Bhutan

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Overview

History and demography

Bhutan is a mountainous country in the middle of the eastern Himalayas with a population of about 700,000. Covering an area of 46,500 square kilometres, it is bordered by India and China. Within an aerial distance of about 200 kilometres, the land rises from about 100 metres above sea level in the south, which is moderately hot and humid, to over 7,000 metres in the north, which is extremely cold and mostly uninhabited. Bhutan remained an isolated country until the 1960s. Planned development started only in 1961 when the first five-year plan was introduced.

Socioeconomy

Bhutan is primarily agrarian and agriculture contributes 62 percent to GDP.[1] The currency is ngultrum (Nu) and is pegged at par with the Indian rupee. Bhutan has a per- capita income of US$1,412[2] and ranks 140 in UNDP's *Human Development Report 2002*. Since the Ninth Five- Year Plan the government has significantly prioritised private sector development. This sector is becoming a major entity to help address unemployment which stand at 1.4 percent in 1994.[3] The civil service is a major employer.

Hydropower is the major source of revenue, with India as the major market. 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 megawatts of hydropower. This is a very promising sector. Balance-of-payment problems with India persist owing to a heavy reliance on imports for most domestic, agricultural and industrial inputs. Diversification of exports and imports, increased revenue from hydropower exports and increased flow of foreign aid will ease this problem.

ICT infrastructure

The Internet and television were introduced for the first time on 2 June 1999. Druknet <http://www.druknet.bt>, the only ISP in the country, was established with the assistance of the International Development Research Centre (IDRC) <http://www.idrc.ca>, the United Nations Development Programme (UNDP) <http://www.undp.org> and the Asia Pacific Development Information Programme (APDIP) of UNDP <http://www.apdip.net>.

Bhutan Telecom <http://www.telecom.net.bt> is fully owned by the government and is the only telecommunications and Internet service provider[4] in the country. The successful implementation of the domestic telecommunications network under the assistance of the government of Japan brought about phenomenal changes in Bhutan. This network is the only medium of electronic communication for all ICT-related services for all sectors in the country.

The backbone of the network is a 34 Mbps digital radio system that connects Thimphu in the west to Trashigang and Samdrup Jongkhar in the east and Phuentsholing and Gelephu in the south. A number of 8 Mbps and 2 Mbps microwave spur (branch) routes are dropped from active repeaters along the path. By virtue of the location of radio repeaters on mountain tops around the country, it has also been possible to drop a limited number of telephone lines from these stations. Remote villages at the vicinity of these repeater stations are provided with telephone connections through cheaper systems that normally operate at lower frequencies. However, these systems cannot carry data. Many such installations are experiencing difficulties because of the absence of stable power systems in remote villages, and much of the equipment has become defunct. The use of solar panels and AC batteries have not solved the problem because of unpredictable weather conditions and the lack of proper and affordable maintenance.

A mobile phone project, Bhutan Mobile[5] will be undertaken in 2003. The first phase of this project will cover major areas in western Bhutan. The introduction of mobile phones will increase telephone usage and penetration.

People's access to technology

All urban towns and district headquarters have telecom- munications services and most offices have computers and Internet connections. Bhutan Telecom aims to provide telecommunications services to all remote and rural areas in the country.[6] Laya (12 days' walk from the nearest road) and Sakten (7 days' walk from the nearest road), located at altitudes above 5,000 metres, are some of the most remote locations that now have access to a telephone.

Besides the digital microwave radio backbone, technically feasible but subsidised technologies[7] are generally used to provide telecommunications services in rural locations. These rural connections are located in schools and health offices. Villagers use telephones from these locations by paying basic charges.

