.bt

Bhutan

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Total population	646,851
GDP per capita	USD 1,414.01
Life expectancy at birth	66.25
Key economic sectors	hydropower, tourism, minerals, forest products
Fixed-lines per 100 inhabitants	4.40
Mobile phone subscribers per 100 inhabitants	38.96
Computers per 100 inhabitants	1.86
Internet domestic bandwidth	200 Mbps+ (2004)
Internet international bandwidth	78 Mbps+ (January 2008)
Internet subscribers (lease lined)	95
Dial-up Internet subscribers	12,000
Internet users per 100 inhabitants	5.9
Domain names registered under .bt	247

(Sources: Internet World Stats 2008; National Statistics Bureau 2007)

INTRODUCTION

Information Technology (IT) is a relatively new and embryonic industry in Bhutan, and its development is being informed by the Information and Communication Technology (ICT) Master Plan, which lays out three broad policy objectives: *(i)* the use of IT as an integral tool to enhance good governance; *(ii)* the development of IT and IT-enabled industries in the private sector to generate income and employment; and *(iii)* the use of IT applications to improve the livelihood of all Bhutanese.

Guiding ICT development is the Bhutan ICT Policy and Strategy (BIPS) launched in July 2004 which calls for balanced and sustainable development based on five pillars: policy, infrastructure, human capacity, content and applications, and enterprise. In June 2006, the Bhutan Information, Communication and Media Act (ICMA) was approved. One purpose of the ICMA is to encourage local and foreign investment in the ICT and media industries by providing a modern regulatory framework that fosters a convergence of information, computing, media, and communications technologies, and facilitates privatization and competition. Provisions for the protection of digital data and information privacy exist under the ICMA, including the consequences of infringement. Documentation is being drafted by the Royal Government of Bhutan (RGoB) to highlight the ICMA's relevant privacy provisions, along with those in the draft contract law, to provide a degree of confidence that data protection concerns are adequately addressed under existing and proposed legislation.

TECHNOLOGY INFRASTRUCTURE

Over the last few decades, significant progress has been made in the ICT infrastructure development and provision of related services across the country. The first telephone network in Bhutan was established in 1963. Thirty-five years later, in 1998, a fully digital national telecommunication network interconnecting all 20 *dzongkhag*s (districts) and major towns was established. The main transmission backbone network consists of 155 Mbps digital microwave routes connected to the digital switching system. Lesser traffic spur routes consist of 34 Mbps and 8 Mbps microwave radios. A Digital Multiple Access Subscriber System (DRMASS) is deployed in areas with smaller requirements. Rural services have been extended using Wireless Local Loop (WLL) and very small aperture terminal (VSAT) technology. The major urban centres like Thimphu, Phuentsholing, Paro, Wangduephodrang, and Punakha are connected using optical power ground wire (OPGW). The national backbone transmission network thus comprises OPGW, digital microwave radios, VSATs, and the Thimphu Satellite Earth Station.

Bhutan Telecom Limited (BT), the incumbent operator, provides fixed-line and mobile telephony, Internet, and other value added ICT services in all 20 *dzongkhag* headquarters, some sections of the national highway, and many other parts of the country. BT's B-Mobile launched its mobile service on 11 November 2003. As of August 2008, BT's B-mobile customer base has reached to 200,000, whereas the number of BT's fixed-line customers decreased marginally to 28,520 from 29,857 (December 2007). Fixed-line and mobile teledensities are 4.40 percent and 38.96 percent (B-mobile and TashiCell), respectively. In 2008, BT commissioned the laying of an international optical fibre link extending from Phuentsholing to London via Mumbai. BT also became a member of LINX (London Internet Exchange). With the expansion of international

bandwidth, BT launched DSL-based broadband services on the 1st of March 2008 and, as of August 2008, it covers 15 *dzongkhag*s.

In keeping with the market liberalization policy of the Royal Government, two Internet service providers (ISPs), DrukCom Private Enterprise and Samden Tech Pvt Ltd, were licenced in 2004 to provide VSAT-based Internet and value added services (VAS). These new ISPs have done away with the monopoly enjoyed by DrukNet of Bhutan Telecom and created a market of choice. Due to their presence in the market, the cost of Internet services such as leased lines and Web hosting has been reduced, connectivity has been enhanced, and new services such as broadband introduced.

