

The Internet in the Andes: Bolivia Case Study



International Telecommunication Union



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THE INTERNET IN THE ANDES: BOLIVIA CASE STUDY



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1. Country background

1.1 Overview

The Republic of Bolivia, just over one million kilometres in size, is located in South America. It is bordered by Brazil on the north and east, Paraguay on the southeast, Argentina on the south, Chile on the southwest and Peru on the west. Although Bolivia is typically perceived as a high mountainous nation, this landlocked country is home to three contrasting environments: the Andes mountains and high plains (28 per cent of territory); sub-Andean valleys (13 per cent); and tropical flatlands (59 per cent). Lake Titicaca, the world's highest lake and fourth largest, is partially situated in Bolivia.

The country is divided into nine departments, 112 provinces, 312 municipalities and 1,384 cantons. The capital is Sucre with the seat of government in La Paz.

1.2 Demography

The population of Bolivia was estimated at 8.3 million in June 2000. It is 37 per cent rural. Nine cities have a population over 100'000, accounting for almost 40 per cent of the country's inhabitants. The largest city, La Paz (including El Alto), has 1.6 million inhabitants and is one of

the highest in the world, with an average altitude of 3'640 metres. By contrast, the country's second largest city, Santa Cruz de la Sierra, with around one million residents, has an average altitude of 416 metres.

Bolivia has the largest indigenous population in Latin America. This is



reflected by the fact that, in addition to Spanish, there are two other official languages, the Indo-American Aymará and Quechua. Spanish, the most widely used language, is the mother tongue of 40 per cent of the population, compared to 37 per cent for Quechua and 24 per cent for Aymará. Some 30 other indigenous languages are also spoken in the country.¹

1.3 Economy

GDP in 1999 amounted to US\$ 8.5 billion with GNP per capita a little over US\$ 1'000.² Economic growth was just 0.6 per cent in 1999 but is forecast to average 5.4 per cent a year between 1999-2003. Inflation declined from 4.4 per cent in 1998 to 3.1 per cent in 1999. The Bolivian government has attempted to reform the economy since 1985. These measures are primarily aimed at restoring price stability, creating conditions for sustained growth, and alleviating poverty. The state has capitalized a number of public sector enterprises. The privatization process has generated commitments of US\$1.7 billion in foreign direct investment over the period 1996-2002. Major sectors that have undergone capitalization include energy, airlines, water supply, and telecommunications.

Bolivia's major trading partners are the United States, Japan and Brazil. Leading exports include metals, natural gas, soybeans, jewelry, and wood. The major imports are capital goods, chemicals, petroleum, and food.

Bolivia has been pursuing greater trading opportunities and joined the World Trade Organization in 1995. As a result of several preferential trading agreements negotiated with neighbouring countries, Bolivia has rapidly expanding export prospects. It became an associate member of the Southern Cone Common Market (MERCOSUR) in 1997 and is a member of the Andean Community.

The major areas of economic activity are in energy, mining, and agriculture. In particular, the hydrocarbon sector is forecast to have a bright future, especially after the recent privatization of the state oil corporation Yacimientos Petroliferos Fiscales Bolivianos (YPFB). With the construction of a pipeline to Brazil and the capitalization of YPFB's transportation company, the government of Bolivia intends to transform the country into a regional hub for exports of hydrocarbons.

In 1998 the country had a foreign debt of US\$ 6.2 billion. Two-thirds of this

amount is owed to international financial institutions (principally the Inter-American Development Bank, the World Bank and the Andean Development Corporation), almost one-third is owed to foreign governments, and less than one per cent is owed to private banks. Debt payments have been rescheduled several times by the Paris Club, and some foreign governments have forgiven substantial amounts of bilateral debt. In 1998 Bolivia became the first Latin American country to enter the IMF/World Bank Highly Indebted Poor Countries program, which will reduce external public debt by over US\$ one billion (around 35 per cent of the total) over the life of the agreement.³

1.4 Human development

Bolivia ranks 114th out of 174 in the United Nation's Development Program (UNDP) *Human Development Index* (HDI), placing the country in the medium human development category. The HDI is composed of a basket of indicators including life expectancy, adult literacy, school enrolment and GDP per capita. Bolivia is the lowest ranked South American country in the index, a result of the social depravation resulting from its relatively low level of economic development.

While Bolivia fares relatively well on most indicators, the one that brings it down is life expectancy. At 62 years, this is some 8 years less than the regional average and the lowest in the Americas except for Haiti. Reduced life expectancy is partly a reflection of Bolivia's tough climate as well as inadequate health infrastructure. Another important indicator, not considered in the HDI, is the percentage of households with electricity. Despite Bolivia's energy potential, only 67 per cent of households had electricity in 1997.

1.5 Political

The Andean region has been inhabited for thousands of years. In the mid-fifteenth century, Quechua-speaking Incas arrived in the Bolivian Andes. The Incas controlled the area until the Spanish conquest in 1525.

Table 1.1: Human Development Indicators

Bolivia compared to selected Latin American countries

| HDI Rank | Life expectancy at birth (years) 1998 | Adult literacy rate (%) 1998 | Combined school gross enrolment ratio (%) 1998 | Real GDP per capita (PPP\$) 1998 |
|-------------------------------|--|-------------------------------------|---|---|
| Latin America & the Caribbean | 69.7 | 87.7 | 74 | 6'510 |
| 35 Argentina | 73.1 | 96.7 | 80 | 12'013 |
| 74 Brazil | 67.0 | 84.5 | 84 | 6'625 |
| 81 Paraguay | 69.8 | 92.8 | 65 | 4'288 |
| 114 Bolivia | 61.8 | 84.4 | 70 | 2'269 |
| 116 Nicaragua | 68.1 | 67.9 | 63 | 2'142 |
| 120 Guatemala | 64.4 | 67.3 | 47 | 3'505 |
| 150 Haití | 54.0 | 47.8 | 24 | 1'383 |

Source: United Nations Development Programme.

Independence was proclaimed in 1809. However, it was not until 6 August 1825 that the country became free. Bolivia is named after the independence fighter Simon Bolivar. Coups, counter-coups and military takeovers have dominated Bolivian politics. One sign of the country's instability was its defeat in the War of the Pacific (1879-83), when it lost its seacoast to Chile. The National Revolutionary Movement seized power in 1952 and introduced universal suffrage, carried out land reform and nationalized some of the country's industries. The succeeding period was again marked by political instability until 1985. Since then, the situation has stabilized and presidents have been democratically elected and served out their terms.

