sector does not have any policy framework on ICT for Education. However, a number of plans and activities are implemented on a continuous basis addressing the basic objective of computerizing as many schools as is feasible and possible. The Department has an ambitious plan to provide computers in all schools in Bhutan. While these desires are not appropriately complimented by matching resources, they do show the vision and jest.

The use of computers in the education is extensive. But this use is concentrated in some segments of the education institutions. With more than 400 computers excluding offices, this sector probably has the highest number of computers in any organization. However, they are available only upto the level of High Schools. Each of the 35 high schools has on average four computers but without Internet connectivity. Sherubtse College and the two National Institutes of Education at Paro and Samtse have more than 40 computers each. They also have their own internal networks. Within the headquarters in Thimphu, the various sections are located at different and considerably far distances to each other. Such arrangement can have one single network but will be costly.

There is plan to provide at least a computer to every school in Bhutan. They need not have Internet facility. Providing Internet to some of the remote and rural schools is virtually impossible due to technical challenges and limited resources. The government has committed an annual Nu 5 million towards computerization of schools programme. More than 300 computers have been purchased during the last three years. Most of the high schools have also started optional computer courses. Sherubtse College has a regular degree programme in computer science. It has also introduced a post-graduate degree on IT for teachers. This course is conducted in winter vacation and more than 100 teachers are already trained. This is an important strategy towards school computerization. One area that Internet might be used on priority is in the Resource centers. This center is an ideally located school identified within a cluster of schools and where specific subject teachers can gather and discuss. Within the 9th five-year plan period, 30 such RCs will be established and interconnecting these RCs and facilitating a method of communications between them will be useful and productive.

Distance learning for teachers, conducted by the National Institute of Education, is paper-based. ICT can be very useful to enhance the current method. An IDRC project is underway in NIE to develop a web portal for e-education. After a leased line is setup and this portal is activated, it will be easy for teachers to carry out much of their studies online. However, there is a fear that unless long-term commitment by government to subsidize or supplement the high leased line cost comes through such service will face difficulty.

The education department's website (http://www.education.gov.bt) is a useful place of information, particularly during the time of school results. More than basic information, it

does not provide much of online and interactive content. Internet in the education HQ is used through a dedicated leased line but it is very slow. This is due to the high number of computers connected through the network and using the same bandwidth. There are no official figures as to how many schools in Bhutan have websites. Private schools use computers more than government schools. Kelki High school is a private high school in Thimphu and has a fully equipped computer lab with more than 20 computers and an IT teacher.

Schools	Number of Schools		Computers by 2007
	2004	2007	
Higher Secondary School	12	33	33 schools x 20 computers
Middle Secondary School	27	34	34 schools x 20 computers
Lower Secondary School	65	100	50 schools x 15 computers

Table 8 - Plan to install Computers in Schools by 2007

4.5.1 Open source technology

Open source system like Linux OS will benefit the Bhutanese schools. More than free, such systems provide a platform for self-learning that would be highly educative to children. The education sector can hardly afford to buy software applications for all schools and institutions. There are advocates and supporters of open source technologies in the education sector but they have strong and valid fears in its wide use in schools' curriculum. Most, if not all, public and private offices use standard closed programs like Windows. When children come out of schools, employers look in job seekers some skills in such popular applications. Students who have been exposed to open applications, like Linux, therefore will have very weak competitive advantage in the market.

Strengths	Weaknesses
• *Strong English skill* • *All 35 high schools have at least computers* • *Adequate penetration of education system around the country* • *Very ambitious ICT Education Master Plan* • *Appropriate organization structure to address ICT in education* • *Sustained government support*	• *Teachers not trained in ICT and computers* • *Quality teacher education needed* • *ICT curriculum is static in teacher institutes as well as in schools* • *Education syllabus does not prioritize ICT education* • *Very few schools have computers*
Opportunities	**Threats**
• *Would create employment* • *Distance Education will close the education gap* • *ICT products can be produced by students as projects and encourage business* • *Students can communicate with other students from outside* • *Education network will save costs* • *Intranet in each school* • *Will keep students upto date with technology* • *Students will be competitive in job markets* • *ICT literate children as agents of change in the country*	• *Not enough budget from government* • *Donor assistances not continuous* • *Sector might be left behind Technology* • *Electricity supply inadequate in all schools* • *Inadequate maintenance people* • *Lack of softwares* • *Lack of funds for Internet subscription*

Table 9 - Education SWOT

4.6 RNRRC

Under the Ministry of Agriculture, 4 Renewable Natural Resource Research Centers (RNRRC) are set up at Yusipang, Bajo, Jakar and Khangma. All RNRRCs have installed local area networks since 1999 through the UNDP. All RNRRCs have a dial-up Internet connection through the LAN. The Ministry has a 64 kbps leased line and hosts its own website (http://www.moa.gov.bt) which is maintained by Information Communications Service (ICS).

RNRRCs do not share electronic information among each other - only hard copies of information are being provided. Each RNRRC could be provided a space within the MOA website which can be updated directly. There are no common applications and databases in use. An application for "Monitoring and Evaluation" is under construction to be deployed over the web for regular updating of information. A consultant has been hired to complete the project by the end of 2003. Major problems faced by the Ministry and RNRRCs are the lack of technical manpower.

RNRRC, Yusipang has 25 computers on 2 isolated LANs to share the Internet connectivity. LAN is used for sharing printers and Internet. All the staff has undergone Basic Computer Course.

4.7 Private Sector

The growth of private sector enterprises did not see any major transformation in the 40-year development history of Bhutan. Only 9,000 industrial and 12,000 trade licenses have been issued till now. There are 124 registered companies under the Company Act. Hydropower is the major source of revenue. Bhutan Power Corporation manages and operates electricity. Most of the business establishments in Bhutan are small and medium enterprises that have less than 10 persons on their payroll. About 80% of all businesses including most of the IT firms come under the SME category. Travel agents and tour operators that are major users of Internet and computers also fall under this category. A World Bank[12] survey found that there are adequate number of IT facilities in the private sector firms and establishments but they are underutilized. 62% of all private sector firms use Internet, e-mail and fax/telephone.

Country	Monthly leased line fee in US$	
	64kbps	128 kbps
Bhutan	625	1,015
India	476	734

Table 10 - Monthly leased line fee

The high cost of Internet, lack of appropriately skilled employees, high cost of external IT professionals and underdeveloped ICT regulations are cited as major constraints to the growth of ICT in private sector. Computers are hardly used for any other purpose than simple desktop works. The underutilization of computers can be attributed to the low affordability of Bhutanese users. As can be seen from Table 10, the leased line costs in Bhutan are in fact comparable to India. The lower usage in private sector therefore, can possibly be attributed to low affordability in respect to the earning capacities of these firms.

[12] Source: "Private Sector Survey, 2002", World Bank sponsored survey carried out in 2002 with cooperation of World Bank, BCCI and the MTI

If Internet charges are affordable, the small and medium enterprises can use them in various ways that would certainly have a positive impact in their development. Most of the websites are static information pages and business through such web medium is extremely low. No major business establishments or banks have leased lines with ISP. Due to the nature of data and information exchange between banks, this is indeed very surprising. The use of computers for production control and automated inventory management are seldom seen besides a few factories.

Lack of IT professionals in the market is a huge impediment to the widespread use of the Internet and computers. Survey found that 14% of established private companies have at least 5 computers in network. Company websites are simple and static pages of information. There is not a single website that facilitates online information sharing and services.

As Bhutan has high English literacy, there are opportunities in the area of call center business. While it will be difficult for Bhutan to compete with such IT giants as India in software and application developments, there are obviously promises for acquiring outsourcing businesses on ICT businesses. But this demands a robust and efficient node for private sector development.

The government is also taking a number of initiatives to promote ICT. Import duty has been lifted for computers and networking equipment. The government should outsource its IT related activities, like website development, hosting and management to private firms. The BCCI is looked upon to play more proactive role in fostering the growth of private sector and this has to be done at all fronts starting with its own capacity building. Government should also look into possibility of availing internal training facilities in ICT, rather than sending candidates outside the country.

4.8 Planning Commission

Planning Commission is developing a web-based Planning Information Network (PIN) for the collection and updating of following primary data:

- Geog profile: population, topography including 12 sectors like Health, Animal Husbandry etc. The system also provides for basic analysis of data.

- Consumer Price Index and
- Monitoring and Evaluation

The project is expected to be a success if the sector heads at the districts can update the information on a timely manner. In order to do so, all sector heads need to have access to the Internet through a Local Area Network at each district. So Planning Commission is piloting local area networks in Thimphu and Paro districts. Rest of the districts is expected to have a LAN installed through a DIT initiated project funded by Government of India within 2003-2004. These LANs will be highly beneficial for number of central applications like Zhi-Yog (Personnel Information System of RCSC), BAS (Budget & Accounting System of Department of Budget) etc.

The PIN was conceptualized in Nov 1999 and development started in November 2000 under Japanese HRD fund. UNDP is scheduled to end the project in December 2003. Besides the development of the databases and provision for its retrieval through the Planning Commission website, the project is providing LAN in Thimphu and Paro districts; 3 computer sets (Pentium IV) and two rounds of training programmes by the Planning Commission staff in each districts:

- First round on use of computers to all staffs in all districts completed at the end of 2001. The course included basic computer operations, MS office and troubleshooting.
- Second round was provided to core group (selected from the first round) in MS Access and troubleshooting.

The development works are being carried out by Japanese volunteers and consultants supported by national counterpart of the Planning Commission.

4.9 Kuensel Corporation

Kuensel produces and sells about 20,000 newspapers in high quality paper. Being a weekly paper the news are already known to the customers through the BBS TV, Radio and websites. Readership is also low due to the sharing habits, high cost of the paper, not much information to encourage students, late arrival at rural locations etc. Sales occasionally go up when inserts like calendars are placed. With the idea of increasing the sale of the newspaper, Kuensel is exploring the possibilities of setting up additional printing press in Tashigang; publishing bi-

weekly issues, engage competitive transporters, engage sales boys in towns and offer discounts to hotels and schools. The cost of production of Kuensel is estimated at Nu. 20 per paper. However the paper is sold at Nu. 10 subsidizing the difference by advertisements.

With the launching of the websites- initially (www.kuensel.com) from Malaysia and later (www.kuensel.com.bt) on DrukNet and finally http://www.kuenselonline.com from USA, Kuensel has a global presence with high rate of hits of about 2,500 per day. Kuensel feels they could provide better service by hosting outside Bhutan with higher up-time.

Language	Copies sold	Pages
English	12,000	20 pages
Dzongkha	5,000	20 pages
Lhotshampa	<100	5 pages
Total	**20,000**	

Table 11 - Kuensel production by language

Place	Copies per week
Thimphu:	5,000-6,000
Chukha/Pling:	2,000
S/Jonkhar :	400-500

Table 12 - Major Sales of Kuensel by location per week

4.10 Post

Modern postal service is one of the oldest public services in Bhutan. Since its start in 1962, the erstwhile Department of Posts ("Bhutan Post" now) has built up a nation-wide network of post offices. There are currently 107 post offices in every corner of the country and many of them are located in some of the most inhospitable and remote places. There are about 250 employees in the organization. Unfortunately, only one person can be categorized as an IT professional who has some basic skills in networking.

Traditional postal market was diluted with new ICT applications and services that came in the market, business diversification was difficult as postal organizations failed to adapt to new business challenges. In order to sustain business and cope with the challenges, Bhutan Post started business diversification and in many instances, investments were made in wrong ventures. As a result, poor financial performance discouraged private investments slowing the privatization process as a whole. Until recently, there was no effort at all to introduce ICT applications and services.

The opportunities provided by ICT are enormous in Bhutan and it is this promise that the organization relies on as it moves into new ventures with new business models in the coming days. Bhutan Post, with its enviable physical network and as due to its public transportation business, can exploit ICT to the fullest.

4.10.1 Case Study – E-Post

E-post is a concept where every household or individual (where possible), is provided an e-post identity. This is basically an e-mail address but is a self-representative e-address of the user. Users can be the household or an individual in a family. The address database is fed into a database and ideally; the address clearly identifies the physical location of the user. Using this identity, users will be able to send and receive electronic mails and attachments. But e-Post is about the integration of traditional post and the Internet. Similar to postal mails, users can send mails, photos, cards, or attachment files via these e-mails. These can be printed at nearby Post Offices and delivered with a nominal printing and delivery fee by postal staff. This delivery is facilitated by the "self-representative" e-Post identity that have been assigned and stored in databases. A post office will be able to download only mails under its jurisdiction and service area.