Bhutanese have used computers only since the 1980s. Major importers and users have been the government. The absence of a digital telecommunications network and the lack of technical knowledge were major reasons for the low usage then. Few Bhutanese were trained in IT before the establishment of the network, but this has now changed. Computer science and electronics are two of the most popular courses for students today. The IT infrastructure in all sectors has been strengthened. A recent survey showed that, out of 54 public and private sectors, 34 have their own LANs. It is estimated that there are around 5,000[8] computers in the country with around 2,500 in government offices, corporations and a few select firms. Out of these, 1,130 are connected to the Internet, with 221 IT professionals managing them.

Quality

A few analogue radio links were established in the past, but none of them were ever used for Internet or other data transmissions. There were no direct international links, and international calls were transmitted via the operators in India. The quality of transmission then was very poor. Moreover, as these calls went via a series of manually operated connections, Internet connection was impossible then.

After digital telecommunications was established, the quality of service became good and efficient.[9] Broadband services are still not available. Therefore, the only type of data communication used is the Internet. Recently, the establishment of a WAN by Bhutan Telecom is a good example of the direction that organisations will go in the future. Problems such as the occasional breakdown of Druknet servers, problems in international links and routing, and low-quality access networks in most regions are affecting the quality of ICT services in the country.

Affordability and connectivity

Bhutan Telecom has reduced telecommunications rates by almost 50 percent within two years. Internet charges have been reduced from Nu 1,500 for 15 hours of Internet time to Nu 850 since June 1999. Subscriptions are, however, concentrated in urban areas, where people are able to afford such services. Very few villagers use the Internet. Most of the 1,200 direct dial-up Internet users or 3,000 Internet users[10] are from the two major towns of Thimphu and Phuentsholing.

A study sponsored by IDRC in 2001 showed that businesspeople in Bhutan tend to use the Internet for longer hours but less frequently, while students use it more

frequently but for shorter periods. This is an interesting finding indicating that students either cannot afford longer durations or have shorter time to spare. Internet connectivity has continuously improved with the increase in Internet bandwidth and modem banks in central servers. Druknet started with a 32-port modem bank and now has a 96-port dial-up modem in Thimphu, a 32-port modem in Phuentsholing and a 16-port modem in Trashigang.[11]

Bhutan facts

Total population: 698,950 (2001)[a]

Rural population as a percentage of total population: 79% (2000) [a]

Key economic sectors: Energy, minerals, fruits, forest products, tourism

Literacy in the national language(s): 54%[b]

Computer ownership per 100 inhabitants: 0.64[c]

Telephone lines per 100 inhabitants: 2.14 [c]

Internet hosts per 10,000 inhabitants: 7.15 [c]

Internet cafés/telecentres per 10,000 inhabitants: 1.72 (including public call offices)[d]

Internet users per 100 inhabitants: 0.43[c]

Number of websites in the national language: None

Number of websites in English and other language(s): 200 (54 hosted by Druknet)[c]

National bandwidth within the country: 34 Mbps (voice), 64 Kbps (data) – 3 circuits[a]

National bandwidth to and from the country (excluding to India): 2.176 Mbps (voice), 2.6 Mbps (data)[a]

Ratio of incoming to outgoing Internet traffic volume:
Peak-time incoming: 95% of bandwidth[c]
Peak-time outgoing: 45% of bandwidth

Sources:
(a) Central Statistical Organization, 2001. *Bhutan Statistics.*
(b) Education Department, Ministry of Health and Education. Includes literacy in three major languages: Dzongkha, English and Nepali. The Central Statistical Organization and the Department of Education clarified that they do not compute literacy for each of the language groups.
(c) Bhutan Telecom and Druknet.
(d) Ministry of Trade and Industries.

Fonts, scripts and languages

The Bhutanese language, Dzongkha, is derived from the Tibetan literature and characters. Computers in Bhutan do not use Dzongkha fonts, but a font application designed in India has been in circulation for some years. The Dzongkha Development Commission is currently developing a standard Dzongkha font in Unicode together with engineers from Microsoft. Once this is completed in mid-2003, it will be possible for Dzongkha to be used in day-to-day scripting, such as mail, programming, applications and databases.