A second mobile operator, Tashi InfoComm Ltd (TICL), was awarded a licence in 2006 through an open bidding licencing process. TICL launched its services commercially in April 2008. At present, TICL's mobile services are available only in six *dzongkhag*s, covering 60 percent of the total population. The remaining *dzongkhag*s shall be covered in the next three years as mandated by the cellular licence issued by the Royal Government of Bhutan. As of August 2008, TICL had a subscriber base of 52,000. This substantial growth from 25,000 users (end of May 2008) was achieved due to the provision of two months of free calls and SMS within the TashiCell network. TICL expects the number of subscribers to grow as the company extends its reach to other *dzongkhag*s and as it continues to improve its service offerings.

The immediate impact of the entrance of a second cellular service provider is choice of cellular service and the availability of different services such as General Packet Radio Service (GPRS), Enhanced Data Rate for GSM Evolution (EDGE), third generation mobile phone standards and technology (3G), and various value added services, as well as cheaper call rates even to other countries.

Indeed, things are moving rapidly in mobile technology, with the subscriber base reaching almost 252,000, or 38.96 percent of the population, since its introduction in 2003. But the rate of Internet and computer usage in the country is low, with only between 10,000 and 12,000 computers in the country. Most of these computers are owned by the government and corporations in the urban areas. Internet use is not increasing at a rapid enough pace because of the cost factor, as well the lack of local content.

The Bhutan Broadcasting Service, the only television station in the country, is also implementing infrastructure projects, such as the construction of the National TV Centre in Thimphu, the installation of a 100 kW shortwave transmitter, and the acquisition of a control and monitoring system for its TV network.

KEY INSTITUTIONS AND ORGANIZATIONS DEALING WITH ICT

The Ministry of Information and Communication (MoIC) was established in July 2003 as the lead government agency for the formulation and implementation of policies and the drafting of ICT legislation in the country. The MoIC is also mandated to: *(i)* develop an efficient and reliable information and communication systems to help transform Bhutan into an information society; *(ii)* promote ICT in the country as an enabler of national development; and *(iii)* develop a safe and progressive national transport system.

In order for the MoIC to carry out its mandate, the Department of Information Technology (DIT*)* was established as the lead department for the development, promotion, and coordination of all ICT-related activities in the country. The department has three divisions. The application division researches and recommends appropriate software applications and operating systems for adoption and use, and drafts guidelines for the development of software applications and quality control. The division also encourages, facilitates, and coordinates the creation of e-services. The infrastructure division assists the department mainly in planning infrastructure development, carrying out research on networking and hardware components, and preparing technical specifications for hardware. The infrastructure division also provides assistance to the Bhutan InfoComm and Media Authority (BICMA) in the analysis of technical matters, including interconnections, radio frequencies, and use of technical standards. The policy and planning division undertakes systematic research on laws; organizes information sessions on policy and regulatory matters relating to ICT; promotes and develops ICT services for the promotion and preservation of culture, tradition, and social cohesion; and conducts studies on the ICT sector to identify opportunities, constraints, and difficulties and to propose government intervention where needed.

Another major institution dealing with ICTs is BICMA, which was established in 2005 as the Bhutan Communications Authority (BCA). With the enactment of the Bhutan Information Communications and Media Act in 2006, BICMA was formally de-linked from its parent ministry, the MoIC. The now independent Authority's functions include regulation of telecommunications services, media services like cable television, broadcasting, and printing presses; assignment of radio communication frequencies; and management of the radiofrequency spectrum. It also licences all ICT and media facility providers and service providers, prepares various guidelines, sets technical standards, and frames terms and conditions for the provision of such services.

Besides the above-mentioned key ICT institutions, the ICT divisions and units at the different ministries, corporations, NGOs, and tertiary and private ICT training institutes assist in the overall promotion, implementation, and development of ICT policies. They also collaborate with the MoIC in the coordination of ICT activities across the country.

ICT AND ICT-RELATED INDUSTRIES

There are about 45 ICT firms in Bhutan. With the government policy of outsourcing most of its ICT developmental activities, the lifting of import duties for ICT products, and the introduction of tax holidays, these ICT businesses have grown in size, expanding their services and providing both software development and network solutions.