To give an example, let a district or region have a common national code "A", and a village in that area be represented by "4". Thus a household in this village can possibly be given an e-post address of A4xxx@bhutanpost.com where 'xxx' after 'A4' is the house number. Similarly an individual's identity within that particular household can be extended as A4xxxyyy@bhutanpost.com. The e-post agent would exactly know from the e-Post identity (A4xxxyyy@bhutanpost.com) that the mail belongs to person "yyy" under house number "xxx" of the said village. There will also be online database accessible to only authorized persons, from where such e-Post identities and physical address can be tallied. This is the address logic that Bhutan Post will use in its e-Post project.

The System is designed with two parallel applications.

1. Free E-mail package (non representative)
2. Rural focused E-Post package (self representative)

1. E-mail application

The main objectives of the system are:

1. Provide free e-mail addresses
2. Compile demographic database
3. Business Advertising
4. Public information and notices

The main intention of the free package is to develop a database for future marketing use by Bhutan Post. This also becomes a strong instrument for information trade. Users can register online once the system is up and running.

2. E-Post application

E-Post identities will be provided to the rural community leaders, households and local government offices. District sector officials and field workers will also be encouraged to avail this service. One important feature of this service is its self-representation of the physical location. By looking at the e-Post addresses, local postal staff can identify for whom or for which office the mails are destined. A standard method of e-Post addressing system will be developed for this purpose.

The facilities in the e-Post application will have options to allow the sender to choose whether the mail is to be directly opened by the receiver, "Private Feature" or to allow the respective Post Offices to receive on behalf of the recipient and hand-deliver them, "Public Feature". Confidentiality to some extent is taken care of by the 'Private Feature' as recipients have the authentication to open private mails.

Bhutan Post's e-Strategy has three major stages. These stages lay the foundation for a complete reorientation of e-business strategy in the long run.

Stage	**Area of Concentration**	Strategy
I	**e-Post Services and Community access**	Services and foundation
II	Information Trade and e-billing services	Business creation and learning
III	e-Business and e-Services	Profitability and empowerment

Table 13 - E-Post Business framework

In an era of competition and flagging business, e-Post is designed with dual purpose; to provide essential communication services taking advantage of its established network and to explore and expand business opportunities so that postal administration will become competitive and profitable.

4.11 The employment sub-sector

The civil service still remains one of the major employers for job seekers. While there are still some opportunities with higher and professional qualifications, this situation is now saturating for the lower categories. There are at present around 14,000 civil servants. 5% of these are expatriate workers mostly concentrated in the education and the IT sectors. Looking from the angle of the number of foreigners working in Bhutan, it does not attempt to address anything on the solving the employment problem in a long term. Moreover 67% of the public servants are below 33 years of age indicating that the current vacancies will not reside due to retirement of workers. An equal percentage holds basic qualification of class 12 or below which indicates that a large number of them might pursue to work for a long time. There is also a possibility of this group to go for higher qualifications thus possibly saturating opportunities that require higher qualifications, positions that are today held by only 12% of the total civil service workforce[13]. A survey conducted by the Royal Civil Service Commission came up with a little more than 6,000 vacant positions in the public sector and all of them will be filled within the 9th Plan period making the total civil servants 17,000 strong by 2007.

Over 900 professionals are expected to be trained in ICT at Diploma and lower level and about 50 at undergraduates and higher level. Thus approximately 1,000 trained professionals will be seeking jobs against approved government vacancies of under 70 slots during the 9FYP. This indicates a huge excess supply of professionals including in the area of ICT. But looking at the current situation this does not seem justified. A total of only 50 undergraduates do not seem adequate to meet the demand of the ICT. Employer demand for ICT professionals is low in number and targets only the low-level of professionals at operator and administrator level. It could be due to the absence of national and agency-wise ICT master plans or knowledge of ICT solutions at all which in turn due to lack of e-awareness. Agencies do not have proper level of technical person who is capable of analyzing the needs and developing its plans for the use of ICT.

[13] These are own analysis

A national master plan along with agency-wise plans needs to be drawn to properly reflect the demand of ICT professionals. Each ministry should have IT person with specific qualification capable of making practical plans.

4.12 Sample District E-Readiness report

4.12.1 Trongsa Dzongkhag

The district of Trongsa is situated in the central part of Bhutan. It comprises of five geogs The districts of Bumthang, Wangdue, Tsirang, Sarpang and Zhemgang border it. The Dzongdag is the administrative head of district and the current incumbent is Mr. Lhab Dorji. Besides the District Administrator's office, the district administration comprise of nine sector offices i.e. Administration, Finance, Planning, Land Records, Registration, RNR, Education, Health and Works and Housing. Because of its location in the middle of the east-west highway and as a node for the highway towards south, Trongsa is a very busy town despite its small size. It has a number of hotels, restaurants and guesthouses to cater to the flow of people and traffic through it.

There are one district hospital, six Basic Health Units (one in each geog) and twenty-two outreach clinics. There are also a number of Village Health Workers (VHWs) who cater to basic health services in the most remote places. The district hospital is well equipped and has adequate medical facilities to cater to the health needs of the people in the district.

There are eighteen (18) schools in Trongsa that includes a high school in Trongsa town, three junior high schools, three primary schools and eleven community schools that cover almost all the villages. A new middle secondary school is being constructed at Takse and will be admitting its first students from 2004. There are 46 national and 9 non-national teachers. School enrollment is estimated to be around 40% for people below 40 years. This low rate is due to the difficulties for children to go to nearest schools until a large number community schools at the vicinities of villages were established. There are 17 computers in the Trongsa High school that were brought in for the optional computer classes. A generator was also procured due to the erratic nature of electricity in Trongsa. However, the start of the course has been differed by a year and is planned to start only in 2004 academic session. The computer in the office of the District Education Officer is used for information storage and

record keeping. It has Internet connectivity and this facility is adequately used for correspondence and information search on education. One mathematics teacher of the high school is undergoing the part-time Post Graduate course in IT at the Sherubtse College.

Agriculture is the main source of income for the people of Trongsa. The private sector is still in its developing stage but the potential for the growth of small and medium scale cottage industries is promising. There are three mini-hydels that collectively produce 0.11 MW of electricity. This is far too less to meet the minimum need of domestic use in the district. The lack of adequate electric power is thus one of the biggest impediments to power-intensive private enterprises. Tourism is a very important source of income for the hotels and other support employees.

4.12.1.1 Telecommunications

The penetration of telephone lines in Trongsa town is quite high. There is a 590-lines telephone switching exchange fed through 9*2Mbps digital bandwidth into the telecom backbone network. There are 312 paying telephone customers. One of the highest altitude telecom repeater stations, Yutola, is located in Trongsa district. The major route towards the central-south also breaks up from this station. By virtue of its high-altitude location, a number of single-channel VHF systems are used to provide telephones to the villages. Though it does not fall under the administrative control of Trongsa administration, the Pelela repeater station14 provides around nine such rural connections. Through the use of DRMASS, telephone is also provided to Chumey town under Jakar Dzongkhag and Bubja under Trongsa. This DRMASS system can be extended in future to cover more places. Bhutan Telecom has provided highway PCO services in the district. These PCOs are very useful for the travelers. Though some of the PCOs fall under different district, they are however maintained and controlled by the Trongsa telephone authorities. A new type of rural telephone system, Qtel64 is also used to provide telephones to Phubjikha.

SN	Base	PCO name	District
1	Pelela	Nobding	Wangdue
2	Pelela	Rukubji	Wangdue
3	Thrumsingla	Ura	Bumthang
4	Thrumsingla	Gezamchu	Bumthang
5	Thrumsingla	Sengor	Mongar
6	Baling	Sengor	Trongsa

Table 14 - Highway PCOs under Trongsa telecom

[14] Pelela repeater station under Wangdue district is under the supervision of the Trongsa telecom administration

4.12.1.2 TV, Print and Mass Media

Kuensel is the only source of news in print form. The Chela distributor sells a total of 110 copies of Kuensel, 80 English and 30 Dzongkha, every week. Some expatriate workers read foreign papers that they subscribe to directly. However, it takes considerable time for these papers to reach them. Television is also popular in Trongsa. A private cable TV service provider runs the business in Trongsa town. Rural people still cannot view television in their homes. For them, radio is the best method of keeping up with news, current affairs and important government announcements.

There is one cable TV service provider in Trongsa. Most of the channels broadcasts are international entertainment channels. BBC and CNN are also aired to the subscribers. The BBS TV programs are physically transported from Thimphu and relayed through the cable system in Trongsa. Because of the distance, a day or two normally delays it. However, this way to reach the Bhutanese TV to the viewers in Trongsa has been very successful. Cable TV was started in Trongsa in 2000 and today the company has 162 paying customers. It provides 20 channels of entertainment of news including the BBS TV. The popular target user groups are the office workers and businessmen who pay a monthly rental fee of Nu 200. The service uses 3 satellite Cable TV dishes and 20 signal receivers or decoders. Weather proof RG-6, 8, 11 and 59 types of cables are used for distribution to customers. One interesting feature of this network is the ease in broadcasting customized and specific announcements to the urban public of Trongsa.

4.12.1.3 Computers and Network

There are 30 computers in Trongsa. These include twelve in the various sector offices of the district administration, one in the Dratshang and seventeen in the high school. All computers have at least Windows 95 Operating System with Pentium processors. Many of the computers however, do not have modems. There is also adequate number of printers. There is no network that connects these computers and printers. The lack of stable electricity is the governing factor to the widespread and efficient use of these facilities.

Electricity will continue to be the biggest bottleneck to the use of computers and Internet in Trongsa. A stable power supplied from Kurichu power station is expected to connect Trongsa only at the end of 2004. Unless this is achieved, computer users in Trongsa will have to live up with the continuous load-sharing carried out by the Chumey hydro project to meet the

demand both in Jakar and Trongsa. The small mini-hydel at Trongsa does not produce enough electricity to meet the demand and is not likely to facilitate anything than light low-wattage bulbs in the houses.

4.12.2 Haa Dzongkhag

Figure 3 - Haa Dzong

Consisting of 5 Gewogs *viz.* Isu, Sama, Katsho, Bji and Sombekha is Haa Dzongkhag with access to good telecom and electricity facilities. Sombekha is the only Gewog without road and telecom facility and is accessible by foot in 4 days. However they enjoy solar powered lighting through the DANIDA assistance. Rest of the Dzongkhag has good telecom and electricity infrastructure.

There are 8 schools of which 2 are not accessible by road. A total of 3,132 students are taught by 120 teachers. Ugyen Dorji High School is the only high school. There are 4 Basic Health Units. IMTRAT runs a fully-equipped hospital for the army personnel which also extends its services to the Civilians population.

The Dzongda, Tashi Norbu expressed that the information technology needs to be encouraged in the district. His office has a computer with the Internet connection. The district administration comprises of nine sector offices i.e. Administration, Finance, Planning, Land Records, Registration, RNR, Education, Health and Works and Housing.

Presently the District office is using three temporary buildings to house all the sectors. And in the absence of local area network, each sector has its own dial-up account and BAS is used on 2 standalone systems. A new building is planned and a proper LAN will be installed only on its completion.

Of the 4 BHUs, one BHU in the town is provided with two computers and Internet connectivity. An operator has been assigned to use the computer for the administration works.

4.12.2.1 TV, Print and Mass Media

A total of 140 copies of Kuensel, 70 English and 70 Dzongkha are sold every week. Kuensel reaches Haa on Saturday by Bus from Thimphu. Television is also popular. A private cable TV service provider (Ess Kay Cable) runs the business in Haa town, IMTRAT and Damthang. Rural people still cannot view television in their homes. For them, radio is the best method of keeping up with news, current affairs and important government announcements.

Most of the channels broadcasts are international entertainment channels. BBC and CNN are also aired to the subscribers. The BBS TV programs are physically transported from Thimphu and relayed through the cable system. The recorded Bhutanese TV programmed are regularly aired with one day delay at the same time in the evening and next morning. Cable TV was started in 2000 and today the company has 350 paying customers. It provides 20 channels of entertainment and news including the BBS TV. The popular target user groups are the office workers and businessmen who pay a monthly rental fee of Nu 260.