The Department of Information Technology, <http://www.dit.gov.bt> plans to regulate the promotion of Dzongkha-compatible applications. It is already making recommendations to suppliers of this impending requirement, and appropriate government policies will be framed to promote broader use of the language.

Content

Internet subscriptions have risen by almost 300 percent since 1999. The number of LANs and WANs is increasing, and many IT businesses have started in urban areas. As many as 120 telephone public call offices and around a dozen Internet cafés have been set-up. In major towns, students go to Internet cafés to chat online, use e-mail, play games or just surf. Thirteen private IT training centres have been established, compared to three by the government, within these two years. Computer sales have also picked up with a large computer supplier selling around 500 computers a year.

Many of these establishments employ Bhutanese nationals. Online courses are becoming popular as more convenient ways of advanced learning. Government offices are sourcing for equipment and other supplies on the Internet. This has helped to reduce administrative costs. The Internet thus has brought about a lot of changes and benefit to Bhutan.

Education

There are 361 educational institutions in Bhutan, most of them community and primary schools. More than 100 non-formal education centres were established within the last decade. Computer education is more prominent in private schools. The use of computers in schools is growing and computer studies are being introduced in their curriculum. A number of IT courses are conducted at Sherubtse College and the Royal Institute of Management <http://www.rim.edu.bt>. The Education Department plans to provide computers with access to the Internet to all schools. The government has earmarked a special budget of Nu 5 million every year for this purpose. An independent sector study showed that 82 percent of Internet usage is in e-mail correspondence in the education sector alone. Given the concentration of computers in offices, the direct use of computers and the Internet in classrooms is relatively low.

Agriculture and rural development

In Bhutan, 72 percent of the land is covered with forests. Farmers grow cash crops like apple, orange, cardamom, ginger, chilli and vegetables. There is increasing use of the Internet as an indirect source of information to farmers. As villagers are not literate in English, information on the Web is obtained by extension workers and researchers for dissemination to farmers. An IT centre in the Ministry of Agriculture was established to promote the use of ICTs in this sector. Using a WAN, it plans to network all research centres and extension offices.

Industry and business

There are 9,016 industrial establishments in Bhutan and 39 of them are large-scale factories. Private sector development is still in its infancy. As large complexes are not feasible, the government promotes cottage industries in the smaller towns and villages. These industries produce cheese, butter, honey, lemon grass oil and fruit products. Paro in the west, Jakar in central Bhutan, Trashigang in the east and Samtse in the south are ideal examples. This sector has not used ICT services efficiently. Dial-up Internet connections are used mainly for e-mail. Internet services are still unaffordable to small companies, but Internet use in this sector is expected to grow as new initiatives like e-commerce are introduced.

Health

There are 29 hospitals, 160 basic health units, 447 outreach clinics and 13 indigenous medical units around the country. The health sector is carefully implementing a few ICT projects, such as health telematics.[12] The Internet is also used for health information and advice. At present, two referral hospitals, one in the capital and the other in Mongar in the east, are linked via a subsidised dedicated 64 Kbps leased line. Health telematics equipment is located in Mongar and health consultations are sought from Thimphu. The Health Department has a LAN connecting 44 computers. Hospitals and health offices in the districts also have computers, but only a few have Internet connections. This low usage is primarily due to a lack of funds and resources.

Technology

The telecommunications network uses digital technology, with 2 Mbps as the primary base band, together with an 8 GHz band microwave radio carrier. Some low-frequency and low-capacity equipment is used for rural access. Though the quality is poor, these technologies are ideal for the rugged terrain of the country.

International traffic is routed using a 6 GHz band Intelsat earth station via England, Singapore and Japan. For Internet

traffic, Druknet uses a 2.640 Mbps stream broken up between these three transit stations. A mobile phone project is underway and will be completed by the end of 2003.

Government

The King is the head of state. A member of the Council of Ministers is elected, on rotation, by the National Assembly to be the Prime Minister every year. Decentralisation is rigorously carried out with more powers given to the heads of the 201 village blocks.