The last presidential election was held in June 1997 with Hugo Banzer of the centre-right Nationalist Democratic Action Party (ADN) winning a five-year term. There are two chambers of Congress: the Senate with 27 elected representatives (three from each department) and the Chamber of Deputies with 130 members.

There has been a move to decentralize power and the country's nine departments were granted greater autonomy under the Administrative Decentralization law of 1995. Bolivian cities and towns are run by elected officials but the central government still appoints the main departmental officers. The Popular Participation Law of April 1994 distributes a portion of national revenues to municipalities.

¹ www.sil.org/ethnologue/countries/Boli.html.

² Statistics for this section are from the World Bank. "Bolivia Data Profile" and "Bolivia at a glance" available at www.worldbank.org/data/countrydata/countrydata.html.

³ World Bank. "World Bank and IMF Support US\$ 1.3 Billion Debt Service Relief Eligibility for Bolivia Under Enhanced HIPC." *Press Release*. 2000/198/S. 8 February 2000.

2. Information and communication technology status

2.1 Telecommunication Sector

2.1.1 Industry structure

The Bolivian telecommunications industry structure is quite distinct from that of other countries. Local service has traditionally been provided by telephone *cooperatives*, each with a monopoly license for a particular geographic area (generally defined around one of the country's main cities and respective department). National and international long-distance telephone service, as well as telex, telegraph and local telephone services in areas with no telephone cooperative, are provided by the largest telecommunications company in Bolivia, *Empresa Nacional de Telecomunicaciones* (ENTEL). *Telefónica Celular de Bolivia* (TELECEL) introduced cellular telephone service in 1991. In 1996 ENTEL also began providing cellular service. The cellular duopoly will change when *NuevaTel*, a joint venture of *WesternWireless* from the United States and *Cooperativa Mixta de Teléfonos Cochabamba* (COMTECO) enters the market. Other communications markets, such as broadcasting and more recently the Internet, are competitive.

The existing industry structure, based primarily on monopoly service providers, will change on 24 November 2001, when the six-year period of exclusivity granted to ENTEL and the cooperatives by the Telecommunications Law of 1995 expires.¹ The fourteen cooperatives providing local telephone service are currently in the process of formulating their business strategies in preparation for full market competition. Some of the largest cooperatives (e.g., *Cooperativa de Teléfonos Automáticos de Santa Cruz de La Sierra* (COTAS) and COMTECO) have improved their coverage, modernized their networks, and increased their service offerings to compete in a new market structure. In addition,

these cooperatives are exploring new business ventures (such as potential mergers or acquisitions of other cooperatives) to maintain and expand their market presence.² However, most of the small cooperatives, six of which serve less than 1'700 lines, will most likely face some difficult business decisions—such as whether to sell their assets, close the business or create joint ventures with existing companies—in order to survive in an increasingly competitive telecommunications market.

ENTEL on the other hand, not only has the means to invest and compete in the new market, but it also has the most extensive national telecommunications network. This puts ENTEL in an advantageous position compared to the other operators as it can easily develop and expand its national long-distance network to provide a full array of local services.

2.1.2 Regulation and policy-making

Regulatory decisions are the primary responsibility of the Superintendent of Telecommunications (*Superintendencia de Telecomunicaciones*—SITTEL).³ Formed in 1995 by the Law of the Sector Regulation System (*Ley del Sistema de Regulación Sectorial*-SIRESE), SITTEL is one of five sectoral *Superintendents* created to regulate and supervise the newly restructured sectors in the country, including electricity and railroads. SITTEL reports to the *General Superintendencia* and also works closely with the General Direction of Communications (*Dirección General de Comunicaciones*, of the Ministry of Economic Development) to develop and implement sector policies.⁴ Despite its governmental relationships, SITTEL has financial and institutional autonomy.

SITTEL has the mandate to formulate policy directions for the sector, such as developing strategies for market

2. Information and communication technology status

Table 2.1: Telecommunication service providers in Bolivia

| May 2000 | | |
|---|---------------------------|--|
| Operator | Subscribers (End 1999) | Web site |
| Local telephone cooperatives | | |
| Cooperativa de Servicios Teléfonos Tarija (COSETT) | 16'890 | www.cosett.com.bo |
| Cooperativa de Teléfonos Automáticos de Potosí (COTAP) | 10'758 | |
| Cooperativa de Teléfonos Automáticos de Santa Cruz de La Sierra (COTAS) | 130'534 | www.cotas.com.bo |
| Cooperativa de Teléfonos Automáticos de Trinidad (COTEAUTRI) | 6'108 | |
| Cooperativa de Teléfonos de Bermejo (COTABE) | 2'229 | |
| Cooperativa de Teléfonos de Guayaramerín (COTEGUA) | 1'510 | |
| Cooperativa de Teléfonos del Valle Alto de Cochabamba | | |
| Cooperativa de Teléfonos La Paz (COTEL) | 159'380 | |
| Cooperativa de Teléfonos Movima (COTEMO) | 392 | |
| Cooperativa de Teléfonos Oruro (COTEOR) | 22'610 | |
| Cooperativa de Teléfonos Riberalta (COTERI) | 1'667 | |
| Cooperativa de Teléfonos Sucre (COTES) | 18'629 | |
| Cooperativa de Teléfonos Villazón (COTEVI) | 255 | |
| Cooperativa Mixta de Teléfonos Cochabamba (COMTECO) | 107'145 | www.comteco.com.bo |
| Long distance | | |
| Empresa Nacional de Telecomunicaciones (ENTEL) | 21'908* | www.entel.com.bo |
| Mobile cellular | | |
| Telefónica Celular de Bolivia (TELECEL) | 242'000 | www.telecel.com.bo |
| Entel Móvil | 150'000 | www.entelmovil.com.bo |
| NuevaTel | ** | |

Note: * ENTEL also provides telephone service in areas not served by the local cooperatives.
 ** Scheduled to launch before the end of year 2000.
 Source: ITU adapted from SITTEL.

opening in November of 2001, regulating tariffs (currently with a price cap system for all non-competitive services), providing licenses and supporting universal access to Information and Communication Technologies (ICT). SITTEL also has the responsibility for managing the Rural Telecommunications Development Fund, for which no implementation policy has yet been established.