4.12.2.2 Computer & Network

A total of 23 computers are installed in the Dzongkhag. Except for the RNR data and Accounting system BAS, computers are used for Word processing. Most of the sectors have equipment some lately through the Wang Watershed Project. Level of training is low and no service centre and institutes are nearby to provide quick assistance. All the sectors have been provided with the Internet connection of 15 hours each. Most of the staffs enrolled for the week-long training programme offered by the Planning Commission but many could just attend about 20% of the time while attending to their office works.

Figure 4 - Ugyen Dorji High School computer lab

Ugyen Dorji High School has a student lab with 15 computers. Computers have not been introduced into the curriculum so the students in Classes XI and XII use during their free periods. A teacher has undergone Basic Course offered for Teachers by Education Departments. He, assisted by a lab assistant, operates a Computer club every Wednesday for the students to give basic computer knowledge. The students showed a great enthusiasm and when we visited the lab has over 40 students. It was told that the teachers have also started using computers for typing question papers and tabulation of results. However there is no Internet connection. Besides this school, only Katsho Lower Secondary School has one computer. The Education sector, which has two computers with Internet, plans to equip all schools with small computer labs in future.

4.12.2.3 Telecom

Area	Station	Type of Exchange	Total Connections	Connected Lines
				May-03
VII	Haa	DRMASS	249	227

Most of the complaints of the staff pertains to the training on the use of computers; shortage of equipment; not enough internet connection hours; bad internet connectivity speed during the day and lack of Repair Centres.

4.12.3 Pemagatshel Dzongkhag

Figure 5 - Pemagatshel Dzong

Shumar, Zobel, Yurung, Khar, Dungmin, Chimong and Chongsing are the 7 geogs. The Dzongkhag office is located 24 KMs from the Trashigang-Samdrup Jonkhar highway but does not have bus service. Pemagatshel is situated in the East and can be reached from Thimphu in 3 days. There is one high school, one middle secondary school and 12 Primary and Community schools with 3,900 students and 110 teachers. There is One Hospital and 4 BHUs in Yurung, Thrumshing (3 days walking distance), Dungmin and Chimong.

Electricity is available in the Shumar and Yurung Geogs. It is expected to reach Khar and Zobel in 2004. Currently the electricity supply is erratic and unreliable. Rest of the Geogs are using solar power lighting system. There is no road in the Geogs.

4.12.3.1 TV, Print and Mass Media

A total of 140 copies of Kuensel are read in Pemagatshel that are availed by post on the following Wednesday- 80 copies in English and 60 copies in Dzongkha. Darjey Cable offers cable television service at Nu. 260 per connection. They are currently serving a total of 130 subscribers for about 10 channels with one pay channel. BBS is not aired due to irregular transport facility as well as the traveling time from Thimphu.

4.12.3.2 Telecom

Telecom is available in Shumar and Yurung Geogs and rest of the Geogs are expected to be connected within the 9th Five Year Plan.

Area	Station	Type of Exchange	Total Connections	Connected Lines
				May-03
IV	Pemagatshel	RLU	376	274

4.12.3.3 Computer and Network

A total of 23 computers are installed in the Dzongkhag and the Sectoral offices. Internet connection is used by the DEO, Planning and DAHSO. In schools, Nangkor HSS and Pemagatshel MSS have 15 and 8 computer labs respectively. Two teachers are attending the PGCIT course. Most of the staffs in the Dzongkhag are self-taught. Finance Section expects to use BAS from this financial year 2003-2004. There are no service and training centres. Nearest town of Samdrup Jonkhar too does not have proper facilities to provide repair or training services. Due to erratic supply of electricity, lots of problems are being faced in the use of computers.

4.12.4 Trashigang Dzongkhag

Figure 6 - Trashigang Dzong

Trashigang is one of the biggest Dzongkhag in Bhutan with 16 Geogs. Trashigang can be reached from Thimphu in 2 days and same day from Samdrup Jonkhar. The Geogs are Bartsham, Bidung, Kanglung, Kangpara, Khaling, Lumang, Merak, Nanong, Phongmey, Radhi, Sakten, Samkhar, Shongphu, Thrimshing, Ozorong and Yangeer.

Geogs of Bartsham, Khaling, Kanglung, Phongmey, Radhi, Shongphu, Samkhar and Lumang are accessible by road. Merak and Sakten are the furthest Geogs which take 72 hours walk to reach. There are two Higher Secondary Schools in Khaling and Shongphu geowgs; two Middle Secondary Schools in Samkhar and Lumang Geogs and ten Lower Secondary

Schools. There are 43 Primary and Community schools with a total of 12,745 students and 281 teachers (56 are Non Bhutanese). Electricity is in most Geogs and rest use solar power.

Two Hospitals are at Trashigang and Riserboo; and 20 BHUs. Most BHUs are accessible on foot only.

4.12.4.1 TV, Print and Mass Media

A total of 400 copies of Kuensel reaches Trashigang by bus on the following Tuesday – 300 copies in English and 100 copies in Dzongkha. Private Cable operators offer cable television service within Trashigang town to a total of 250 subscribers for about 15 channels. BBS is not aired due to irregular transport facility as well as the traveling time from Thimphu.

An internet café was setup in Trashigang town but has remained closed due to less number of customers.

Figure 7 - Internet Cafe Trashigang

4.12.4.2 Telecom

Telephone is available in most Geogs except Kangpara, Nanong, Ozorong, Phongmey, Merak and parts of Samkhar. Within Trashigang a total of 350 telephone lines and 30 Internet connections have been subscribed.

Area	Station	Type of Exchange	Total Connection	Connected Lines
				MAY 03
III	Trashigang	NEAX61 TLS	924	357

4.12.4.3 Computer and Networks

A total of 20 computers are installed in the Dzongkhag with Internet connection in Planning and Education sector. The computers are not networked.

Both the Higher Secondary School and Wamrong Middle Secondary Schools have computer lab with 15 computers each as well as computers in the School Administration while Trashigang MSS has two. All Middle and Higher Secondary Schools use internet. Most of the Lower Secondary Schools having electricity supply has one computer each. All schools with computer labs have computer teachers.

Hospital at Samkhar has 4 computers and Riserboo has 3 computers. The DHSO has undergone basic training and uses computers for word processing, Internet and HMIS.

4.12.4.4 Sherubste college

Sherubste College, the only college in Bhutan, is 28 KM from Tashigang. It provides computer education at bachelors' level since 1999. This is the most well equipped centre with about 150 computers connected by 128 kbps leased line to Druknet. Approximate distribution of computers are: 30 computers for faculties, 8 for Administration/Library, 1 for the Principal, 40 for open lab (to be used by all students), 6 for Geography Lab, and 47 computers in the Computer department lab.

There is a total of 65 faculty members - 21 Bhutanese (30%) and 44 Non Bhutanese (70%). Computer Department has nine faculty members. A total of 850 students are in different streams. Bachelors of Computer Applications (BCA) was started in 1999 with 13 students of which 4 graduated in 2002. In 2000, Bachelors of Information Technology (BIT), a 4-year programme was started which will graduate in 2004. Since 2001, B.Sc. (Computers) is the only 3-year course being offered. A total of 38 are in the on-going B.Sc and BIT courses.

With the setting up of the Bhutanese University, number of changes is expected in the curriculum – clarification of the role of Sherubtse in the context of the new university, New courses to be designed based on the in-country needs etc.. There is a need to conduct survey to facilitate the design of the course so that the graduates have skills that are in demand. The college also plans running ad-hoc short-term courses to meet the immediate market demand.

Current graduate level course takes longer to produce the required manpower. E-education for the distance learning programs will also need to be initiated.

4.12.5 Samtse Dzongkhag

Figure 8 - Samtse Dzong

Samtse is connected to Thimphu by a regular bus service which arrives on the same day. There are 16Geogs in Samtse namely: Samtse, Chengmari, Nainital, Chargharey, Larini, Sipsu, Biru, Tendu, Bara, Tading, Pugli, Dorokha, Denchukha, Dumtoe, Mayona and Ghumauney.

Geogs of Tading, Dorokha, Denchukha, Dumtoe and Mayona are not accessible by road and also do not have electricity supply.

There is a total of 14 schools - two Middle Secondary in Pugli and Samtse; four Lower Secondart in Dorokha, Ghumauney, Peljorling and Tendu and 8 Community/Primary schools. There is a total of 188 teachers (155 are Bhutanese Nationals) and 6,891 students in the district.

The district also has three Hospitals at Samtse, Pugli and Sipsu; and 6 BHUs.

4.12.5.1 TV, Print and Mass Media

A total of 203 copies of Kuensel reach Samtse by bus on Sunday through Yangkhil Tshongkhang -150 copies of English, 50 copies of Dzongkha and 5 copies of Lhotsham. Private Cable operator, SKD Communications offers cable television service within Samtse

town to a total of 350 subscribers for about 15 channels. BBS is regularly aired on the following evening and the next morning.

4.12.5.2 Telecom

Telephone is available in most Samtse, Chengmari, Chargharey, Sipsu, Tendu and Pugli.

Area	Station	Type of Exchange	Total Connection	Connected Lines
				MAY 03
VI	Samtse	NEAX61 LS	848	396

4.12.5.3 Computer and Network

A total of 11 computers are in the District office. Internet connection is used by Planning Sector only. Computers are mostly used for word processing. There are six computers in the Samtse School. No service centers have yet been established - Samphel Computer Center has been registered as a training centre. 21 district staff underwent the training provided by Planning Commission.

4.12.6 Punakha Dzongkhag

Before Thimphu was made capital of Bhutan, Punakha held the title as winter capital because of its more temperate climate. Thimphu's monk body and the Je Khenpo (leader of Bhutan's religious order) still come to Punakha in winter.

Punakha has 9 Geogs *viz.* Chubu, Goentshari, Guma, Kabji, Shengana, Tewang, Talo, Limbukha and Zomi. Chubu and Goentshari Geogs are still not connected to road network. Electricity and telecom has not reached Chubu, Goentshari, Kabji and Shengana. The district administration comprise of nine sector offices i.e. Administration, Finance, Planning, Land Records, Registration, RNR, Education, Health and Works and Housing. Offices of RNR sector and Health are located outside the Dzong and at quite a considerable distance. Five BHUs are located in Kabji, Shengana, Tewong, Talo and Limbukha and one Dzongkhag hospital.

There is 1 Higher Secondary, 3 Lower Secondary and 9 Community Schools. There is one private school – Ugyen Academy in Khuruthang. The HSS has 30 teachers (50% Non-Bhutanese) and 830 students.

Dzongkhag	Road	Electricity	Telecom	Hospital/BHU
1. Chubu	Some	No	No	
2. Goentshari	Yes	No	No	
3. Guma (Town)	Yes	Yes	Yes	1 Hospital
4. Kabji	Yes	No	No	1
5. Shengana	Yes	Yes	No	1
6. Tewong	Furthest	No	No	1
7. Talo	Yes	No	Yes	1
8. Limbukha	Yes	Few places	Yes	1
9. Zomi	Yes	No	Yes	

4.12.6.1 Computer and Network

There are 20 computers in the District and most of them are used as stand-alone mainly for word processing. Electrical outages are quite common and every computer is equipped with an UPS. Internet is seldom used and only one connection was used by the Planning section. Few officers are using their Internet personal accounts. The Finance section is proposing to set up a local area network to use the Budget and Accounts Systems (BAS) from the 2004.

Figure 9- Punakha School Lab

Each sector has been provided with computers and most users have not undergone training in use of computers.

Punakha Higher Secondary School has a computer laboratory with 9 computers and 3 computers are in the Administration Section. A local area network connects the 9 computers and shares the 300 hour Internet connection. A teacher is undergoing the PGCIT Course and

is the designated the Computer teacher. Most teachers are using the lab for typing the question papers and tabulation of mark sheets.

4.12.6.2 Telecom

Area	Station	Type of Exchange	Total Connections	Connected Lines
				May-03
I	Punakha	Remote line Unit	504	401

5 E-Readiness Assessment

There are many assessment models currently available. Each of these models was developed to address a particular and specific socio-economic situation. The e-readiness guide of the Center for International Development (CID) of Harvard University is used in the case of Bhutan with substantial adjustments. This is a relevant model in our socio-economic environment.

The CID is built upon a set of parameters. The extent of readiness in each of these parameters are ranked from Level 0 to Level 4 with 'Level 0' representing "not ready at all" and 'Level 4' representing full readiness in that factor. Though this ranking is ideally required, we decided not to do so as it may be representative of our judgment. Though the number of major measurement parameters is defined, there is room for us to add any number of sub-parameters under them as we deem fit needed.