A medical transcript centre and a call centre were licenced in October 2006, and both have been operational since the end of 2007. The medical transcript centre has 75 agents while the call centre has 175 agents engaged in non-voice services. The latter's intended business (voice) has not taken off, largely because of the substantial investment required and the unpredictable market. Neither of the two centres is generating significant revenues, and both are in fact still struggling to meet their operational cost. However, both are absorbing many job seekers and it is anticipated that once they are fully functional, they will be able to absorb more. The two companies are being carefully watched and their success is expected to encourage the entry of new players into the market, generating revenues and more jobs for graduates as well as school dropouts.

To boost ICT development, the establishment of the Bhutan IT Park has been proposed under the Private Sector Development Project with funding support from the World Bank. The project aims to provide employment opportunities through the promotion of enterprise development in the IT and IT-enabled services (ITES) sector, enhance IT skills, and improve access to finance. The project involves a five-year investment of USD 8 million (from 2008 to 2013) for the development of infrastructure, lease-in space for an incubation facility, a shared technology centre and a data centre, an IT skills development program, and IT-related hardware and software investment in the financial sector complemented by a small amount of technical assistance advisory services.

KEY ICT POLICIES, THRUSTS, AND PROGRAMS

The Bhutan ICT Policies and Strategies (BIPS) launched in July 2004 is the main document guiding national ICT developments.

The development of BIPS involved stakeholders from the government, non-government, and private sectors. Five committees were formed along the lines of the Digital Opportunity Initiative, covering policy, infrastructure, human capacity, content and applications, and enterprise. With inputs from open consultative workshops and previous ICT studies, the committees formulated strategies and activities designed to promote ICT development in Bhutan.

The three overall policy objectives underpinning BIPS initiatives are: *(i)* use ICT for good governance; *(ii)* create a Bhutanese info-culture; and *(iii)* create a 'high-tech habitat'. Under each objective are five strategies as follows:

- *Policy* activities are focused on making governance more efficient, transparent and inclusive; introducing and strengthening a modern legal and regulatory framework; and investigating ways to fund ICT and reduce the costs of ICT services.
- *Infrastructure* activities are focused on implementing a liberalized and competitive market infrastructure and ensuring affordable, fast, secure, sustainable, and appropriate ICT infrastructure throughout Bhutan.
- *Human capacity* activities include developing appropriate ICT awareness and skills, from basic computer literacy to high-level technical skills, to boost the ICT industry. The aim is to improve the quality and coverage of training institutions, develop a centre of excellence, and accredit ICT training institutes in Bhutan.
- *Content and applications* targets include establishing the framework for e-business, using ICT to preserve Bhutan's cultural heritage (see 'Digital Content'), enhancing the quality and accessibility of health and education, broadening national media and Web presence, and supporting good governance.
- *Enterprise* activities aim to boost the competence of the local ICT (private) sector, and provide business opportunities by outsourcing government ICT work. Access to finance will be addressed, as well as a strategy to target export of ICT services and boost the application of ICT in non-ICT businesses.

The following are some of the programs being implemented under the five strategies:

1. Use of ICT to make governance more efficient, transparent, and inclusive, in particular through information sharing between agencies, policies on ICT security and ICT units in each *dzongkhag*, use of free and open source software, introducing the 'e-Gazette' as an official government publication

of record, and using ICT to deliver 75 percent of all public services.

2. Establishment of an ICT 'centre for excellence' to build linkages with international institutions, carry out ICT research and development, and create a standardized curriculum to develop skills required in the job market.

3. Establishment of a liberalized and competitive ICT infrastructure market by providing a licence for new operators and service providers, establishing incentives for new ICT players to set up ICT businesses, and promoting foreign direct investment in the ICT infrastructure development.

4. Ensuring that all students who have completed a basic level of education have acquired basic IT and computer skills by building the necessary infrastructure in all middle and high schools, recruiting ICT-literate teachers, training teachers in ICT use, and developing a standardized basic ICT literacy curriculum in schools and training centres.

5. Harnessing ICTs to enhance the quality and accessibility of health services by establishing links with neighbouring countries and international agencies to track emerging health threats, provide real-time telemedicine from basic health units (BHUs) to districts to referral hospitals, and set up an integrated health management system.

6. Outsourcing appropriate government ICT work by conducting a baseline survey of current ICT outsourcing practice, and developing awareness and capacity to outsource through business fairs and workshops on ICT outsourcing for industry and the Royal Government of Bhutan.