2.1.2.1 Market liberalization and privatization

The process of market liberalization in Bolivia started in 1992 with the Privatization Law (April 1992). This law

allowed for all state owned companies to be privatized. With the approval of the Capitalization Law (*Ley de Capitalización*) in March 1994, the Bolivian legislature established the means for privatization. In contrast with normal privatization, the capitalization process in Bolivia was not developed to raise funds for the government. Instead, it was designed to attract private investment to be used for the purpose of improving the specific companies' infrastructure and service provision capability. Soon after, the new Telecommunications Law (July 1995) and the Sectoral Regulatory System Law (October 1995) were approved. The Telecommunications

Law established goals for the industry and its players. Accordingly, the capitalization of ENTEL was prepared considering the goals established by these laws, such as:

- doubling the country's teledensity level to eight per cent,
- installing telephone service in all rural areas with more than 350 inhabitants,
- providing local service to all localities with 10,000 inhabitants or more,
- improving quality of services,
- establishing a price cap system to regulate tariffs,
- improving the level of digitalization in the network,
- establishing an open market after a period of exclusivity, and
- establishing an autonomous regulator.

Accordingly, ENTEL was *capitalized* in November 1995 through the sale of 50 per cent of its capital to STET International (a subsidiary of Telecom Italia) for US\$ 610 million, to be invested in the company. The other 50 per cent of the company is now owned by all Bolivians through national pension plans.

While none of the cooperatives are privatized, there have been attempts towards that goal. As SITTEL stated in a recent report: "this process of privatization did not serve to capitalize basic telephony, which needed large investments, and on the contrary, the long-distance sector, which did not need significant investment amounts, received the entire capital accumulated in years of national savings."⁵

Further liberalization of the market will occur in November 2001, when ENTEL and the cooperatives' period of exclusivity expires. At that point, all tele-

communications services should become competitive and no restrictions should exist for market entry. In preparation for the upcoming change, SITTEL has started to discuss and prepare policies regarding future market structure. The details are still unclear but it appears that SITTEL is interested in implementing a so-called "structural separation approach," where two major markets would be established, one monopoly market controlling infrastructure investment and development and another market focusing on competitive service provision.

2.1.2.2 Universal Service and access

Only around one fifth of households have a fixed telephone line and just over six in 100 inhabitants in Bolivia have a fixed line telephone, one of the lowest levels of teledensity in Latin America. The figure is even glimmer when considering urban-rural disparities, as around 80 per cent of all lines in service are in the three largest cities and departments (i.e., La Paz, Cochabamba and Santa Cruz). The current lack of universal service policy suggests that there will not be any quick improvement of the situation. Fixed line growth has been extremely low as teledensity only increased from about five per cent in 1996 to 6.2 in 1999.

Since the introduction of cellular telephones, the number of subscribers has steadily increased. In 1999, cellular telephone density reached 5.2 per cent, only one percentage point behind fixed line density. The number of cellular subscribers is equivalent to 46 per cent of all telephone subscribers in the country. In the department of Santa Cruz, mobile subscribers have surpassed the number of fixed telephone lines in service and it is expected that this will happen nationwide before the end of the year 2000. Factors driving the rapid mobile growth include competition, low connection charges and pre-paid cards. For example, since ENTEL's entry into the market, the number of subscribers has more than doubled each year. There is no connection charge for mobile cellular service in

2. Information and communication technology status

Table 2.2: Telephone distribution

Fixed telephone lines in service and mobile cellular subscribers, by department, December 1999

| Department | Fixed telephone lines in service | | | Mobile cellular subscribers | | |
|----------------|----------------------------------|-------------------|----------------|-----------------------------|-------------------|----------------|
| | Total | Per cent of total | Per 100 people | Total | Per cent of total | Per 100 people |
| Beni | 11'790 | 2.3% | 3.31 | 4'557 | 1.1% | 1.28 |
| Cochabamba | 111'718 | 22.2% | 7.52 | 64'364 | 15.3% | 4.33 |
| Chuquisaca | 19'807 | 3.9% | 3.44 | 9'287 | 2.2% | 1.61 |
| La Paz | 165'719 | 33.0% | 7.02 | 159'016 | 37.8% | 6.74 |
| Oruro | 23'602 | 4.7% | 6.04 | 9'869 | 2.3% | 2.53 |
| Pando | 1'423 | 0.3% | 2.55 | 635 | 0.2% | 1.14 |
| Potosí | 16'734 | 3.3% | 2.19 | 5'934 | 1.4% | 0.78 |
| Santa Cruz | 130'534 | 26.0% | 7.43 | 157'247 | 37.4% | 8.95 |
| Tarija | 21'156 | 4.2% | 5.41 | 9'435 | 2.2% | 2.41 |
| Bolivia | 502'483 | 100% | 6.18% | 420'344 | 100% | 5.17% |

Source: SITTEL.

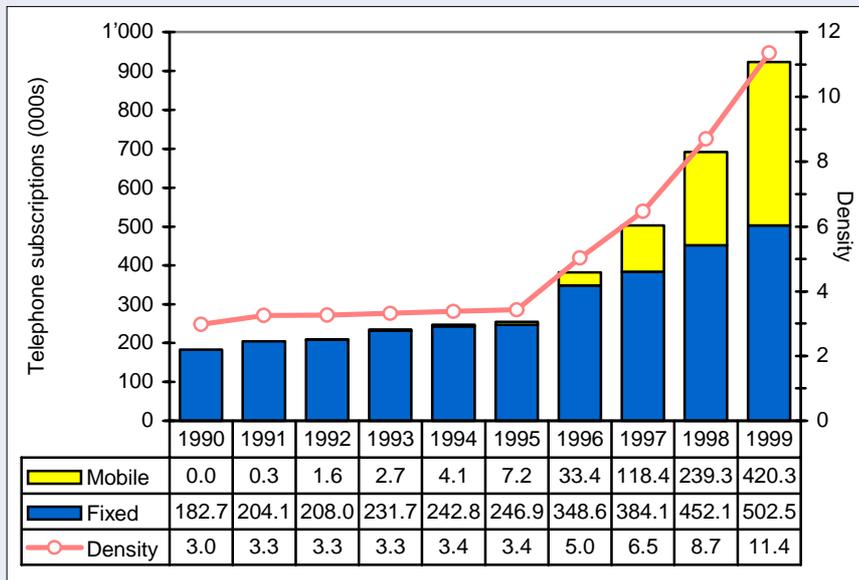
contrast to the relatively high fixed telephone line installation charges (see Section 2.1.2.4 below). The introduction of pre-paid mobile service in 1998 was also a big boost by making cellular service available to the many Bolivians that could not previously meet credit requirements for post-paid service. For example, some 85 per cent of Telecel's subscribers were pre-paid in March 2000. However, the majority of cellular telephone lines are also concentrated in the three main cities and departments (around 90 per cent) leaving other departments and most rural areas with little improved access to telephone services. Hopefully, the entry of the third mobile operator will help to extend access.