5.1 Networked access

5.1.1 Information Infrastructure

The national telecom backbone network is quite adequate to meet the demand for bandwidth for a foreseeable future. Its backbone is 8GHz microwave radio system carrying 34 Mbps of signal. Being an Asynchronous Digital Hierarchy (ADH) system, the total bandwidth is broken and distribute along the route into 8 Mbps and 2 Mbps streams. There is plan to simultaneously provide separate data network nation-wide but this project has not taken up due to low demand for high bandwidth data services. The high-traffic route between Thimphu and Phuentsholing will be upgraded to an optical fibre link. A mobile phone company, Bhutan Mobile completely owned by Bhutan Telecom, will provide mobile phone service.

The project is currently under implementation. A number of satellite-based remote stations, DAMA are used in very isolated locations. Thuraya mobile phones with international roaming facilities are also used.

Broadcasting facilities for SW and FM transmissions are in place and BBS radio is listened by most people. At present, real-time TV broadcasting is confined to Thimphu valley only. However, a number of private cable service providers in the remote districts facilitate the broadcast of BBS TV programs through their system. This system however, is cumbersome, as recorded tapes have to be transported to these places from Thimphu. There are at present around 10,000 Cable TV subscribers in the country. Though this may indicate a penetration of only 1.4%, in real terms it will be quite high given again the number of people who watch from homes. But TV coverage to every part of the country has been technically difficult. There is also a general misunderstanding as what bandwidth of telecom is required to carry a single TV channel.

Infrastructures for the print media may be adequate to meet the demand for now. Kuensel has a very good printing establishment and it also prints books, magazines and other materials as required on commercial basis. It may well serve its purpose more if electronic transferring and printing facilities are available in remote districts. KMT Printing, Norbu Rabten and Peljorkhang enterprises are other prominent printers. Many Bhutanese organizations still outsource to firms outside the country for quality printing works.

The development of infrastructure plays an important role in the promotion of ICT. Such developments however, have to be carried out in a planned and coordinated manner. More important the dissemination of current and planned development information to other sectors would be very much required. This would enable other organizations that use ICT for their activities, to be able to plan their own e-strategies that are commensurate to available infrastructures and other resources. The ICT policy should address the need for such coordination and information sharing needs.

5.1.2 Internet Diffusion

Internet users are mostly based in Thimphu contributing about 50% of all users in the country. One way to look at this concentration is because most government, non-government,

international and private sector offices are located here. This naturally makes the city an information node. Other sectors that use Internet most, including tour operators, travel agents, international organizations and development agencies are also located in Thimphu.

Bhutan's per capita Internet usage is 0.71 % considering there are about 5,000 Internet users[15]. However, if the capita were broken into two components, one for Thimphu and one for the rest of the country, the values would be 8%[16] and 0.15% respectively. The disparity in the use of Internet and computers between Thimphu and other areas is therefore an issue to note. All district offices have Internet connectivity but none of the geog offices or villages has Internet, though 76 geogs have telephone connections today[17]. This is likely change with the implementation of the Rural Telecommunication project within the 9th Five Year plan period. But such desires will have to be supported by capacities, applications, computerization and resources at all levels.

One of the primary objectives of any ICT development is to enable the diffusion of ICT services in a homogenous manner across the country in a balanced and fair manner. Policies play an important role to address the need to encourage the propagation of Internet diffusion in a non-protagonist and non-politicized fashion.

5.1.3 Internet Affordability

One of the biggest obstacles to the popular use of Internet in Bhutan is affordability. Using Internet for an hour in Bhutan costs around US$ 3.00 at an Internet Café but Bhutanese office workers and private sector employees earn around US$ 1.56 per hour (~US$ 250 per month). This situation does not need any explanations. Such a high cost of Internet in respect to the earning capacity may be a significant factor of concern that is keeping users away.

The private sector Internet user survey, carried out specifically for this study found that 82% of private sector firms surveyed in Thimphu ranging from bakeries and grocery shops to computer dealers and Internet Cafes have computers and 85% of them use Internet for business related works and personal communication simultaneously. However, 48% of those

[15] Source: Division of Information Technology

[16] Thimphu has approximately 4,000 Internet users including Internet Café visitors

[17] This update as of 31st May 2003

who have computers and use Internet feel that Internet is not affordable in Bhutan though they have to use it for their work.

Internet connection charge is homogenous across the country. Users can dial either 100 or 101 to from anywhere in Bhutan to logon to the Druknet servers. No matter from where one accesses, the connectivity charge is the same. However the charges for using PSTN (Public Switched Telephone Network) and Internet usage are different. Thus connecting to the Internet includes two cost factors 1) The telephone connection charge and 2) The Internet usage charge. The telephone line usage fee is Nu 1.00 per unit whereby a unit for Internet usage is 4 minutes contrary to 3 minutes for telephone calls. Thus Internet connectivity charge is 25% less than normal telephone charge for local calls.

The most popular package is the Internet15 (15 hours, 3 month limited) package and it is found that 34% of all Internet dial-up customers use this package. As can be seen from the information below, per-minute computation, the trend generally is a logarithmic drop for the per-minute cost.

SN	Type	Duration (hrs)	Fee (Nu)	Validity (months)	Per minute charge
1	Internet5	5	350	3	1.167
2	Internet 15	15	850	3	0.944
3	Internet30	30	1,450	3	0.806
4	Internet60	60	2,200	3	0.611
5	Internet100	100	3,350	3	0.558
6	Internet20 (Night surfer)	20	600	3	0.500
7	Copper200	200	6,350	6	0.529
8	Silver300	300	9,000	6	0.500
9	Gold400	400	11,300	6	0.471
10	Platinum500	500	13,200	6	0.440
11	64 Kbps leased	Unlimited	30,000	1	0.694
12	128 Kbps leased	-do-	48,750	1	1.128
13	256 Kbps leased	-do-	78,000	1	1.806
14	512 Kbps leased	-do-	124,800	1	2.889

Table 15 - Druknet (ISP) package details

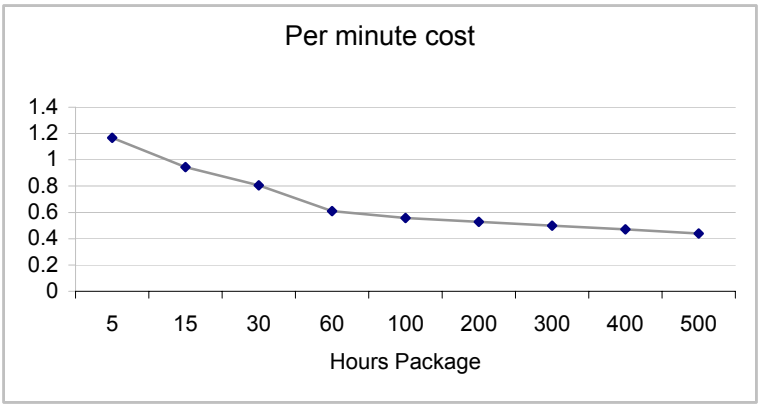

Figure 10 - Druknet per-minute package cost

It can thus be concluded that the users would prefer shorter duration packages, even if they have to pay a bit high. Regarding leased line charges, the per-minute charges may look very high but these leased lines are normally used in a network and there will be many computers that can be used at the same time. At present there are an estimated 1,050 computers connected to the Internet through the 26 leased lines, an average of 40 computers per network.

There are two options to address this: 1) Salaries have to be increased over the board. This cannot be possible particularly in the private sector. 2) The cost of Internet has to go down drastically for people to be able to afford. The ICT policy has to be explicit in this debate and recommend the best and immediately implemental strategies to facilitate affordability in Bhutan.

5.1.4 Network Speed and Quality

The telecommunication backbone uses 34 Mbps digital stream carried over 8 GHz band microwave radio. 34Mbps is the bandwidth and 8Ghz is the carrier frequency. Most of the digital multiplexer and radio equipment are of Japanese make (NEC). The quality of voice and data outputs is good. The Bit Error Rate, BER for the main backbone network is around 10^{-6} and is sufficiently good for efficient and high quality data services. However, there are still some technical bottlenecks in home-access networks due to poor quality of cables.

The dial-up modems of Druknet are configured for a speed of 64 Kbps. Internet users normally uses 56 Kbps external modems. US Robotics is a popular brand but more and more

computers are coming with inbuilt fax/modem cards. However, the local telephone switches are designed to accept only 33 Kbps of data. Ideally this should be the speed of data transfer over telephone lines but this is hardly achieved. The quality of performance is severely affected by the old local access cables in the towns. Users connected to telephone lines through new cables networks achieve higher speed. Besides the quality of cables, the number of terminations or cable joints also affects the bit rate. There has been significant improvement over the last year after the installation of V.92 interfaces at DrukNet. Even the dedicated leased-line cannot achieve the speed that they were designed for.

Networks may be good and efficient, but unless such strengths are transformed into a faster and better quality service to users, ICT services like Internet will continue to lack the required demand. The creation of demand is born from the extent of efficiency and quality of the umbrella of services that are available to customers. The ICT policy should make an indication of the genuine need of quality service on top of higher network speed and efficiency.

5.1.5 Applications

If Bhutan's ICT industry has missed out any thing, it would be the development and use of relevant applications. A few organizations have developed web-based applications for their own internal use. Such systems are still not interactive to users and viewers. The common practice is to provide user name and login to employees to access the internal data and communication systems. Though these applications use the network bandwidth, most of them are closed environment. With the low skills of Bhutanese IT professionals, such systems are very vulnerable to penetration and destruction by hackers. The BACS and the TIIMS are ideal examples of such closed applications. However, users cannot check his/her telephone bill, electricity bill, bank balance etc online,

There is a very important need for organizations, public, private or corporations to develop suitable applications for the purpose of general use. The MEGDOOT system for postal services is a very interesting application for customer counter service. Such tailor-made applications can be used in other sectors particularly the service sectors such as telecom, power and urban utilities.

Applications play an important role in bringing the benefits of ICT to the general users, external to the organization. When applications are there, content would again play equally important role. ICT applications have to be designed and developed with the public at large, in mind and consideration and also with the right content. While applications developed for internal use may enhance work efficiencies and reduce costs for any organization, such benefits have to be extended to external clients and customers. ICT policy should indicate the lack of any relevant applications in Bhutan and recommend policy guidelines on how and where applications are needed on priority. It may also indicate the imminent need for a more robust and trustworthy public-private partnership to develop professional and quality applications on ICT.

5.1.6 Services and Maintenance

There are a number of service and maintenance establishments. These centers are mostly available in Thimphu and Phuentsholing. Many organizations also have their own IT maintenance and service centers. In most instances, computer servicing is taken care of by suppliers under the routine maintenance contract. For example, Minolta has an office in Thimphu that provides service and maintenance to its customers. Peljorkhang, the official agent of Dell International in Bhutan, services DELL equipment. Sherikhang enterprise is the official agent of Acer Computers and provides all maintenance services. NT Enterprise is Sony's franchise and provides services for all types of Sony equipment.

Among the organizations, DIT has its own testing facilities for computers. Bhutan Telecom has a repair unit of its. Services and maintenance facilities of basic computers and other IT equipment can fairly be stated as good in Bhutan.

The service and maintenance sub-sectors of ICT have played significant role in other countries. The engagement of the service industry in ICT has fostered successful business development for the private sector and efficient services for the service provider. The vibrancy of national economy comes through the mobilization of national resources in any economy. The need and importance of this concept need to be sufficiently indicated in the ICT policy.

5.2 Networked society

5.2.1 The Bhutanese ICT society

Bhutanese society can be divided according to the following tree structure.