LEGAL AND REGULATORY ENVIRONMENT FOR ICT DEVELOPMENT

The Technical Guidelines on ICT in the 10th Five Year Plan sets out the necessary framework for mainstreaming ICT as a tool in sectoral development programs (at the central and local levels), addressing the needs of the poor, and fostering pro-poor innovation and growth through the effective and innovative use of ICT. This framework was developed as a means to achieve core development objectives embodied in the UN Millennium Development Goals and Bhutan's development concept of Gross National Happiness (GNH).

The Bhutan Information, Communications, and Media Act provides the legal basis for the regulation of the ICT and media sector. The Act is a modern technology-neutral and service sector-neutral regulatory mechanism based on the principle of convergence of information, computing, media, communications technologies, and facilities for the provision of a whole range of new ICT and media services. It provides the rationale for the creation of a new regulatory authority, BICMA (see 'Key ICT Organizations'), and its functions. It also has provisions related to ICT facilities and ICT services, the licencing mechanism for such services, and the management of the radio frequency spectrum, as well as provisions for the licensing and regulation of media content. Provisions related to cyber issues are included, such as those on electronic governance, electronic commerce,

Bhutan's Digital Signature Project 2006

Although Bhutan is making considerable progress in implementing numerous ICT activities, the country is not able to deploy secure online applications due to the lack of a digital signature authentication framework. Thus, the Department of Information Technology (DIT), with technical and funding support from the International Telecommunication Union (ITU) and the United Nations Development Programme (UNDP), initiated the Digital Signature Project in 2006. It aims to enable the government, citizens, and businesses to communicate securely and exchange sensitive business information safely.

The project is currently in the pilot phase of deployment after the setting up of the Certification Authority (CA) and Registration Authority (RA) servers and the physical security system. The Certificate Policy (CP) and Certification Practice Statement (CPS), which are required to make a digital signature legally binding, have also been formulated with the assistance of the ITU. eTokens (smart card) containing a user's certificates and private key are distributed to users at the DIT. Basically a digital signature is used for document and mail signing and encrypting.

The next step is to deploy the technology at the ministry level and then to other agencies of the government. The deployment of completed digital signatures will happen during the 10th Five Year Plan (i.e. from July 2008 until June 2013).

(Source: DIT 2006)

and digital signatures; consumer protection in e-commerce; online privacy; domain names; operations and liabilities of ISPs; and cyber offences.

A code of content is being drawn up by BICMA to apply to all content made available by the ICT and media industry within the Kingdom of Bhutan. The code seeks to foster a sense of responsibility among content providers and to ensure that online content is safe, secure, informative, educational, and entertaining. The objective is to create a self-regulatory environment for industry to provide online content in a practical and commercially feasible manner and promote the growth and development of online service industries.

The Bhutan ICT Human Resources Development Master Plan and Strategies (BIHMPS), which is still at the draft stage, is underpinned by a vision of Bhutan becoming a knowledge-based society and is closely aligned with key strategy documents such as the BIPS and the Good Governance Report. Intended to be relevant for a period of five years, the Master Plan has been developed in consultation with various stakeholders.

Details about the laws and regulations described in this section are available at www.moic.gov.bt. The Royal Government of Bhutan is preparing other guidelines and regulations for electronic signatures, e-business, security policies, and information management.

DIGITAL CONTENT

BIPS lists under the 'content and applications' initiatives the development of 'a digital archive of significant Bhutanese re-ligious texts and cultural contents in sound and picture format'. Thus, in 1997, the DIT, with technical support from the University of Virginia and funding support from the Royal Government of Bhutan, started the National Digital Library Project. The project aims to consolidate efforts by Bhutanese individuals and communities to represent their traditions and perspectives, collect existing cultural materials, and document aspects of Bhutanese life and traditions for people to access from anywhere in Bhutan and the world. In other words, the project seeks to put together an invaluable record of Bhutanese culture for Bhutanese researchers, tourists, and anyone interested in learning more about Bhutanese culture.

During the first phase of the project (completed in July 2007), a basic portal for the digital library was built to collect the work of various agencies, with the help of consultants from the University of Virginia who had earlier worked on the Tibetan and Himalayan Digital Library (THDL). The portal includes audio files, videos, images, and texts. The project utilized Dzongkha–Dzongkha (national language), English–Dzongkha,

and Dzongkha–English dictionaries from the Dzongkha Development Commission (DDC). Thus, the content can be accessed both in Dzongkha and English (bilingual).

For the digital library to be easily accessible in other parts of the world, the project has set up a mirror server at the University of Virginia.