Despite low levels of telecommunication access in Bolivia, there is still no universal service or universal access policy in place. As part of the Telecommunications Law and the renewed concession contracts, some targets were established to improve service quality and to a certain extent service availability, such as:

- Repair response time,
- Call completion,
- Installation of a percentage of lines requested,
- Waiting period for line installations,
- Installation of one public telephone per 200 lines in service, by the year 2001,
- Installation of one line in all rural localities with more than 300 inhabitants (this line can be a public telephone or a line in a public place, such as a store, as long as it is available at least ten hours a day), and
- Digitalization of the network.

While most of these service targets have been met in the wake of market opening, as the data shows, they have not made a substantial contribution to improve universal service and access. For instance, the companies are only obligated to install a percentage of

Figure 2.1: Fixed and mobile telephone subscriptions



Source: ITU adapted from SITTEL data.

lines demanded. As demand for residential lines is low because of price barriers, particularly membership fees with the cooperatives, these expansion and quality targets only address expressed demand rather than potential demand. ENTEL, who was obligated to install about 5'000 public telephones by 1997, supposedly met the requirement and has had no other obligation since then. In reality, the companies have few universal access obligations, and those that they have, do not make a tremendous impact in terms of number of lines installed, number of public telephones or number of community access points installed.

It is therefore crucial that SITTEL focus on designing and implementing a concrete universal service and access policy for the country. This is particularly important in the context of the planned market opening strategies, as all operators and new entrants should be responsible for certain universal access obligations and consequently participate in universal access efforts. Moreover, as the agency responsible for the administration and management of the *Rural Telecommunications*

Development Fund (financed by licenses fees, penalties, etc.), SITTEL should develop a clear plan for investment of the fund's resources. Once a universal service and access policy is established, this fund may be used for development projects that can lead to increased access to telecommunications, particularly those in rural and low-income areas of the country. This fund can be particularly important in the development of telecenters or community access points where the population can have access to various communications services, including the Internet and e-mail.

2.1.2.3 Licensing

Licenses or registrations are attributed by SITTEL and required for practically all services, even those not regulated, such as the Internet. SITTEL requires registration as a way to monitor the telecommunications sector. In addition, all licensed providers are obligated to pay an annual license fee of about one per cent of gross revenues to SITTEL, which serves to cover SITTEL's operating costs. In addition to basic telephone services, long distance telephony and mobile cellular, the other categories for which SITTEL

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requires a license include radio paging, trunking, data transmission and value-added-services such as Internet service provision.

2.1.2.4 Tariff rebalancing and inter-connection

The Telecommunications Law of 1995 addresses both the elimination of cross-subsidies and interconnection among all licensed operators. While SITTEL never implemented a specific tariff rebalancing policy, it developed policies that implicitly reflected these objectives.

The implementation of *price cap* regulation with prices based on costs suggests that cross-subsidies are not allowed. However, since it is based on the current tariff structure of the cooperatives (which consists of an initial membership fee and monthly charges, both fixed and variable), local service tariffs are in fact not rebalanced. The price cap regime applies to installation charges, monthly charges and usage charges but not to membership fees. This is a problem that SITTEL and the cooperatives will have to address in preparation for market liberalization. Cooperatives membership fees, which provide the

customer with a share in the cooperative, average about US\$ 1'400 (compared with the country's GDP per capita of about US\$ 1'077 in 1998). As discussed elsewhere, this is a major barrier for access and creates a tariff imbalance problem for the cooperatives. On the other hand, the high joining fees are what allow the cooperatives to keep tariffs relatively low for members, since, unlike ENTEL, they do not provide long distance or mobile services. A reduction or abolition of the membership fee might raise tariffs to the level of existing non-member tariffs that are significantly higher. This would reduce even further the number of Bolivians that could afford telephone service and be politically sensitive.⁶ To this conundrum must be added the current complexity of tariffs in the country. Unlike most countries, there is no uniform nationwide tariff for local telephone service. Tariffs and options differ significantly between and within cooperatives (e.g., depending on member or non-member, fixed or wireless local loop, business or residential) (see Table 2.3).

With respect to interconnection charges, these are established by SITTEL. Operators have the option to negotiate interconnection charges

Table 2.3: Telephone charges

May 2000, US\$

| | COTAS | | COMTECO | | COTEL | |
|---------------------|---------------------|----------------------------|----------------------------|--------------------------------|----------------------------|--------------------|
| | Member | Non member | Member | Non member | Member | Non member |
| Member fee | 1'300 | | 1'800 | | 1'500 | |
| Installation | 137 | 137 | 126 | 126 | 124 | 124 |
| Monthly line rental | 7.43 | 21.87 | 2.83 | 16.62 | 1.63/ 0.81 | 21.17 |
| Free calls included | 60 calls | 0 | 90 calls | 90 calls | 200 minutes 100 minutes | 50 minutes |
| Local call | 0.07 (flat rate) | 0.07 every 2 minutes | 0.05 every 3 minutes | 0.05 every three minutes | 0.29 per minute | 0.20 per minute |

Note: For residential telephone service and fixed line. Not including taxes. Members own shares in the telephone cooperative. Only COTEL offers off-peak pricing for local calls (1.8 US cents per minute). Converted to US\$ at rate of 30 June 2000.

Source: ITU adapted from SITTEL data.

among themselves but none elected to do so. Current charges were determined based on a combination of an international benchmark study as well as SITTEL's own analysis of the approximate cost of interconnection for Bolivian operators. According to SITTEL, these charges are within international standards.