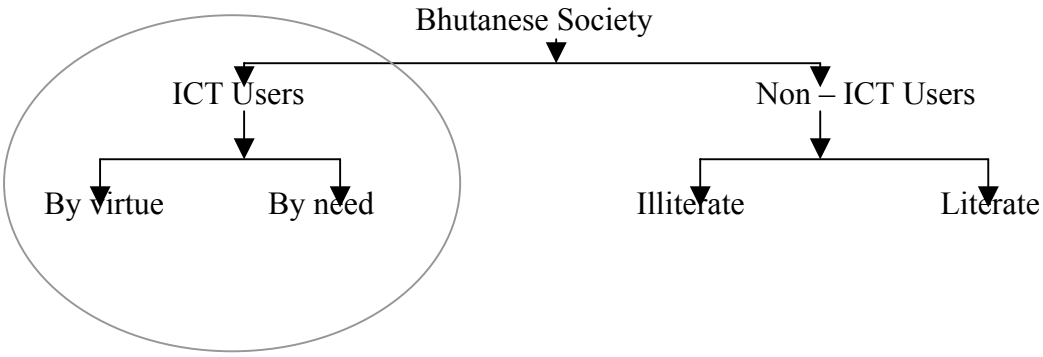

Figure 11 - The Bhutanese ICT society

By virtue

- Office workers who work with computers and Internet and e-mail
- Domestic workers who can listen to radio or watch TV at home
- General public including students who read Kuensel and other newspapers

By need

- Internet and computers users in Internet cafés
- Businessmen and women who use personal computers
- District and local government workers subscribing to newspaper
- Viewers who watch TV to keep abreast of developments

Illiterates

- Villagers including farmers, housewives and non-school going children
- Laborers and workers in towns

Literates

- Office workers who do not have or use computers and Internet
- Literate housewives who do not have TV or radio
- Students who do not use computers, read newspaper or watch TV

The four categories to which the Bhutanese society can be segregated are shown above. There is room for further segregation so that ICT activities are targeted to each of these groups rather than the public at large. Such niche targeting will be useful in the design of projects for specific groups of people. Policy has to guide the strategy to group society in this fashion so that national strategies can be devised to address each of these groups and preferably that can be coordinated with other activities.

5.2.2 E-government

Figure 12 - Official Government website on its first day

According to the 9th Five-year Plan document, the government will promote e-governance through a number of concrete activities. As one of the first steps, the official government web portal (http://www.bhutan.gov.bt) was launched on 20th May 2003 at the Ministry of Communications. It is hosted and managed by the DIT and unlike most of the other organizational websites; this site was completely planned and developed by Bhutanese engineers at DIT. To promote e-Government a number of LAN and WAN systems along-with relevant web portals will be established. In regard to online information, the Planning Commission has a website that provides good information on the five-year plans. It is establishing LAN systems in districts headquarters to connect to these information hubs. The DIT will implement an inter-ministerial optical fibre network in Thimphu, which is again designed to foster and compliment e-Government applications. However, there are obvious limitations on the extent to which the concept of e-government can be implemented.

The following factors influence the extent to which e-government can be implemented.

Policy

Does the policy support the widespread use of online information and communication technologies? There isn't much evidence of this as yet. An e-mail message is not an authenticate document in government procedures. For example, organizations are

facing difficulties in computerizing accounting and book keeping as the Royal Audit Authority does not recognize the authenticity of such software applications.

Infrastructures

Does every organization that ought to be using e-government services have adequate infrastructures? Computers are widely used in most of the Ministries and organizations. However, using e-government facilities and services need real-time (preferable) information sharing. This can be done only through dedicated networks and servers and such facilities are not available in all offices.

Capacity

Are there enough capacities in the various sectors for e-government? Organizations are managing the available computers and servers with the minimum of IT staff. Some offices have enough IT employees but they are not suitably trained or qualified to handle certain specific activities like server maintenance or network administration. The IT employees carry out most of these works on an ad-hoc basis.

Organizational Support

The DIT is playing an important role in fostering various e-services in the country. Its effort in the promotion of e-government is gaining momentum. It has a number of initiatives in this. It has carried out Dzongkhag networking plans, conducts IT awareness campaigns and engages private IT vendors on a continuous basis. Such type of public-private partnership will go a long way in the success of e-government and other e-service initiatives. Likewise, the support and complimentary works of the Planning Commission, the BTA, Druknet, BT and some IT vendors have been very effective. It is also to be seen the extent the constructive role that the new Ministry of Information and Communication will play in the development of ICT in Bhutan.

Most of the government websites are public information sites. There are efforts being made to make them more useful. Procurement notices have been coming up on the respective websites.

List of government websites in Bhutan are listed below:

1.	Ministry of Agriculture	http://www.moa.gov.bt
2.	Ministry of Trade and Industries	http://www.mti.gov.bt
3.	Department of Tourism	http://www.mti.gov.bt/tourism-web.htm
4.	Ministry of Communication	http://www.moc.gov.bt
5.	Department of IT	http://www.dit.gov.bt
6.	Bhutan Telecom Authority	http://bta.gov.bt
7.	Planning Commission	http://pcs.gov.bt
8.	Education Department	http://education.gov.bt
9.	Royal Institute of Management	http://rim.edu.bt
10.	Royal Audit Authority	http://raa.gov.bt
11.	Construction Board	http://cdb.gov.bt
12.	Cultural Trust Fund	http://ctd.gov.bt
13.	Department of Employment and Labor	http://www.del.gov.bt
14.	Ministry of Finance	http://www.mof.gov.bt
15.	Ministry of Foreign Affairs	http://www.mofa.gov.bt
16.	Department of Roads	http://www.dor.gov.bt
17.	National Technical Training Authority	http://www.ntta.gov.bt
18.	Youth Development Fund	http://www.youthdevfund.gov.bt
19.	Government Portal	http://www.bhutan.gov.bt

As common to many organizations, these websites do not provide any facilities for online communication or services. Important forms are downloaded, filled and sent physically. While this may reduce time on one end, it does not really address the whole issue of enhancing efficiencies and cutting costs. All government websites need to be upgraded and standardized.

None of the websites are in the national language, Dzongkha. With the introduction of standard Dzongkha fonts, most of the websites in Bhutan should have bilingual capability. Government websites will then have more readership and users. To make optimum use of the government portal, well-coordinated information sharing system and a standardization process for public information is required. This will then enable pooling in already available information and other resources from such sites. There are already new web technologies such as XML that facilitates such information extraction between different systems. However, there has to be some fundamental standardization in data structures and site management before such initiatives can prevail.

The ICT Policy will need to make list of coordinated policies that will facilitate e-government in Bhutan.

5.2.3 Content

The development of appropriate and relevant online content is still in its primary stage. The ones available are basically general information about the organization or the firm. There are no authorizing and regulating agencies for online public content. This is particularly required to administer correctness and homogeneity of online information.

The appropriateness of content may also be lagging due to the general absence of readership. This is further aggravated by the absence of content localization. There are still no websites in Dzongkha, which further aggravates the situation. While this will change with the standardization of the Dzongkha font in Unicode, methods seeking new ways to reach the content to the general mass can be developed in future. The font is expected to be supported from the next version of Windows XP. Websites can then be developed in Dzongkha so that it will be easy for the popular mass to read. Community focused web portals can be designed and developed so people can benefit directly. In particular, multipurpose community telecentres can be established and simple applications developed in Dzongkha so that people can avail better facilities.

Content, will unarguably play one of the most important roles in the near future for the Bhutanese. Policy has to make sure that there are enough deliberations made on the need for appropriate, relevant, dynamic and reliable content on Bhutanese websites.

5.2.4 Work Environment

Computer use can be found in almost every government office today. They are used for writing internal memos, storing information, and basic e-mail communication. In Thimphu, organizations also have networks and the users share files and printing facilities through such networks. Where there are leased line services, they can also use the Internet and e-mail. With an average of 40 computers per independent network, such arrangements are significant for government organizations to reducing overhead costs of communications and logistics.

The extent of productive use of ICT services in workplace is difficult to debate. Computers and Internet is very common in offices. With the absence of any integrated network system between agencies and Ministries and also with the absence of any online capable systems, the use of computers does not go much beyond simple desktop works. However, with the planned optical fibre network among government Ministries in Thimphu, the efficient and effective use of ICT services at workplace will certainly pick up. Such initiatives will also encourage its use in the private sector as survey found that computers and Internet are already used quite extensively in private sector offices.

The Bhutanese work environment still has not exploited ICT to its fullest. The use of networking and resource facilities has to be encouraged. However, this comes through the integration and combination of a number of other factors such as infrastructures, knowledge, applications, content and resources. Unless ICT use is aggressively promoted in the work place, the benefits will hardly move further down.

5.2.5 E-health

E-health or telemedicine is generally termed as health telematics in Bhutan. The rugged terrain and the challenging distances make e-health a viable solution to consultative health in the country. The government recognizes the need and the importance of telemedicine. Many casualties occur in remote inaccessible part of the country due to poor communication and lack of timely consultation. For example, it is believed that many people could have been saved in the bus accident in central Bhutan in 1999, had there been some communication between a doctor in Thimphu and the health worker attending the injured.

In Bhutan, the concept of telemedicine started with the establishment of a telecenter in Jakar. Some telemedicine equipments were donated by the Telemedicine society of Japan to Bumthang hospital in 1997. However, the equipment could not be used due to interface difficulties with the telecom network. Due to short distance, many patients preferred to travel to Thimphu for treatment when required. Therefore the telemedicine equipments were then shifted to Mongar Referral hospital in the eastern region in 2000. A dedicated 64kbps leased line was also established in Mongar hospital for telemedicine purposes.

The Health division has established telemedicine facilities in Thimphu and Mongar hospitals. Another one in Yebilapcha hospital in Central Bhutan is planned. More district and urban hospitals and BHUs could be linked to these regional referral hospitals through dial-up systems. These facilities are planned to be extended to hospitals in Gelephu, Phuentsholing, Damphu and Bumthang. This would be cost effective and would need much less technical and financial resources for operation and maintenance.

Strengths	**Weaknesses**
▪ *Dedicated employees* ▪ *Organizational experience with ICT* ▪ *Good donor support* ▪ *Enough equipment at headquarters* ▪ *A number of best practice examples available*	▪ *ICT equipment only concentrated in headquarters* ▪ *Health Staff do not have enough ICT experience* ▪ *ICT staff do not have health knowledge* ▪ *Lack of health record codification and standardization*
Opportunities	**Threats**
▪ *Improving health extension and services around the country* ▪ *Record health coverage* ▪ *Diversification of health services* ▪ *Improved recording and retrievable system in the headquarters* ▪ *Basic distance diagnostic and analysis already in place* ▪ *Benchmark study on digitized X-ray and ECG already realized* ▪ *More public health education* ▪ *Costs will be saved on referrals*	▪ *Unstable power supplies in many of the hospitals* ▪ *Standardization of patient data not possible for young patients as ID cards only issued at 15 years of age* ▪ *Acceptance of ICT systems may be difficult to traditional methods*

Table 16 - Health SWOT

While technologies such as telemedicine and e-health may be promising in Bhutan, their implementation has to be planned in a realistic manner. Villages in Bhutan are spread far and wide. Reaching a telephone line to the vicinity of every house has been very difficult and resource and technology-intensive. Even when telephones are reached, there is yet another imminent technology bottleneck, stable power supply. Telemedicine demands the use of a number of electronic devices including computers. Therefore ICT Policy has to take special note of such bottlenecks while making any recommendations on e-health services in Bhutan.

5.3 Networked economy

5.3.1 Employment

Employment is a major concern for Bhutanese youths today. It is estimated that 50,000 people will be seeking jobs by 2007 and 100,000 by end of 2010. There is an equally

disturbing trend of rural-urban migration. Massive number of jobs has to be created in the country. The state the private sector pathetic and thus job market situation is not very encouraging. The public sector has always been the primary employer in Bhutan, but this is changing with most of the public sector offices closing major employments.

The National Employment Board and its implementing organization, the Department of Employment and Labor, DEL monitors and overlooks the job market situation in the country. The functions of the DEL have primarily been the matching of demand with the supply in the job market. The general fact is the severe mis-match between these two parameters in the Bhutan. While employers are always indicating that there is a lack of supply of IT professionals, it is found that most of the IT trainees from the 18 IT Training Institutes are still unemployed. More than 70% of all job hunters are between the age range 15 and 24 years indicating that they are mostly the pass-outs from schools and colleges. Another problem is the tendency of the job seekers to go for office jobs rather than do physical works. There is a great deal of interest in these youths for software works but there is still some reluctance to take up hardware works like services and maintenance. There is also an issue of the recruitment of a number of expatriates on IT jobs by organizations.

Year	Job seekers	Employed
2000	496	123
2001	714	289
2002	709	598
2003	79	69
Total	**1998**	**1079**

Table 17 - DEL data on job

This mis-match is basically due to the level of skills that the job seekers posses. Most of the IT job seekers have class 10 or class 12 and a few months of computer training mainly focusing on the operation of computers and desktop editing. While the demand indicated by organizations are for high-end software and system engineers. Indian software and Japanese (JOCV) system engineers fill this high-end demand. The IT Diploma graduates (DIMS) of RIM have been much in demand but most of them are been absorbed by the public sector organizations. The DEL is conducting a nation-wide job-market survey and the final report in September should be able to declare some of the most pressing employment issues in the ICT sector as well.