The government has recognised that the provision of ICT services would greatly enhance the overall socioeconomic development. It plans to connect every village with a telephone[13] and, where possible, provide Internet connections. E-government is a concept that Bhutan can benefit from. Most of the government head offices have computers today. However, computers and the Internet are still not widely available in local government offices. Recently, a high-level committee was established to oversee ICTs and exploit its potential. Though many of the 201 village block offices now have telephone connections, none have computers or Internet facilities.

Independent networks are available in many government offices and particularly in ministries. But there are some ministries that have not initiated computerisation at all. As a result, documentation and information storage are done through traditional means. Besides resources, it will take considerable time and effort for all government agencies and offices to totally avail themselves of the benefits of ICTs.

NGOs and civil society

There are some NGOs in Bhutan. They work in a few select areas like environment. Use of ICT services in NGO offices can be fruitful, particularly in terms of saving costs and enhancing efficiency and reach. Some of these NGOs use computers and the Internet more for their day-to-day work than for actual field work. Bhutan does not have any law or Act with regard to the formation and work of NGOs in the country. Informal discussions and preliminary work are underway to formulate rules and regulations for NGOs before a formal NGO Act is passed. It remains to be seen how ICTs would then promote the functions and work of these organisations.

Political groupings

Political groups do not exist in Bhutan. The slow democratisation may allow legal political groups to form within the framework of a political structure. Bhutanese will also see the first Constitution, which is being drafted at the time of writing. The country also witnessed in 2002 historic elections at the village level. Owing to the rugged terrain and the wide spread of inhabitants, ICTs will play an important role in promoting these institutions in the future. Training of local politicians in the promotion of ICTs in communities is important.

Culture and literature

Though Dzongkha is the national language, Bhutanese speak more than 18 local dialects. Most prominent of these dialects are Nepali, Sharchopkha and Khengkha. Mahayana Buddhism plays an important role in the daily lives, culture and traditions. Hinduism is also widely followed by people of Nepali origin. Bhutanese have high respect for literary values. All of this is evident in the hundreds of monastic practices around the country as well as the strength of the national language in schools. Bhutan is also known for its strong bonds with its culture and traditions. Efforts are underway to use ICTs to promote and enhance its culture and traditions. When the standard Dzongkha font is fully developed, more popular use of ICTs in the areas will be seen.

News and current affairs

Kuensel, the weekly national newspaper, is the only source of national news in print. There are no daily papers. An estimated 20,000 people read the *Kuensel*. Radio is very popular among people in rural areas. The Bhutan Broadcasting Service (BBS) broadcasts news and other programmes in four languages: English, Dzongkha, Nepali and Sharchopkha. BBS TV broadcasts programmes in English and Dzongkha in the evenings. Television is still not available to rural people because of the high cost of transmission equipment necessary for such broadcasts. There are many private cable television operators and they are important sources of entertainment programmes. A significant number of Indian entertainment channels are available in Bhutan. *Kuensel* and BBS make quite intensive use of the Internet in their operations.

Commerce and tourism

India is Bhutan's biggest trading partner but the country is slowly establishing trade with more countries and regions. Many parts of the country still practise the barter-trade system. The business community is one of the largest groups that use ICT services. Almost every large and medium-scale business enterprise has a computer and many of them have Internet connections. Dial-up connections, in particular, have become the lifeline of business activities. But usage has been confined to the basic use of e-mail services and Internet surfing. Company websites are static and lack professionalism.

Given the mountainous terrain and rough landscape, ICT use is very promising in the promotion of commerce and trade. Once computers and Internet are widely available to communities, farmers will use the Internet to look for useful information on agriculture and farming. Rural people will use it to compare prices and establish cost-effective trading systems.