2.1.3 Network

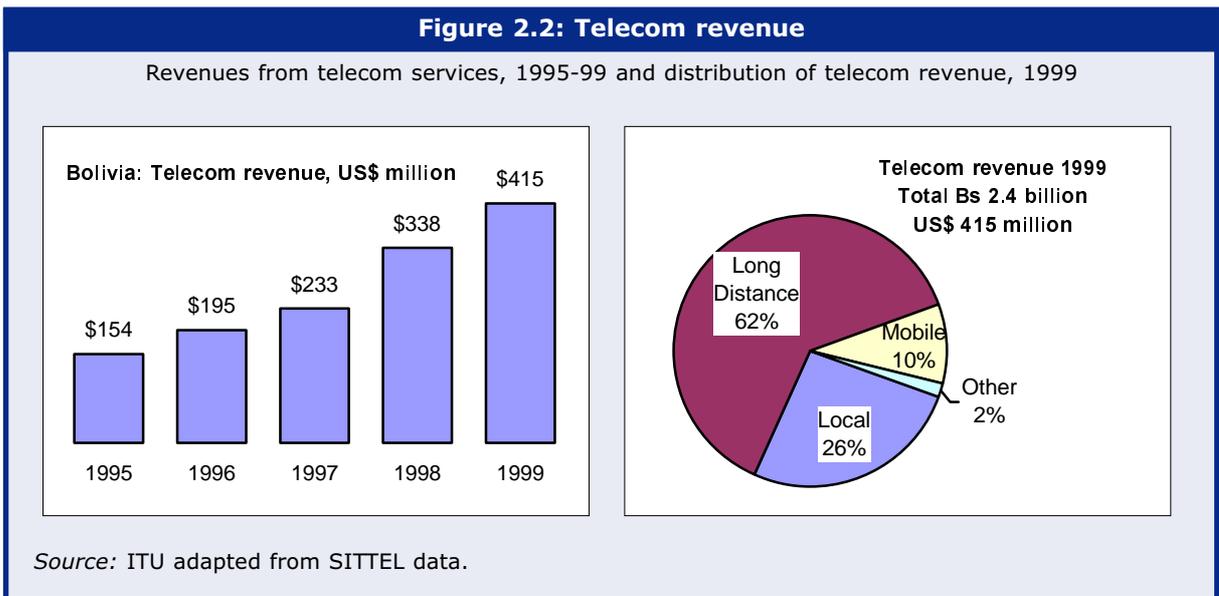
Some 3'200 kilometres of fibre optic cable connect the major cities of La Paz, Oruro, Cochabamba, Santa Cruz, Potosí, Sucre, and Tarija. A microwave network is used as a backup for the fibre optic as well as to connect other locations. In addition, the country uses domestic satellite (around 30 stations and more than 100 VSATs) to connect hard to reach places.

2.1.4 International service

ENTEL has an exclusive license for international telephone service. Like many developing countries, Bolivia has more incoming than outgoing international traffic. International outgoing minutes were 32 million in 1999 while incoming minutes were 87 million, a ratio of 1:2.7. Overall international traffic barely grew in 1999 while

outgoing traffic actually declined around eight per cent. One of the reasons for the large incoming traffic is that tariffs are relatively high. For example it costs around one US\$ per minute for a call to the United States, significantly above prices available in the other direction. Almost half of Bolivia's incoming traffic comes from the United States. Only around a fifth of outgoing traffic heads towards the US; half is destined for neighbouring countries.

Recent data on the economic impact of international telephone traffic is unavailable. The most recent available data, from 1996, shows that ENTEL's international settlements of US\$ 52 million accounted for around 35 per cent of its total revenues. In 1999, domestic and international long distance revenue accounted for some 60 per cent of Bolivia's telecommunication revenue. Bolivia's settlement rate with the United States has come down significantly since 1995, from 75 US cents to 29 US cents per minute. According to the United States Federal Communication Commission (FCC) benchmarks, Bolivia would have to lower the settlement rate to 19 US cents per minute by 31 January 2000.⁷



2.2 Information Technology Sector

2.2.1 Computer market

Published information on unit sales or the stock of personal computers (PCs) is not obtainable. Estimates have been derived based on data from the UN and interviews with ENTEL (see Table 2.4). It is estimated that the stock of personal computers in Bolivia at the end of 1999 was around 100'000. On a per capita basis, this amounts to around 1.23 computers per 100 people. Along with Paraguay, Bolivia has the lowest penetration of PCs in South America, where the regional average is 3.58 per 100 people.

In an effort to promote Internet access and make PCs more readily affordable, ENTEL has partnered with a local bank to provide PCs on instalment terms. The US\$ 79 per month payment is stretched out over 30 months and includes 18 months of unlimited Internet access.

2.2.2 The Internet market

Although Bolivia's Internet country code '.bo' was assigned in 1991, it was not until July 1995 that hosts using the .bo domain name became connected to the Internet. Connectivity was established as a result of a project between BolNet (a special unit of the

National Council for Science and Technology, CONACYT), RedHUCyt (Hemisphere Wide Inter-University Scientific and Technological Information Network) and the United Nations Development Program (UNDP). By December 1995, a 64 kbps satellite link had been established to the US and a number of educational institutions connected (as well as ENTEL). It is noteworthy that Bolivia was connected to the Internet with government, educational and international donor support. It also appears that one of the early application drivers for Internet connectivity was the need to exchange information about environmental protection. The Bolivian *green* community remains one of the most active Internet users in the nation today.⁸ Commercial Internet services became available in 1996.

Under the Bolivian Telecommunications Law, Internet is considered a Value-Added-Service (VAS) and providers of Internet service are supposed to register with SITTEL. The registration is valid for a period of five years. There is no fee but registrants do have to pay up to one per cent of their gross revenues to SITTEL.

According to SITTEL records, as of May 2000, there were 16 registered VAS providers (including three telephone operators) of which 12 provide Internet-related services. As ISPs may

Table 2.4: Personal computer market in Bolivia

| | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 |
|----------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|---------|
| Computer imports (US\$ 000s) | 5'602 | 4'235 | 5'055 | 4'538 | 5'304 | 5'586 | 1'380 | | |
| Computer imports / sales (units) | 3'000 | 2'000 | 3'000 | 2'000 | 3'000 | 3'000 | 1'000 | 25'000 | 40'000 |
| PC base | 15'000 | 17'000 | 20'000 | 22'000 | 25'000 | 28'000 | 30'000 | 60'000 | 100'000 |
| PCs per 100 people | 0.2% | 0.3% | 0.3% | 0.3% | 0.3% | 0.4% | 0.4% | 0.8% | 1.2% |

Note: Published data on unit sales or stock of personal computers is not available. Estimates have been derived based on the value of digital computer imports (1991-97) and estimates of unit sales for 1998 and 1999 provided by ENTEL. The sharp discrepancy between import data and later estimates is unexplained but might be due to poor customs records, gray market or smuggling.

Source: ITU estimates based on UN COMTRADE and ENTEL estimates of unit sales.