The next step is to put in place a public awareness component as many Bhutanese do not yet know about the project to digitize Bhutanese cultural and religious content, as well as to seek funding from donor agencies to develop the digital library further.

ONLINE SERVICES

BIPS specifies the need to introduce online services covering clearances, approvals and financial transactions, and to deploy ICT to improve the reach and quality of essential services such as education, health, and agriculture. All of the concerned agencies have put in considerable effort to provide online services since BIPS was launched. Setting an example, the DIT itself has developed and is hosting the Bhutan portal www.bhutan.gov.bt.

The portal received a boost with the completion of the Thimphu WAN connecting 42 of 72 listed organizations. The Thimphu WAN allows these organizations to access each other's websites and other online resources at very high speed. Thus, the Thimphu WAN makes it possible to exploit the opportunities for interconnection and integration of government services. However, the Thimphu WAN is at present available only in the capital. There are plans for the laying of fibre optic connections in all *dzongkhag* and *geog* (blocks or sub-districts).

Bhutan Post is implementing an electronic mail service called e-Post at selected post offices to bridge the gap between the electronic haves and have-nots. The service was launched in 2005 and has two models — the 'post office to post office' model and the 'anywhere to post office' model. The first model, which is based the originator-pays-fee model, suits those who use the post office to send their mail and who do not have access to or are not even familiar with the Internet. Such customers go to any of the selected post offices with e-Post facilities with handwritten mail, photos, floppy discs, or just a message in their mind for translation into a meaningful message to the recipient. The postmaster helps each customer send this e-Post to another post office in Bhutan. The receiving postmaster prints the e-Post, puts it in an envelope, and delivers it to the addressee. The second model, which is based on a receiver-pays-fee model, suits customers with Internet facilities. In this instance the customer sends to a post office an email containing his/her message for his/her intended recipient. The receiving postmaster prints the

mail, puts it in an envelope, and delivers it to the recipient for an e-Post fee. In the correct delivery address is not available, a telephone number may be provided and the postmaster will call the number and request the recipient to pick up his/her e-Post.

Bhutan Post is also in the process of implementing an *Easy pay and online tracking system* for both postal and non-postal deliveries. The easy pay facility will enable citizens to pay for different services at one stop. The online tracking system will enable individuals to track their mail by entering a unique barcode number.

LabourNet is an online system through which an individual, firm, company, or enterprise can forward job applications from foreign workers (expatriates, volunteers, labourers, etc.) to the Labour Recruitment Committee (LRC) for processing and approval. The decision of the LRC is uploaded to the system, and the information is forwarded to concerned applicants via email or through phone or fax. The main objective is to maintain a complete and accurate database of foreign workers in Bhutan.

Drukair, the national airline, has introduced a Web-based reservation system called *Air Kiosk* to enable customers to make reservations online and thus reduce reservation costs. The main goal is to do away with paper tickets and replace these with electronic tickets.

Other useful applications have been identified and are being implemented, such as the online issuance of security clearance, the agriculture marketing system to provide market rates and information, and online forest clearance and land transactions. In addition, 90 percent of all government forms can now be downloaded from the Bhutan portal.

ICT-RELATED EDUCATION AND CAPACITY-BUILDING PROGRAMS

Strengthening educational institutions and curricula to provide ICT skills at all levels — from technical, professional, and entre-preneurial skills for industry and government, to basic ICT literacy for all — is one of the vision statements of BIPS.

At present, around 50–80 percent of qualified ICT personnel added to the system annually are graduates of Sherubtse College, the only institute providing degree level ICT courses, and the Royal Institute of Management (RIM), which offers diploma (DIMS) level courses. Most of these graduates are employed by the public sector with a few opting to work for private enterprises.

The BIPS report (July 2004) acknowledges Bhutan's limited capacity in building a critical mass of ICT professionals and its reliance on outside technical assistance. It also notes that there are less than 400 ICT professionals in the whole country.

This lack of Bhutanese ICT personnel is somewhat offset by Bhutan's access to a large number of ICT professionals from the region.

The availability of ICT professionals is directly linked to the output of the tertiary ICT educational institutions. There are few local training institutes and the certification they provide is recognized only within the country. As noted earlier, the two government institutes offering full-time ICT training are Sherubtse College (degree courses) and the Royal Institute of Management (diploma and Cisco programs). The Paro College of Education offers a three-year elective IT course for students taking up a bachelor's degree in Education. Some students pursue tertiary education abroad and return to Bhutan to work.