ICT can play an important role in addressing employment issues in Bhutan. IT professionals who once worked in the civil service own most of the private IT vendors. Though this has been a major boost to the development of this sector, government organizations have lost

most of the experienced IT professionals. New employees do not come with the necessary and required skills in ICT related works. There is thus an internal brain drain. While it may deprive the public sector and companies of skilled capacities, it actually is fostering the development of entrepreneurs in this sector. But to mitigate this trend into positive results, there is a need for supportive policies on ICT entrepreneurship.

Bhutan's ICT sector has to focus on job-creation at this moment of time. The extent of demand-supply mismatch indicates that there is a requirement for the change in national strategy on employment. ICT can play and fill up this national void. But how it does - will need pooling in of a number of factors. ICT policy has to be implicit in its description and recommendation on employment in Bhutan.

5.3.2 E-commerce

Bhutanese firms and businesses do not use e-commerce, in its real sense. The closest form of e-commerce currently used is e-mail that is generally used for business development and communication. Online advertising hardly gets attention, as most of the websites do not enable visitors to interact on real time basis. Moreover, these banner ads are hosted in Druknet, which gets only around 400 hits a day and most of them by Bhutanese living abroad.

There are significant opportunities for e-commerce in the country. This is particularly true for rural products where it will be possible for villagers to sell handicraft items, agriculture products and even local tourism. Women play a very role in domestic affairs in Bhutan. Therefore, e-commerce activities have to target this group. In association with the Ministry of Trade and Industries and the National Women's Association of Bhutan, the UNDP is developing a project called "E-Business for Women Entrepreneurs and Handicraft Producers in Bhutan". If this project is implemented, this may be one of the first projects in the area of e-commerce. Bhutan Post is also planning to implement an e-Post project. This project will be extended to cover a number of online services like bill payment, transport ticket reservation, banking and e-commerce is also an important area that will be explored.

The basic features of e-commerce are absent in Bhutan. Foreign currency policy of the Royal Monetary Authority does not allow citizens or firms to hold foreign currency accounts. Only

a few financial institutes like the Banks and some government agencies have foreign exchange accounts outside the country.

The MTI would be an ideal organization to promote the initial phases of e-commerce in the country. There are about 100 computers and 2 servers in the organization. Out of those, 60 computers are connected to its internal network that has a 128 kbps leased line with Druknet. The MTI website is hosted at Druknet but besides some general information on its various departments, it does not really provide anything concrete on e-commerce. Moreover, there are only 2 full-time IT staff who do not possess adequate and relevant know-how on e-commerce technologies. There is also a general lack of ideas and knowledge on e-commerce in the country as a whole. Development and international organizations that ought to be advising and assisting in these areas have not been able to do anything. The need for a practical and realistic e-commerce guideline is very much required.

E-commerce can provide tremendous economic benefits to the Bhutanese people. However, for a country to have a good e-commerce architecture and system in place it has to mobilize technical resources and capacities. It needs to liaise with third party entities on security, online transactions, banking guarantees, supply management etc. The ICT policy has to indicate these areas of requirements in e-commerce. As much as possible, the policy should address a national drive on e-commerce rather on some piecemeal pilot projects on e-commerce because basically e-commerce entails the whole structure of the country and its socio-economic organization and this foundation is lacking. It should also be seen as to which entity is technically capable to providing e-commerce technical backstopping for now.

5.3.3 E-services

There are not many websites for the service industry in Bhutan. Bhutan Telecom has a website that is informational and not much can be done online. Even the website of Druknet, the only ISP owned and operated by Bhutan Telecom does not have much to be done online. It has been improved recently and a limited number of functions can be carried out online but it can set better benchmarks for a country learning from best practices within itself. Being an important service organization, Bhutan Power still has no official website of its own that caters to customer needs such as bill tracing, account information and payment procedures. Some information is provided on power systems from the MTI website.

The official government portal (http://www.bhutan.gov.bt) provides substantial online resources and information intended for the general public. This portal will play a very important role in coming times. Most of the general external readers however, do not know the existence of such information and resources. So how can this information be enhanced or improved so that they become useful for people. Once the people know of such facilities it is expected that they will use them. E-service is an area that Bhutan will benefit from. However, it has to be designed in an appropriate manner so that it caters to the basic needs of people. For example, there should be facilities such as online registration of their properties, online census, online voting, online applications for basic services are some of the features that will be useful. ICT Policy has to support and guide the creation of such online services.

5.3.4 E-Banking and Financial Services

There are no e-banking services in the country. While computerization of banking internal services may have resolved lot of administrative works within the institutions, the benefits of such services are yet to be reaped by the general customers.

Bhutan National Bank (BNB) and the Bank of Bhutan (BOB) are the only two commercial banks in the country and neither have any e-banking facilities. Built on WinNT platform, the Druk Banking System of BOB was developed by an Indian consulting firm. Primarily it handles counter service, data transfers, interest calculation and book keeping.

The Bhutan National Bank uses Micro Banker, a banking system developed by City Bank. BNB is the main agent of City Bank in Bhutan. Though transactions with the City Bank are normally carried out through traditional communication like fax and telex, this system has been very useful in standardizing the day-to-day banking activities. It is a proprietary application. Recently this application has been upgraded to its latest version FlexCube. It is used for counter services, monitoring of foreign exchange, stock inventory, clearing house and personal information. Bhutan National Bank is starting number of e-facility for their customers in Bhutan e.g. domestic ATM service for Thimphu and Phuntsholing clients for transactions. The facility will be extended over both towns with the anywhere banking concept for the clients to transact in any town. Use the ATM cards as debit cards to pay the shops for the merchandise bought using this card and instantly affect the bank balance. BNB

clients can also use their PC or phone to check their bank balances. Utility Bills payments are also high on their agenda starting with the payment of telecom bill online. Above all is the plan to introduce international VISA card within 2003. Such projects will modernize the banking sector.

BNB has been quite ahead in promoting ICT among the staff. All staff has access to computer and has basic know-how in using it. They have also set up an Internet Café with 3 computers for the staff. It is open during the lunch hour and after the office hours. This does not hamper the office works while staff can also learn to use Internet. They also provide utilities like loans for the purchase of equipment mainly for agricultural purposes which may also be extended for procuring of home computers; continuing education loans etc.

BNB is exploring the possibility of using of fibre optic earthing line along the high-tension electrical power line for the data connectivity between Thimphu and Phuentsholing. Bhutan Telecom and Bhutan Power are jointly exploring this project.. Estimated cost of installation to the tune of Nu. 100 million is expected to be functional by the end of 2004.

The Royal Insurance Corporation of Bhutan (RICB) uses an online system. Its HQ office is connected with the Phuentsholing Branch office. It is mainly used for life insurance, investment and payroll. After the breakup of the Provident fund component from the RICB to the National Pension Board (NPB), the PF component is now administered by NPB.

E-commerce flourishes where there is a robust and reliable e-banking facility. This includes credit card services, data security firms, a good supply chain management and above all a vibrant private sector that is export oriented and capital intensive. However there is a persistent situation. The business community points to the banks for the lack of such services, the banking sector points to the government for lack of guidance and policy on foreign transactions, the government on its part points to the private sector to build up business and create demand for online banking services. The ICT Policy has to debate on the exact place to break the cycle and initiate progress in this area.

5.4 Networked learning

5.4.1 E-education

The literacy rate in Bhutan is 54%. This figure includes literary capacity in both English and Dzongkha. Separate rates for these two languages are not available. However, the level of English language for any Bhutanese child who has attended school is good. He/she can read and write basic English and will have fairly good capability to be able to learn basic computers and Internet. A detail on the number of educational institutes in the country is given below.

SN	Institutions	Nos	Enrollment	Teachers
1	Community/Primary Schools	268	49,654	1,436
2	Junior High Schools	64	43,275	1,234
3	High Schools	31	21,444	807
4	Private Schools	12	2,927	163
5	Sherubtse College	1	623	61
6	NIE	2	975	77

Table 18 - Education Institutes

Source: Ninth Plan Main document, Education Sector

The Department Education prepared the Education Master Plan in 1999. It plans to provide computers to every school and Institute in Bhutan[18] and establish a network among the tertiary institutes (high schools, colleges and institutes). Though computerization of schools will take place in a phased manner, it is still early for the sector to introduce e-education through use of Internet and web applications. Some extent of distance education (physical) was introduced at the National Institute of Education. Every High School has a minimum of 4 computers. Most of these were bought through the yearly government budget of Nu 5 million towards computerization of schools.

Sherubtse College is the only college of higher learning in Bhutan. Along-with the NIE, it will play an important role in fostering e-education in future. E-education would need a team of dedicated professionals to develop content and supervise students. A number of servers will need to be established in different regions and their interconnectivity has to be efficient. Major constraints to the introduction of e-education are resources and technical capacity.

[18] Refer Annex (Education IT Master Plan) for details

E-learning has to come with a broad array of parameters that support it. Infrastructures, resources, capacity building and skill development are some of those. One cannot have an e-learning service where there are no computers, no networks, no Internet, no teacher, no facilities. But the other issue is to analyze the need for e-education in Bhutan. Will Bhutan benefit from e-learning? Or are our children and public too skeptic about technologies? How do we change the situation? What should be Bhutan's strategy towards e-education? These are the questions that the policy document should attempt to answer in regard to e-education.

5.4.2 IT training

Since the introduction of Internet, there has been lot of emphasis on IT training in the country. This further complimented by the deregulation of IT training that once was conducted primarily by the government. Most of the IT institutes are in Thimphu and operated by the private sector. Of the 18 IT training centers, only one, the Royal Institute of Management, is a government institute. The Royal Institute of Management is taking up a number of IT projects that would facilitate e-education and e-government. Its erstwhile Information Management Program is now called Center for Information Technology. It plans and coordinates diploma programs on information technology and also administers short tailor-made courses mainly for in-service IT personnel. A total of 884 trainees have formally[19] graduated from the RIM including 72 in IT related subjects. It also conducts IT Awareness Workshops for executives and managers from both public and private sectors. The Center is also the focal point for the Cisco Networking Academy Program that offers online courses of networking. Following are the list of such training centers in the country.

[19] These are formal certificates and degrees awarded to trainees. Besides this a number of short-term operators' level computers courses are also conducted for which figures are not available.

List of IT Training Institutes in Bhutan

S.N	Name of training Institute	Courses	Annual Intake 02-03	Established
	Thimphu Dzongkhag:			
1.	Visual Institute of Technology	Windows 98/2000; Microsoft Office; Windows NT Microsoft Front page 2000; MS Internet Explorer; Page maker; Photoshop; etc.	14	December 1999 vit@druknet.net.bt
2.	InfoTech Learning Center	Basic Computers; Programming; Web Design; Data base; SQL Server Networking; Commercial Application.	200	July 1999 its@druknet.net.bt
3.	Digital Shangrila	Basic Computer operation Secretarial Course ;Internet/email Office Automation; Desk Top Publishing & Web Publishing; Networking, etc.	200	November 2000
4.	Rigsum Namtruel Institute of Information Technology (RIIT)	Basic Computer Operation; advanced Computer operation Desk Top Publishing; Basic Web Design; Basic Networking; Accounting course; Dzongkha Computing Course, etc.	215	June 2000
5.	Kuenphen Tehnology	Basic and advance Computer operation Basic and Advance web design Dynaimc web design Basic and Advance Database Development Basic and Advance Networking		June 2002
6.	Tashi Institute of Technology	Basic Computer Operation Courses, Diploma in information Technology, WAP,ECRM, etc.	Not started	
7.	Druk Information Technology/IT Training Institute	Basic Computer Operation, Advanced Computer Operation, Basic web Design, Dynamic Web Development, etc.	Not started	
8.	National Institute of Information Technology (NIIT)	Basic Computer operation; Advanced computer operation Using Internet and email Basic database development using access and visual basic Advance database development using SQL and visual basic Basic Web design; Basic Net working; Advanced Networking	200	August 2001