Table 2.5: ISPs in Bolivia

Registered ISPs, May 2000

| ISP | Subscribers | POPs | Web site |
|--------------------|---------------|---------------------------------------|--|
| Compunet | 1'000 | Cochabamba | www.cnb.net |
| CosettNet a) | n.a. | Tarija | www.cosett.com.bo/internet.html |
| COTASnet | 6'674 | Santa Cruz Dept | www.cotas.com.bo/internet |
| DWS | 1'200 | Since 1996. Cochabamba, La Paz, Sucre | www.kolla.net |
| ENTELnet | 8'689 | Since 1996 13 cities. | www.entelnet.bo |
| Infonet b) | n.a. | Since 1997. Santa Cruz, Cochabamba | www.latuti.com |
| Megalink | 1'000 | Since 1994 | www.megalink.com |
| Supernet (Comteco) | 3'910 | Cochabamba | www.supernet.com.bo |
| Telecel | 600 | La Paz | www.telecel.net.bo |
| Zupernet (Únete) | 2'750 | La Paz, Santa Cruz | www.unete.com |
| TOTAL | 29'452 | | |

Note: a) Not in SITTEL registry but as a local telephone cooperative, not necessarily required to register.
 b) Not registered with SITTEL.
 Source: ITU adapted from SITTEL and ISP data.

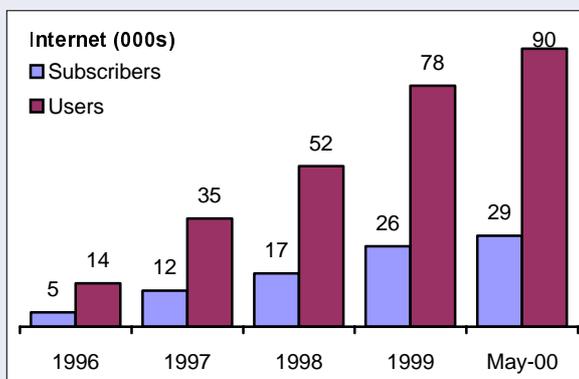
not be aware that they need to register, SITTEL's registry is not a definite list of all ISPs operating in the country. On the other hand, there are companies in SITTEL's registry that do not currently provide service or have

ceased to exist. Research suggests that there were ten ISPs active in Bolivia at May 2000 (see table above).

Three of the phone cooperatives (COTAS, COSETT and COMTECO) as well ENTEL and Telecel provide Internet access service. The largest telephone cooperative, COTEL of La Paz, did not provide Internet access service at the time this report was researched. The number of subscribers in the country at the end of 1999 was 29'500 with ENTEL, COTAS and COMTECO having the largest share of the market. ENTEL has the highest market share in La Paz where the local telephone cooperative does not provide service, whereas COTAS and COMTECO lead the market in their

Figure 2.3: Internet subscribers and users

Number of Internet subscribers and estimated users in Bolivia, 000s, 1996-1999



Source: ITU based on ITU estimates and SITTEL and ISP data.

operating areas, Santa Cruz and Cochabamba respectively. There is no official data on the number of Internet users nor are there any known market surveys. Based on estimates of the number of users per account, it is estimated that there were around 80'000 Internet users in the country at the beginning of the year 2000.

Internet service is available in the largest towns. ENTEL is the only ISP that offers service in all departments. Telephone cooperatives providing Internet service do so only in their concession area. A few of the other ISPs provide service in the largest cities. Usage is relatively dispersed compared to other developing countries where the bulk of users tends to be clustered in the largest city. Santa Cruz de la Sierra, the second largest city after La Paz, has the highest number of Internet users. This is attributed to the dynamism of Santa Cruz—it is often referred to as the most advanced of Bolivian cities in terms of business and social trends. Just as important is the fact that unlike other areas of Bolivia, the local telephone cooperative, COTAS, uses flat rate pricing for local calls. So a user could be logged on indefinitely for the price of one local call (Bs. 0.48, around 8 US cents).

Unlike other countries in Latin America, there has been limited foreign investment in the Bolivian Internet market. By default, Telecom Italia is an investor in ENTEL's Internet activities due to its part ownership of the company. This connection is manifested in one of the international Internet links ENTEL maintains to Italy. Uunete, which provides service in La Paz and Santa Cruz, was bought by IFX Corporation of the US in June 1999. IFX owns a number of other ISPs in the region and is also a part-owner in one of the largest Spanish language portals, Yupi.

International data transmission is considered to fall under ENTEL's exclusive monopoly. Nonetheless, TELEDATA (www.teledata.com.bo), a subsidiary of COTAS, has also obtained an international data transmission license.

This means that except for ENTEL, all other ISPs are not allowed to have their own outgoing international Internet links and must go through either ENTEL or TELEDATA. ISPs can, however, have their own incoming international Internet connectivity, although few have availed themselves of this option, possibly because of the technical complexity.

ENTEL's international outgoing bandwidth was eight Mbps in December 1999, with capacity more than doubling during the year. Supposedly, SITTEL requested ENTEL to increase bandwidth because of complaints from ISPs. In May 2000, ENTEL had increased outgoing international data connectivity to 12 Mbps via three links. One is a 4 Mbps link via Telecom Italia, using the Pan American fibre optic cable. A second is with AT&T. A third is a satellite connection with AmeriTel. There were plans to expand international bandwidth to between 16-20 Mbps by the end of the year 2000.

TELEDATA started by providing private VSAT connections to the petroleum and banking industry. It has since expanded into the Internet, providing international connectivity to COTAS and COMTECO. TELEDATA's international Internet connection is via the PanAmSat 5 satellite to the US backbone. The company offers asymmetrical connections ranging in speed from 64 kbps to ten Mbps.

2.3 Mass media

The provision and use of mass media offers a proxy of the demand for information. Bolivia has a wealth of mass media sources, which might lead one to assume that the same kind of enthusiasm should exist for Internet related services.

2.3.1 Print

There is no lack of Spanish language newspapers published in Bolivia. According to UNESCO, there were 18 dailies published in 1996, with a circulation of just over 400'000. Nine dailies—five in La Paz and two each from Cochabamba and Santa Cruz—have nationwide circulation. The

2. Information and communication technology status

merous unlicensed ones. Radio has the largest reach of any media in Bolivia, with some five million radio sets in use.⁹ Reasons for its popularity include relatively low cost of a radio receiver, reach to illiterate populations, availability in rural areas and broadcasts in Aymara and Quechua. A few radio stations have web sites and some of those provide audio streaming.¹⁰

2.3.2.2 Television

Just as radio, the television market is competitive in Bolivia. There are over 50 broadcasting stations. Over half of the channels are transmitted in the main cities of La Paz, Santa Cruz and Cochabamba. Less than half the households in the country are estimated to have a television set. This is surprising, given that while a TV receiver may require a relatively high initial investment, reception is free for over the air channels. This suggests that low TV penetration may be due to poor reception in some areas, as well as limited or poor quality over the air programming.