Tourism is an important source of hard currency and its potential is vast. Bhutan has focused on high-value low-volume tourism for a long time and this policy is still followed strictly. Though there is constant growth, tourist arrivals have not been very encouraging owing to this policy. Efforts are underway to promote Bhutan as a value destination, and policy makers have realised that there is no other efficient means than the Internet to do so. However, the Internet is still not used efficiently in this sector. The year 2007 is marked as the "Visit Bhutan Year" to commemorate 100 years of the current hereditary monarchy system. The tourism sector is exploring what it can do to attract visitors. It sees the Internet as a suitable means to fulfil this objective, but urgent and sincere efforts are needed if any significant impact is to be seen.

Important national sources of content

Druknet, the only ISP in Bhutan, hosts more than 200 websites. A small number of websites are hosted outside the country. Most of the content in Bhutanese websites is derived from public literature and archives. The National Library and a public library in Thimphu are important sources of information on Bhutan. Religious texts, documents and legends are interesting sources as well. A project is underway to store and make available online historical documents and texts. All Bhutanese websites are developed and hosted in English. Some of the sources of content are:

Central Statistical Organization (CSO)
CSO is an agency that researches, compiles and provides economic and social data on Bhutan. It still does not have a website. It produces and circulates a yearly statistical book on Bhutan.

**National Library of Bhutan
<http://www.library.gov.bt/nlb.htm>**
The National Library is a good source of both historical and current information. Danish International Development Agency has funded a project to electronically document this information in its database and make it available to its members.

***Kuensel* <http://www.kuenselonline.com>**
Kuensel is published on Saturdays. It claims to have the highest number of visitors among all Bhutanese websites. It publishes in English in the web version and in three languages in its print version. The newspaper provides important insights and debates on policy issues.

Ministry of Agriculture <http://www.moa.gov.bt>
This site gives a lot of information on agriculture and livestock and is widely used. Its primary target users are its employees.

Education Department <http://www.education.gov.bt>
This website provides information to students. Its online examination result announcements are widely referred to.

Planning Commission <http://www.pcs.gov.bt>
This is a useful source of information on development plans and implementation. It also gives details of all the past five-year plans.

**Ministry of Trade and Industries
<http://www.mti.gov.bt>**
This site provides useful information on trade and industries. It also contains statistics on the sector.

Department of Tourism <http://www.tourism.gov.bt>
This site is useful for visitors and travel agents. Visitors are briefed on Bhutan, while travel agents can download forms and read policies on tourism.

**Royal Civil Service Commission
<http://www.rcsc.gov.bt>**
This site provides information, such as job vacancies and application forms on employment in the civil service.

**Centre for Bhutan Studies
<http://www.geocities.com/bhutanstudies>**
Most studies related to Bhutan, including policy analysis, are presented on this website. An archive of papers published is found at <http://www.bhutanstudies.com/pages/archives.html>.

Online services

More Bhutanese are using computers and the Internet today than a decade ago. Government offices are developing websites to provide public information. Rules, regulations, plans and policies are also available online, but they are still out of reach of the masses. The Royal Civil Service Commission, for example, posts all its vacancies and application forms on its website.

As part of its master plan, the Education Department will develop an online distance learning portal. Sherubtse College also plans to do the same to enable office workers

to pursue further studies while working. The trade and industry sector will promote e-commerce portals. As more computers and the Internet reach the villages, e-commerce will be exploited to promote the rural economy. Telemedicine is currently used on a pilot basis. The health sector is exploring viable solutions for telemedicine, such as web-based health applications. The usefulness of e-forums and e-conferences is being considered in Bhutan, but their affordability is a big obstacle to mass implementation. The discussion forum of *Kuensel* is one important forum for public debate and it has gained much popularity recently.

Communities and the general public are learning about computers and the Internet; and with appropriate plans and policies, ICTs will soon be extensively used. Many agencies are making efforts to promote the use of the Internet. UNDP, the International Telecommunication Union (ITU) <http://www.itu.int>, Bhutan Telecom and the district office in Bumthang gave free Internet training to villagers, the business community, students and government employees of the district recently. The Japan Overseas Cooperation Volunteer office in Bhutan <http://www.jocv.org.bt> is conducting IT training for all sector heads in the districts.