The Ministry of Education in collaboration with EduPlanner Pte Ltd, a consultancy firm from Singapore, has reviewed and revised the IT curriculum for classes 9 to 12 based on a preliminary study carried out in January 2003. The new IT curriculum, which covers learning computing productivity tools (i.e. computer applications) and programming skills, aims to enable Bhutan's young people to function effectively in the new and fast changing environment. The new IT curriculum for classes 9 to 10 was rolled out in March 2003 and by the end of 2003 eight schools had successfully implemented it as elective subjects. By 2005, 22 more schools had been introduced to the curriculum. The IT curriculum for classes 11 and 12 was rolled out in March 2005 but could not be successfully implemented due to the lack of computers in schools and the lack of qualified teachers.

OPEN SOURCE/OPEN CONTENT INITIATIVES

Dzongkha Linux, an operating system for Dzongkha Desktop using an open source platform, was developed in June 2006 to be adopted as standard operating software for government offices. However, Dzongkha Linux was not very user-friendly and there were incompatibility issues. This led to the development of an updated version called the Dzongkha Debian Linux. Launched in August 2007, the new version supports computing in Dzongkha with standard applications like word processing, spreadsheets, PowerPoint presentations, Web browsing, and chatting. The number of users remains small however, as government employees are accustomed to Microsoft packages.

To promote the use of the Dzongkha Desktop, the DIT started an awareness program and user training. The DIT also distributed customized keyboards, which means that people no longer have to type two or more letters for a single Dzongkha alphabet as they would have to when using the international standard keyboard. The Dzongkha Desktop is a good alternative

for users who cannot read and write in English because it has an interface in Dzongkha as well as in English. It can also be downloaded for free.

ICT RESEARCH AND DEVELOPMENT

Dzongkha Linux, which was funded under the PAN Localization Project, was a success story in the research and development (R&D) front. Through this project, many technical terms that did not exist in Dzongkha were translated. In order to have a complete Dzongkha computing environment, more than 90,000 terms were translated.

The second phase of the project, which started in June 2007 and is expected to be completed by 2010, aims to carry out research and develop internationalized domain names in Dzongkha, Dzongkha part of speech, Dzongkha corpus, and text-to-speech system and optical character recognition.

The last release of Dzongkha Linux came with Gnome 2.14 and OpenOffice.org.2.

CHALLENGES AND OPPORTUNITIES

The past two to three years have been spent on building the ICT infrastructure and developing policies toward further development of the ICT sector in Bhutan. Within the next five years, the aim is to establish IT parks as well as community information centres in all 202 *geog*, set up e-governance applications, form ICT units with Bhutanese ICT personnel in all of the ministries, train more teachers, and implement a national broadband network. Internet rates are also to be reduced within the next year or so.

But for all of these to happen, a lot of resources, political will, and commitment and support from all agencies are needed. In particular, financing ICT development is a challenge. The total budget to develop ICT during the 9th Five Year Plan (fiscal year July 2007–June 2008) was BTN 80 million (USD 2 million), which is equivalent to the cost of building one higher secondary school with boarding facilities. For the 10th Five Year Plan (fiscal year July 2008–June 2009), the budget has been increased to BTN 2 billion (USD 50 million), which indicates government recognition of the importance of and opportunities available from ICT development. However, overall financing for ICT remains a major challenge for the country.

Another key challenge is coordinating ICT initiatives in Bhutan. At present, various projects seeking to contribute to the overall development of Bhutan are being carried out. However, the lack of coordination results in inefficient use of budgetary, human, and technical resources. Furthermore, most of the ICT projects are resource-driven rather than needs-driven. More importance is given to hardware than to software, training and communications. These issues should be addressed by the national policy on ICT (BIPS) and by legislation such as the Bhutan Information, Communications and Media Act. In addition, the DIT's role as a coordinator and promoter of ICT implementation is being strengthened.

To reduce the digital divide, the *dzongkhag* administration must be given priority in ICT training and deployment of ICT resources. National and agency-wide ICT master plans with achievable milestones should be drawn up. The lack of trained personnel is a big problem, leaving many organizations, including government ministries, without a long-term plan for e-services. Thus, the schools need to implement computer education and training programs. Moreover, in-country ICT firms should be utilized as much as possible so that the government and private sector can work together as a combined national resource.

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