With respect to cable television, or paid TV, there are 20 operators registered with SITTEL although there may

be others who have not registered. All departments except Pando have at least one subscription television operator. It is estimated that there are around 70'000 pay television subscribers in the country, equivalent to some 8.5 per cent of families with a television. Both Multichannel Multipoint Distribution Service (MMDS) wireless and coaxial cable are used. Multivision, operating in five cities, claims to be the largest subscription television operator in the country and the first in the world to provide 60 channels using wireless technology.¹¹ Prices for pay television range from US\$ 20-40 per month, beyond the reach of most Bolivians. However, this may change as the market becomes more competitive. There are offers providing free installation and several months of free service. There are also allegations that some operators are providing below cost prices in order to attract subscribers. There is little evidence that existing cable television operators plan to provide Internet services via cable modem any time soon. Multivision is considering providing Internet service as MMDS technology develops to support two-way communications.

Table 2.7: Mass media indicators

| Indicator | Value | Source |
|---|------------------|-----------------------------------|
| Newspapers Number of dailies Circulation | 18 420'000 | UNESCO 1996 |
| Radio sets Per 1'000 inhabitants | 5'250'000 675 | UNESCO 1997 |
| Television sets Per 100 inhabitants | 930'000 11.7 | US Country Commercial Guide, 1998 |
| Television households As % of total households | 800'000 42% | Multivision 1998 |
| Pay TV subscribers As % of TV households | 70'000 8.5% | Multivision 1999 |

Source: ITU adapted from Sources shown.

- ¹ November seems to be a favourite month for significant telecommunication developments in Bolivia. In November 1991, the country's first private telecom operator launched mobile cellular services. ENTEL was privatized in November 1995 and entered the cellular market in November 1996. The third cellular license was awarded in November 1999 and full competition is to be introduced in November 2001.
- ² One of the most active is Comteco, the local cooperative for Cochabamba. It formed the NuevaTel joint venture with Western Wireless of the United States to provide mobile cellular service. See NuevaTel page on the Western Wireless web site at www.wirelessintl.com/boliv.htm. In addition, ENTEL, along with a major Bolivian media group, have made an offer to purchase Comteco. See Telecom Italia. *Annual Report 1999*. 2000. Turin, Italy. Available on the Internet at www.telecomitalia.it.
- ³ SITTEL's web site is: www.sittel.gov.bo.
- ⁴ Theoretically, the top telecommunication policy-making branch of the government is the General Direction of Communications, found within the Vice-ministry of the Transport, Communications and Civil Aviation which in turn is part of the Ministry of Economic Development. In practice, the General Direction of Communications has few resources and most policy input is provided by SITTEL. The Ministry's web site is: www.desarrollo.gov.bo.
- ⁵ SITTEL, *Regulacion de Telecomunicaciones en Bolivia*, 2000.
- ⁶ For example, SITTEL rejected a proposal by COTEL to raise local tariffs in May 2000. SITTEL argued that the proposed increase was more than twice the Price Cap level. See "Superintendencia rechazó tarifas presentadas por Cotel." *La Prensa* (La Paz). 18 May 2000.
- ⁷ FCC. *Report & Order In the Matter of International Settlement Rates*. August 1997. www.fcc.gov/Bureaus/International/Orders/1997/fcc97280.html.
- ⁸ For example they are among the heaviest users of the 'Dossier', an online service of the Bolivian Congress where users can electronically comment on laws.
- ⁹ That figure is from UNESCO. The US government, in its Country Commercial Guide 2000 for Bolivia, reports that there are 3.6 million radios with an audience reach of some 5.5 million people. The Guide, along with useful descriptions of mass media in Bolivia, is available at: www.megalink.com/usemblapaz/ccg20000.htm.
- ¹⁰ www.tvradioworld.com/region1/bol/Radio_TV_on_Internet.asp.
- ¹¹ www.mtvision.com.

3. Internet strategy & policy

3.1 Role of incumbent telecom operator in Internet

Bolivia is unique in that there is not one incumbent telecom operator. Rather, there are the local telephone cooperatives and ENTEL. The latter is involved in the Internet market, both as a nationwide service provider and through the provision of national and international connectivity. Along with TELEDATA, ENTEL has the exclusive right to provide international Internet bandwidth. According to most downstream ISPs, this duopoly is not sufficient to generate the level of competition necessary to provide low costs and good quality. The major cooperatives—except notably COTEL—are involved in the provision of Internet dial-up service and leased line provision in their area of coverage. The most disadvantaged ISPs are those that are not part of the existing telephone hierarchy since they are not allowed to provide their own infrastructure and must lease all equipment from ENTEL, or the cooperatives.

3.2 Pricing structure for Internet services

There are a range of Internet dial-up plans in Bolivia. Registration charges for Internet access range from US\$ 8 – 20 but in many instances they are being waived to attract more customers. There is little variation in hourly Internet packages among ISPs. A fifteen hour package costs around US\$ 10 per month. There are significant variations for unlimited access, ranging from US\$ 20 to 40 per month. Other dial-up Internet packages include late night (US\$ 10 per month for unlimited access) and on demand (usage-based, no monthly fee, about US\$ 1 per hour peak, US\$ 0.50 off-peak).

Telephone usage charges must be added to dial-up Internet access. Unlike most other countries, telephone

charges vary across Bolivia as well as within local telephone cooperatives. This complicates comparability and analysis of the impact of telephone usage on Internet access. Some cooperatives use metered charging while others use a flat fee. A certain number of free minutes or calls are typically included with most telephone subscriptions. Also, charges differ depending on whether the subscriber is a member of the cooperative or not. Arrangements have been made between COTEL and some ISPs to reduce the telephone usage charge for Internet access. For example, instead of charging the normal peak usage charge of Bs. 0.21, the rate of Bs. 0.07 is used. Some ISPs have complained that while this is good for encouraging Internet access, they are required to carry out the billing of the telephone usage charge. This type of system is less needed in Santa Cruz where a flat rate of Bs. 0.43 is charged per call. It is not known whether reduction of telephone usage charge is available in other parts of the country.

The use of leased lines is not widespread. There are several reasons for this. One is that there is scarcely any discount for higher speeds. The quality of the leased line has also been questioned by some users who argue that they are not getting the full bandwidth they pay for. Also, in the case of Santa Cruz, the use of flat rate pricing for telephone usage mitigates against the need for leased lines, especially considering that prices are fairly high.