ICT industries and services

ICT industries have not developed fully in Bhutan. It is only recently that a few firms started assembling computers. Many organisations continue to import computers, though the prices of locally assembled computers are cheaper. A few cable television operators are interested in establishing ISPs to provide broadband services via their cable networks. ICT industries in Bhutan may not be profitable in the long run because of high capital costs and a small market base.

Software development is, however, flourishing in the country. Many software firms bring in engineers from India to customise applications for sale. A successful story is the recent implementation of the Telecom Integrated Information Management System (TIIMS), a multi-user, multi-module WAN application. Organisations such as Revenue and Customs, Ministry of Agriculture, and Royal Insurance and Banks have already initiated such projects. The computerisation of the government's accounting system is yet another promising initiative.

The few Bhutanese ICT firms have little to fear in this industry. They have to contend only with local competition. But with more advanced technologies being developed elsewhere, Bhutanese might find cheaper alternatives to meet their ICT needs. Mobile phones that enable Internet browsing are a possible threat to computer-based Internet services.

Examples of innovative and key initiatives

A multipurpose community telecentre was successfully established in central Bhutan by IDRC and ITU. Health telematics or telemedicine was piloted by the health sector. The Ministry of Agriculture is implementing its Enterprise Network to link all its research and extension centres and will incorporate renewable natural resources information in this system. Sherubtse College has introduced a popular three-year winter programme on IT study for select high school teachers. This is part of a wider ICT project of the education sector. The Department of Information Technology (DIT) is conducting nationwide computer literacy training among students. The Planning Commission is also training district sector heads in the use of computers. Many government offices have established ICT departments and developing their own websites. Almost all travel agents use the Internet for marketing and customer service on a limited basis. Bhutan Post, along with Bhutan Telecom, is implementing an e-post venture pilot project with financial assistance from ITU and Universal Postal Union. This is a new concept being piloted in Bhutan for the first time. The Ministry of Trade and Industries is planning to implement an e-commerce project focusing on rural women. The Internet, however, is totally absent in the banking sector.

A high-level committee has been formed recently to oversee the development of ICTs in the country. It is envisaged that the committee will support and promote ICT innovations and initiatives in the future.

Enabling policies

UNDP is supporting a project to prepare national ICT policies and regulations. An ICT Act may soon be ready for submission to the National Assembly. The Bhutan Telecom Authority (BTA) and DIT are now adequately geared to promote the broader use of ICTs. The *Bhutan Telecom Act 1999* provides clear guidelines to telecommunications service providers regarding rural services, and it is hoped that the upcoming ICT policy will complement this drive. The Ministry of Communications also plans to develop a Media Act. DIT has developed a draft ICT master plan to be implemented within the next five to ten years, an important component of which is the networking of the districts. ICT centres have been established in most of the ministries and departments. Though these new establishments are not coordinated by DIT at present, a collective approach in ICTs is very important and they have to be supported through enabling ICT policies. With the impending establishment of a separate Ministry for Information Technology and Communications, the focus on and the importance given to ICT development will increase. The DIT is preparing an ICT Policy and an ICT Act that will be presented to the National Assembly for adoption.

Regulatory environment

BTA, as the regulatory body for telecommunications and broadcasting services, has formulated important policy guidelines in these areas. DIT is the central organisation for all ICT-related issues. After the establishment of a separate Ministry of Information Technology and Communications, DIT will play a more prominent role as an ICT regulator. At present, BTA also regulates Internet- related issues, and it is anticipated that DIT will take care of Internet regulatory functions. DIT has developed long-term ICT plans and is also preparing an ICT Act to facilitate smooth development of ICT services. It is also actively engaged in human resource development in the ICT sector on a nationwide scale. It also plans to implement a *dzongkhag* (district) network and public Internet kiosks once funding is available. Though more such projects may be initiated, until and unless there is a strong ICT regulatory regime, ICT-related activities will continue to grow in an unplanned and unsustainable fashion.