S.N	Name of training Institute	Courses	Annual Intake 02-03	Established
	Samtse Dzongkhag			
1	Samphel Computer Center	Windows based applications, IT Enabled Accounting, Visual Programming, Programming with Oracle, Diploma in Information technology; Masters in Information Technology; Oracle & SQL	40	March 2001
	Paro Dzongkhag			
1	Rimpung Computer Training Center	Courses will be offered as per the Standardized IT training Programmes of NTTA & DIT.	25	March 2001
	Chhukha Dzongkhag			
1	Computer and Management Institute	Basic Computer Operation; IT Training Programme Visual C++ with OOPS; Programming Logic and Technics SQL Server 7.0; Database Design; Internet email Visual Programming; Accounts; Certificate in Programming Diploma in Information Technology, etc	300	January 1999
2	Druk Info Tech.	Internet & E mail; Office Executive Course; Financial Accounting Graphic Designing & Dzongkha; Advanced FoxPro Programming Database; Office Executives Course; Auto Cad Ver.2000, etc.	70	September 1997
3.	Milestone Computer Education & Business Centre	Diploma in Information Technology Diploma in IT Management	150	November 2001
4	Tagma Institute of Computer studies	Certificate in computer operation and management in English and dzongkha Certificate in Accountancy and Computer operation Certificate in programming Diploma in Information Technology Tailor made intensive computer operation courses Crash course for Secretarial level (package)	160	August 2001

S.N	Name of training Institute	Courses	Annual Intake 02-03	Established
	Samdrup Jongkhar			
1	Computer Training Center	Basic and advance Computer operation Basic web design Database Development PC maintenance and trouble shooting	15	June 2002
2	Dee Pee Infotech	Basic and advance Computer operation Basic and Advanced web design Basic and Advance Database Development PC maintenance and trouble shooting Dynamic web development Basic and advance Networking	30	1st July 2002
	Gelephu			
1	Computer Training and Consulting Institute	Basic and advance Computer operation Basic web design	270	June 2002
	Mongar			
1	Eastern Infotech	Certificate in IT; web development; Database Development; PC maintenance and trouble shooting; Networking	330	August 2002

Table 19 - IT Training Institutes

The Royal Management Institute also caters to IT training needs of the public sector organizations. Some of the short-term IT programs conducted by the RIM are:

- Internet Technologies in collaboration with ICIMOD
- Web Publishing/Designing in collaboration with UNDP
- Cisco Networking
- Advanced MS Applications
- IT for Teachers
- Advanced Database Programming

RIM also conducts mobile IT awareness campaign in the districts. It has plans to introduce new courses such as e-government within the 9th five-year plan. The institute also provides consultancy services on IT and has carried out research works on IT policy and distance education.

The principal coordinating agencies in IT training are the Division of Information Technology (http://www.dit.gov.bt) and the National Technical Training Authority (http://www.ntta.gov.bt). The NTTA coordinates and conducts fifteen different types of courses including IT.

The growth of IT training centers is appreciable. However, a question arises whether the growth is demand-driven or business-driven? In Bhutan, this has largely been business-demand. This is a result of demand but demand has been primarily based on the trainees' willingness to pay training fees to improve their skills. These trainees have not necessarily, landed up with ICT-related jobs. Lack of national resource persons and limited permission to employ foreign resource persons in the institutes has greatly affected the quality of training offered. The level of IT training provided is not matching the demand that is there in the Bhutanese job market. Policy has to define a strategy to narrow this demand-supply gap.

5.4.3 Education e-policy

There is no e-policy for the education sector yet. However, a number of ICT plans and activities are implemented. Such implementation has been totally based on the availability of resources. The department of education expects to come up with an ICT policy for Education. When such a policy comes through, the National ICT Policy should provide a very strong reference and guidance for this. ICT Policy has to give due importance and priority to the

Education policy on IT. The integration and symbiosis of these two will result in a more realistic and practical implementation of the Education IT master plan.

5.5 Networked policy

5.5.1 Development towards GNH

Bhutan development is guided by its development objective of Gross National Happiness.

The guiding principle for the development of Bhutan is the maximization of Gross National Happiness. Its principles guide Bhutan's development over a much longer period of time. The concept of Gross National Happiness[20] was articulated by His Majesty to indicate that development has many more dimensions than those associated with Gross Domestic Product, and that development should be understood as a process that seeks to maximize happiness rather than economic growth. The concept places the individual at the centre of all development efforts and it recognizes that the individual has material, spiritual and emotional needs. It asserts that spiritual development cannot and should not be.

GDP is defined in material terms of the increased consumption of goods and services. Gross domestic product is as such an inadequate indicator of development. Despite the importance accorded it, it is nothing more than a measure of the money that changes hands. It is insensitive to, for example, social problems and natural resource depletion. With this measure of 'development' it is possible for a nation's GDP to increase rapidly while its natural assets are rapidly exhausted, undermining sustainability and even the very survival of the nation.

The ICT Policy should take note of the development objective of Bhutan, Gross National Happiness as the core guiding principle.

[20] Except for some national papers, no external materials based on quantitative research could be found on GNH.

5.5.2 Telecom policy and regulation

Bhutan Telecommunications Authority (BTA) was established after the restructuring of the Ministry of Communications in January 2000. BTA regulates the telecommunications industry in Bhutan and is closely guided in its activities by the Bhutan Telecommunications Act, 1999.

Its responsibilities include economic regulation, technical and broadcasting regulation, licensing, technical standards, telecommunications infrastructure, radio frequency spectrum, commercial cable television and advisory services to the government on telecommunications matters. It also represents the Bhutanese government in international telecommunications organizations and agencies.

The Ministry of Communication through its Division of Information Technology, on the other hand regulates ICT. It is responsible for regulation, standardization and awareness of ICT in the country.

The ICT Policy should make implicit study and integration of the various ICT-related policies in Bhutan. The ICT policy also needs to study the new structure of the Ministry of Information and Communications and see areas of policy interventions.

5.5.3 Long-term ICT policy considerations

The following is the excerpt from "Bhutan 2020: A Vision for Peace, Prosperity & Happiness"

> "In the field of ***telecommunications***, our future strategies must also meet multiple objectives. They must bring telecommunications as well as postal services closer to the rural population. They must facilitate communication and exchange within the nation through the development of such services as email, internet and intranet. They must also further improve our contacts with the outside world, making it possible for us, at an appropriate time and following the introduction of appropriate standards, to access the 'information superhighway' that will provide us with access to the same information and data as those residing in the technologically most advanced nations."

6 Case Studies

6.1 Rigsum Institute of Information Technology, RIIT

Rigsum Institute of Information Technology or RIIT is located in Thimphu. Mr. Chenchen, a retired government servant, established it in 2000. Since its establishment, around 100 trainees have graduated from the Institute. It provides a broad range of course ranging from typing tutor to more advanced programming courses like C++.

RIIT provides 16 different courses as follows:

a.	Basic computer operation	b.	Certificate in IT
c.	Certificate in Web designing	d.	Certificate in advanced web
e.	Certificate in programming language	f.	Certificate in Database programming
g.	Certificate in networking	h.	Diploma in Commercial accounts
i.	Multimedia course	j.	Certificate in Film Editing
k.	Certificate in Dzongkha computing	l.	Desk top publishing
m.	Certificate in Tally 6.3	n.	Certificate in Hardware
o.	Basic English and Dzongkha	p.	Certificate in Office management

As can be seen from the list, the institute has adopted to provide wholesome or complete course on IT. Trainees would not only learn about computers, but they can also continue this knowledge to more useful subjects as improving their language or work methods.

Course Title	Duration	M	F	Total	Commencing Date	Completion Date
1.Commercial Accounting Course with Computer	12 months	18	33	51	Nov.2001	Nov.2002
2.Operating Level Certificate Course English	3 months	2	7	9	Aug 2002	Oct.2002
3.Operating Level Certificate Course Dzongkha	3 months	1	2	3	June 2002	Sept 2002
4. Tally 6.2 Accounting Package	1 month	3	2	5	Aug 2002	Sept 2002
5. Data Base & Programming	12 months	1	4	5	Aug 2002	July 2003
6. Hardware Course	12 months	0	1	1	July 2002	June 2003
7.Commercial Accounting Course with Computer	12 months	4	5	9	Aug 2002	July 2003
8. Dzongkha Secretarial Course with Computer	45 days	27	3	30	Oct.2002	Nov.2002
9. Advanced Ms Office 2000 Course	7 days	11	9	20	Sept 2002	Sept.2002
TOTAL		67	66	133		

Table 20 - RIIT Courses

This is an example of the strategy that private IT training institutes follow in Bhutan. This diversity is particularly affected due to the limited number of trainees that may come for specific IT training. One is willing to acquire a collective range of skills so that such skills are more marketable in the work place. They are proposing to set up a multimedia culture program for the preservation of Religious text, images and documentations in association with the Orient Foundation.

6.2 Private Sector Survey

A private sector survey was carried out in Thimphu for the purpose of this study. Fifty companies or firms were selected at random for the survey and the work was carried out over a period of 8 days.

A survey was made to find out an overall perception of the private sector on some specific parameters or factors. The mapping of the findings is shown above. For example, most of the private sector companies feel that their business or the national economy is quite ready for ICT services like e-commerce, e-business, online payments etc. But the biggest issue of concern was affordability. A good number of companies still rate affordability as the key

bottleneck to ICT development in Bhutan. Surprisingly there is almost equal ranking for policy support as well.

A simple survey of private sector concern was also prepared in a mosaic as shown below.

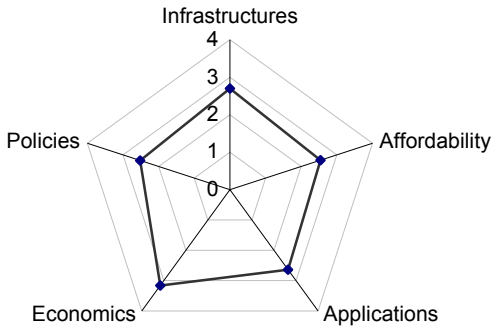

Figure 13 - Private Sector finding

Some of the other findings are presented below.

Computers	
• No. of firms covered by survey	50
• Firms having computers	82%
• Firms planning to buy more computers	60%
• Average budget for computerization	Nu 50,000 – 100,000
• Firms with more than 10 computers	15%
o Internet Café and IT training centers	(5)
o Industry	(1)
• Firms with less than 5 computers	80%
• Firms with Local Area Networks	32%
• Firms with leased Internet lines	None
Internet and e-mail	
• Firms that use Internet and e-mail	100% (22% use from Cafes)
• Firms that state Internet is not affordable but still use it	46%
• Firms that feel reduction by Nu 500 will double their Internet usage time	28%

Table 21 - Private sector survey findings

82% of the 50 firms surveyed have computers in their offices. 60% of firms including the ones that already have computers are planning to buy new computers with most of them willing to allocate a budget in the range of Nu 50,000 and Nu 100,000. Though a significant number of them do plan to buy, they are willing to allocate less than Nu 50,000 indicating

that they plan to buy only one set of computer and accessories. Among the companies that have computers, 15% have more than 10 computers and 80% have less than 5 computers. This indicates that most of the firms in Bhutan have only a few computers in their offices. There is however, not a single private firm among the ones surveyed that have leased line connection with Druknet. 48% of the firms say that Internet is not affordable in Bhutan, but they have to use due to the demand in business communication. This shows an important fact that Bhutanese businesses are slowly unable to do any business without the use of Internet and computers. It can fairly be said then that if the affordability issue can be addressed and solved, a good percentage of SMEs in Bhutan would use Internet for their business.

7 Policy Recommendations

Based on the e-readiness and sector studies, the following policy recommendations are listed for incorporation into the ICT Policy. Below the general recommendations, we are also listing some specific project recommendations to the DIT.

- Address national level plan and implementation
    - Leadership- is to be recognized as one of the most important factor for the success of ICT.
    - Set up an agency (or upgrade DIT) that is mandated for the planning, reviewing and coordination of national ICT activities as well as the recommend policy support within the Ministry of Information and Communications.
    - Vibrant National ICT Task Force to be able to utilize the Digital Opportunity Initiative in a participatory approach.
    - Develop national e-strategies
    - Integrate ICT into key national development priorities
    - Initiative to promote public awareness on ICT.
        - Regular National level workshops/Seminars
        - Create and promote national and local networks for sharing experiences and successes in use of ICT.
        - Loans schemes for skills upgradation or procurement of computers to individuals
    - Explore possibilities of making ICT sector as a major industry
- Creation of a National ICT Policy Advocates Networks to monitor and supervise the implementation of the activities in terms with the ICT Policy of Bhutan. It need not be a network of ICT experts, but who can be national ambassadors and advocates for ICT promotion
    - Build up an online network of ICT policy advocates and consultants
- Indicate the lack of any relevant ICT application
    - Provide sector-by-sector advice and assistance for application development
- Recommend policy guidelines on how and where applications are needed on priority basis.
- Encourage different ICT strategies for different groups of Bhutanese ICT society.

- Encourage e-government and show guidelines and justifications of a collective approach.
- The need for inter-sector coordination and information sharing.
    - Conduct a series of inter-Ministerial ICT coordination meetings
    - Conduct inter-sector meeting in all 20 districts
- E-services need implicit description in ICT policy.
- Strong emphasis on E-learning in line with policies on infrastructures, resources, capacity building and IT skill development among youth.
    - Provide distinctive guidelines on e-learning and the school computerization programmes
- Policy should provide indirect answers to such questions as, will Bhutan benefit from e-learning? Are the Bhutanese too skeptic on ICT? If so, how should the country address these skepticism? What should be Bhutan's strategy towards e-education? Should it start training all school-going children, all housewives, all unemployed, all illiterates etc? And what should be priority? How should Bhutan address the immense resources required?
- Recommending telemedicine and e-health services appropriately.
- Address the employment mismatch between supply and demand in Bhutan.
    - Built up an online matching application for job seekers and employers
- Address universal accessibility of ICT services (telephone, radios, print, Internet)
    - Establish and fulfill a position of ICT Focal Point in each of the 20 districts
    - Conduct surveys, field visits and cross-sector discussions and come up with an ICT Strategy Paper to implement ICT projects
- Address the need for efficient and reliable network systems.
- Indication of the genuine need of quality networks and services
    - Make a review study of ICT network and service qualities
- Policy support to address affordability of ICT services.
    - Recommend immediate reduction of Internet and telephone charges in the country mainly for the non-urban users
- Need for robust and trustworthy public-private partnership in the area of ICT.
    - Establish a public-private sector partnership forum on ICT
- Importance of developing private sector ICT vendors and firms.

    - DIT to develop a modality to acquire all ICT works from the public sectors and set up match with its database of private firms and individuals to conduct such work
    - DIT to make strong recommendation for ICT training and outsourcing business to be explored in-house
- Make effort to include policy needs for a vibrant private sector in the promotion of ICT
    - Appreciate the growth of private IT firms and at the same time provide guidelines for their sustenance and vibrancy.
- The strengthening of the role of the Bhutan Chamber of Commerce and Industries so it plays a better role in private sector development
    - Immediately Advise/assist the BCCI on ICT activities
    - Take up all ICT related discussion issues with the private sector
    - Work closely and advise BCCI on their portal development
- The promotion of ICT in the work place and ICT education for the users
- The need for government to encourage wider and homogenous Internet diffusion.
    - Recommend the Royal Government to allocate resources and build capacities on ICT in Bhutan
- Establishment of a National Web Portal standardization agency to administer website content and design quality of public sites. DIT may additionally take up this responsibility.
    - Immediately mobilize resources for setting up National portal and content regulation
- Address the requirement for integration of all government websites under a National web portal standardization agency.
- Deliberate on appropriate, relevant, dynamic and reliable website contents.
- State the importance of local content and the importance of local language
    - Assist agencies in content development
    - Provide standard guidelines on content
- E-commerce needs an educative handling in the policy recommendation.
    - Conduct a series of awareness events on e-commerce and its technicalities
- Policies on digital signatures.

    - Recommend to the government concrete measures to go about digital signatures
- Policy has to indicate important areas of e-services like online registration of their properties, online census, online voting, online applications.
- E-banking and financial services need a special mention but policies should not recommend too ambitious and impractical initiatives. Bhutan's environment of business, infrastructure and economy should be give due consideration.
    - DIT to specifically function as a facilitating and supportive role in various e-services
    - DIT to build its own capacities in doing so
- Mention of credit card services, data security features and firms, the need good supply chain management need to be made.
- Policy guidelines on how the government should exploit this national capacity for ICT development.
- Incorporate in an integrated fashion the Education IT plans and policies.
    - Assist the Education Department to review the ICT master plan and also prepare their Action Plan
    - Mobilize resources if required
- Promotion and encouragement of community based ICT projects like Community Telecenters, Geog Telecenters, Telekiosk, E-Post systems etc.
    - Establish at least one Community Telecenter in each Geog in the country
- Encourage Open Source Technologies
    - Work as the focal point and a National Centre of Excellence on Open Source technologies
- Encouragement on the privatization of all ICT services including telecom service, Internet, broadcasting, print and other mass media
    - Prepare concept paper to force slow and controlled privatization of ICT sectors
- Introduction of competition
- Promotion of cheaper ICT technologies like WLL, VHF and VOIP for rural accessibility.
- Total mandate and accountability for an ICT agency otherwise it leads to confusion and lack of coordination

    - Work as the central coordinating agency for all ICT activities
- Respect for IPR in R&D from private sector in particular
    - Work as the IPR focal point for ICT products
- Recommendation to the introduction of patent laws in ICT products
    - Introduce patent and copyright laws for ICT services
- Recommendation on the initial support of government required in International marketing and trade management on ICT products and services.
- Take special note of Bhutan's development objective - Gross National Happiness.

> ***"…there is talent, ingenuity, and knowledge. But when all is said and done, what innovation requires is hard, focused, purposeful work."***
> **Peter Drucker**

8 Conclusion

The development of ICT has been very significant in Bhutan. The country has seen the coming of Internet, the advent of closed networks and applications, the growing imports of computers and systems and the significant use of computers and Internet in offices. These developments are positive and are contributing towards the overall development of Bhutan. However, ICT developments in Bhutan have been taking place in an uncoordinated fashion. This results in the inefficient use of budgetary, human and technical resources. Most of the ICT projects are also resource driven rather than needs driven. The importance has been given more on the hardware and not on the software, training and communications. To guide and streamline these, there is an important and urgent need for a national policy on ICT and a set of regulations. The E-assessment study provides a basis for the development of these national instruments.

ICT awareness at both the decision-making and operational level needs encouragement. In order to minimize the Digital Divide, Dzongkhag administration must be accorded high priority in ICT training and implementation. DIT should be strengthened to be a coordinator and promoter of ICT implementation. Widespread promotion of ICT must be taken up. Lack of trained manpower has been the biggest bottleneck, which has left most of the organizations (Ministries) with out a long-term ICT plan for e-services. National and agency-wide master plans with achievable milestones should be drawn. The schools need to embark on computer education at the earliest. In-country ICT firms should be utilized to the extent possible for the promotion of the technology so that government and private sector can work together as combined national resource.

ANNEXURES

Annex 1 ICT Master Plan for Education

The education division has prepared an IT Master Plan for Education. The 9 packages of the Master Plan are briefly described below.

Package 1

ICT services for immediate use will be established in the 2 teacher training institutions in Samtse and Paro. Lecturers and trainees teachers will be familiarized on Information and Communications Technologies. Preliminary works on distance education will be started.

Package 2

Activities from package 1 will be continued. Use of online resources to enhance the knowledge of lecturers and students alike will be promoted. Distance education will be fully implemented with all resources and infrastructures. A dynamic web page will be developed for distance education. Computer courses will be introduced in teacher training programmes. One-year Post Graduation Certificate in Education in Computer Science will be introduced in these institutes.

Package 3

There are 2 categories of high schools. One with classes upto 12 and one with classes upto 10. Computer Studies as an optional subject will be introduced in 10 high schools with class 12. All teachers and students in these schools will be trained in ICT. Internet will be provided to these schools and individual school homepages developed. Using computer, Internet and networking facilities will improve teachers' delivery and school's administration.

Package 4

Computer Studies as an optional subject will be introduced in the remaining high schools. All teachers and students in these schools will be trained in ICT. Internet will be provided to these schools and a school homepage developed. Using computer, Internet and networking facilities will improve teachers' delivery and administration.

Package 5

25 Resource Centres, RC for education will be established to provide up-to-date information for teachers of the cluster schools. These RCs will function as a link between the cluster schools and other agencies including the education division itself. This centre will function as a resource node where teachers can share teaching materials and other resources within themselves. Teachers will be trained on new technologies in these Centres.

Package 6

Internet will be provided to 36 Junior high schools that have electricity. Teachers and students will be trained in ICT. Adequate ICT materials as teaching resources will be arranged. School management and administration will be enhanced through efficient use of ICT.

Package 7

Internet will be provided to 34 Junior high schools that do not have electricity. Teachers and students will be trained in ICT. Adequate ICT materials as teaching resources will be arranged. School management and administration will be enhanced through efficient use of ICT. Where required arrangement for power supply will be arranged.

Package 8

Basic ICT literacy and education will be introduced in 50 primary schools that have electricity. Teachers will also be trained in computers and Internet. Internet services will be provided in the primary schools. Instructional delivery and school administration will be improved by exploiting the facilities.

Package 9

Basic ICT literacy and education will be introduced in 100 primary schools that do have electricity supply. Necessary power supply facilities will be arranged in these schools. Internet services will be provided. Teachers will also be trained in computers and Internet. Instructional delivery and school administration will be improved by exploiting the facilities.

Annex 2 DIT Dzongkhag Network Plan

DIT has prepared a DRAFT Dzongkhag Local Area Network: A Feasibility Study Report on April 2003. The document includes logical diagram of tentative local area network plan for the following Dzongkhags:

1 Trashigang
2 Mongar
3 Jakar
4 Trongsa
5 Zhemgang
6 Sarpang
7 Tsirang
8 Gasa
9 Thimphu and
10 Paro

With the installation of the LAN, it is expected that there will be better communications and good file sharing with immediate response between the sectors and the head quarters. The officials need not depend on their subordinates for the access of information; Internet connection can be shared; systems like Zhi-Yog and BAS can be installed and used effectively; and resources like printers and scanners can be shared.

The LANs have already been installed in Thimphu and Paro dzongkhags in 2003. Funds are being secured to set up the LAN in all dzongkhags within the financial year 2003-2004.

During the study for the preparation of the document, DIT found that dzongkhags had sufficient number of computers. The computers were used for word processing, spreadsheets and printing purposes. It was also found the some computers required LAN cards to be on the LAN and numbers of modems were also there which were not being used. In the absence of a LAN, multiple internet accounts were being used to access from different computers.

Feasibility study of rest of the dzongkhags is underway.

Annex 3 Internet Café User Survey

Seven Internet Cafes were surveyed in Thimphu. It was found that average investment is Nu. 200,000. Three reported to be running at loss and 4 doing break-even business. Average 15 customers use at an average of 20 minutes which includes both local and expats users. Some cafes also provide virtual-office service but the business in not very significant. Complaints remain with the DrukNet service, speed of connection and the overall cost.

Question	Café							
	Average	A	B	C	F	G	H	I
2. Number of Computers:	5	4	5	4	2	6	4	11
3. Type of DrukNet connection:			200	100				100
4. Number of months in Business:	17	9	48	4	1	45	12	2
5. Investment (approx):	195,714	200,000	200,000	300,000	70,000	150,000	150,000	300,000
6. Average customers per day:	15	6	15	20	15	20	10	20
7. Type of customers (students, working people, expats, etc.) Rate 0-Low to 10 High:								
a. Student	5	0	9					
b. Working People	2	0	3					
c. Expats	3	0	5					
8 Average time used by customers:	22	30	30	30	10	20	15	20
9a. Non Internet (Typing, Printing, Scanning) (0 Low, 10 High)	2	0	4	2	0	3	5	3
9b. Internet								
Email	8	5	8	9	X	8	9	8
Surfing/research/School results/News	6	4	7	9	X	5	8	2
Chat/games/Penfriend	6	3	5	10		7	7	5
Others (Specify)	3		3					
11. Rate your business income								
Very bad	1	1						
At Loss	2				1			1
Break even	4		1	1		1	1	
Making profit								
12. Average cost per month on Internet Connection + Telephone:	6,864	2,000	6,200	10,000	5,000	15,000	5,000	4,850

Question	Café							
	Average	A	B	C	F	G	H	I
13. Problems faced in this business:		Internal Technical difficulty	Slow connection, Poor DrukNet Service		Less customers	High cost	DrukNet down	DrukNet down, Expensive
14. Recommendations to concerned agencies (like Bhutan Telecom, Ministry of Trade and Industry, Division of Information Technology etc.) to change policies to facilitate the business			Provide affordable leased line to Cafes	Reduce Tarriff	Reduce Tarriff	Reduce Tarriff	Maintain steady service and better speed to DrukNet	Reduce Tarriff for Café, No Tel. Charge. Affordable leased line
15. Any other comments					Poor connectivity		Sponsor student programs	

Annex 4 Proposed Ministry of Information and Communications