Until recently, Internet content was strictly regulated through filtering software in Druknet's proxy servers.[14] This regulation has now been eased. There is still no strategy or policy on e-commerce, even though this will soon become be an important requirement. The consumer laws also do not take proper consideration of e-commerce issues. For Bhutan to become a member of the World Trade Organization (WTO), such regulations will need to be put in place.

Open source movement

There is no single organisation that promotes open source, suppliers and vendors are responsible for marketing their own products. Licensed Microsoft applications such as Windows and Office are very popular in Bhutan. Druknet and a few organisations use Linux on their servers. The Education Department plans to import used and donated computers with Linux operating systems.

The Dzongkha Development Commission will regulate standardised Dzongkha fonts once they are available in the market. Given the great desire of policy makers to promote Dzongkha, it is hoped that making Dzongkha font an open source will go a long way in fulfilling this objective.

Research into ICT

There are no established research centres in ICTs. Independent researchers conduct a little research on their own. DIT is the approving authority for all ICT equipment. It has established a small research centre with basic equipment to test and approve ICT equipment. It also carries out occasional field research on computer and Internet usage among organisations and firms. DIT plans to establish an advanced ICT research centre in Thimphu where IT people will be trained for more rural- and district- focused projects. It is mobilising resources for this project at the time of writing.

Future trends

The use of ICT services by Bhutanese organisations, the business community, civil society, rural communities and individuals will continue to grow. The government is the primary user of the Internet and computers for the time being, but usage by the private sector and individuals will grow. Schools and colleges will be networked and IT courses introduced in their curriculum. Computer usage by students will also increase and communities will benefit from e-commerce.

One important need is the appointment of a focal organisation to coordinate and facilitate cooperation among agencies and organisations. Enhanced coordination among agencies will make it possible to share the limited resources in the country.

The mobile phone project will increase the use of ICT services. New ISPs might be established to compete with Druknet. Broadband services through cable television might also be introduced.

Bhutan will see growing usage of computers and the Internet in all spheres and in all sectors in a useful and productive manner.

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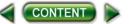Mishra, H.N. (1998). *Bhutan: Problems and Policies.* New Delhi: Heritage.
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Notes

1. Central Statistical Organisation, 2001.
2. UNDP. *Human Development Report* 2002.
3. The latest figure is not available.
4. *Bhutan Telecom Act 1999.*
5. Bhutan Mobile will be fully owned and operated by Bhutan Telecom.
6. Telephone services in rural areas will be realised through a rural project for which financing is being negotiated with the government of Denmark.
7. Demand assigned multiple access (DAMA), voice-over Internet Protocol (VOIP), wireless local loop (WLL), digital radio multiple access subscriber system (DRMASS), very high frequency (VHF) and ultra-high frequency (UHF) systems.
8. Department of Information Technology <http://www.dit.gov.bt>.
9. This network uses asynchronous digital hierarchy (ADH) technology, which enables a specific number of high-quality voice and data channels to be dropped at intermediate locations. This system may be replaced with a more robust synchronous digital hierarchy (SDH) in the future as demand in various places increases.
10. E-mail account holders may not be dial-up users. The number of Internet users is estimated from the number of e-mail account holders. It should be noted that many people use the Internet from Internet cafés and offices without necessarily having an account with Druknet.
11. Druknet has a router each at Trashigang in the east and Phuentsholing in the south to enable easy and faster access to the Internet.
12. The Department of Health refers to telemedicine services as health telematics.
13. The Ninth Five-Year Plan (2002-2007) of the Ministry of Communications indicates that by the end of the plan period there will be a telephone for every ten households or one at a distance of two hours' walk from every house.
14. Druknet used a filtering software called Xstop.