3.3 Regulatory status of Internet

3.3.1 Internet Service Provider (ISP) market

The ISP market is open in that there are no restrictions on becoming a provider. ISPs are supposed to register with the regulator SITTEL as Value

Table 3.1: Internet access prices

| Internet dial-up prices, US\$, May 2000 | | | | | | |
|---|-------------|----------------|------------|----------------|-------------------|-----------------------|
| | Plan | Hours included | Connection | Monthly charge | Extra hour (peak) | Extra hour (off-peak) |
| CompuNet | - | 30 | \$20.00 | \$30.00 | \$1.00 | - |
| CosettNet | A | 35 | \$16.34 | \$16.34 | \$0.82 | - |
| CosettNet | B | 15 | \$16.34 | \$8.99 | \$0.82 | - |
| CosettNet | C | UL | \$16.34 | \$39.22 | \$0.00 | - |
| COTASnet | A | 15 | - | \$10.00 | \$1.00 | \$0.50 |
| COTASnet | B | 40 | - | \$20.00 | \$1.00 | \$0.50 |
| COTASnet | C | 80 | - | \$30.00 | \$1.00 | \$0.50 |
| COTASnet | 900 | - | - | - | \$1.00 | \$0.50 |
| COTASnet | Empresarial | UL | - | \$35.00 | - | - |
| COTASnet | Lechuza | UL | - | \$10.00 | - | - |
| COTASnet | Full | UL | - | \$45.00 | - | - |
| EntelNet | Básico | 15 | \$0.00 | \$9.80 | \$1.14 | \$0.82 |
| EntelNet | Familia | 30 | \$16.34 | \$16.34 | \$1.14 | \$0.82 |
| EntelNet | Illimitado | UL | \$16.34 | \$20.42 | - | - |
| Supernet | - | Up to 20 | \$8.17 | - | \$0.78 | - |
| Supernet | - | Up to 30 | \$8.17 | - | \$0.74 | - |
| Supernet | - | More than 30 | \$8.17 | - | \$0.65 | - |
| Telecel | - | - | - | - | \$2.06 | - |
| Unete | Oro | UL | 10 | 22 | - | - |
| Unete | Bronce | 25 | 10 | 15 | - | 1 |

Note: Converted at Bs 6.13 to one US\$. Not including telephone usage charges.
Source: ITU adapted from ISP data.

Added Services providers and are expected to contribute around one per cent of revenue to the regulatory authority.

Table 3.2: Leased lines prices

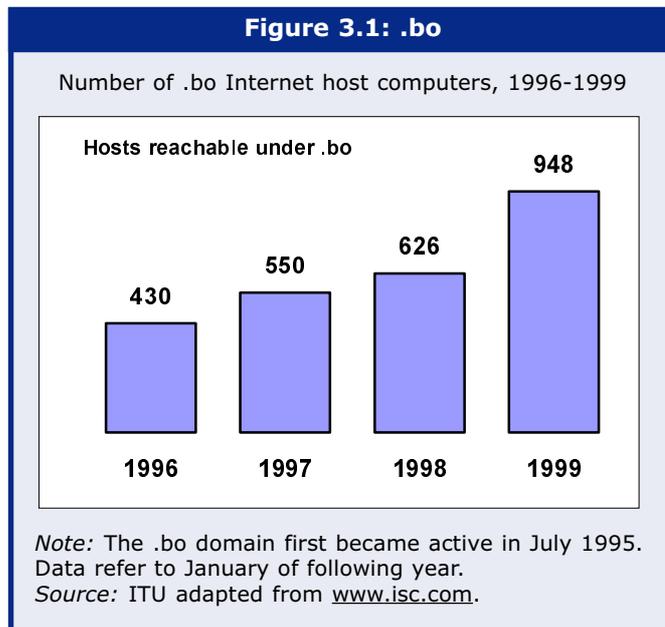
| Entel, June 2000, US\$ | | |
|------------------------|--------------|-------------|
| Speed (KBPS) | Installation | Monthly fee |
| 19.2 | 255 | 350 |
| 32 | 255 | 550 |
| 64 | 255 | 1000 |
| 128 | 255 | 1800 |
| 256 | 255 | 3500 |
| 512 | 255 | 6100 |
| 1024 | 255 | 12200 |

Source: Entel.

The provision of infrastructure is considered to be the exclusive right of basic telecommunication operators. Therefore, ISPs cannot provide their own leased lines and can only resell those provided by the telephone cooperatives or ENTEL. Nor can ISPs provide their own outgoing international connectivity. They must use one of the two authorized providers, ENTEL or TELEDATA. ISPs can have their own incoming international gateways; however this option has not been used to a great extent.

3.3.2 Top level domain name

The administrative contact for the Bolivian country code top level domain (ccTLD, .bo) is Clifford Paravicini, Executive Director of BolNet.¹ The ccTLD was assigned to him in 1991. It costs US\$ 100 to register a host using the .bo domain. Second level domain



names follow the standard convention of '.edu' for education, '.gov' for government, '.com' for commercial, '.net' for network and '.org' for organization. ISPs are supposed to use the '.net' second level domain name, though few actually do. When ISPs apply for a domain name, they are also supposed to provide evidence that they have registered with SITTEL.

The .bo ccTLD has been growing steadily and registered its highest growth ever during 1999. Nonetheless, most Bolivian web sites prefer to use generic TLDs (e.g., '.com'). One reason is cost: a dot.com registration costs US\$ 35 versus US\$ 100 for dot.bo. Also, some organizations stated that dot.com is more prestigious. It was estimated that there are around 2'000 Bolivian registrations under '.com'.

3.3.3 IP telephony

IP telephony—the provision of telephone services over the Internet—is considered a voice service. Therefore, only licensed basic telephone operators are allowed to use IP telephony. It is alleged that there is some use of IP telephony. For example, SITTEL has been called upon several times to warn cyber cafés about offering this service. However, the current level of Internet quality in the country miti-

gates against widespread use. As one user stated, IP telephony works at three in the morning but not during office hours. It would not be surprising, as has been the experience in other countries, if incoming international telephone calls are being routed over the Internet, terminated at an ISP's location and broken out over the local network.

3.4 Universal access

There is presently no Internet-specific component in Bolivia's universal service / access policy. SITTEL's mission statement says that it is to "*guarantee ample access to services*." This is codified in the Law of the Sector Regulation System (Law 1600), which states that one of SITTEL's primary responsibilities is to promote the expansion of basic telecommunication services to the majority of Bolivians. There are targets relating to quality of service and line installation that telecom companies have to meet that indirectly have a bearing on Internet take-up. The provision of public telephone service requires a concession. At the end of 1998, there were around 11'000 public telephones in the country.

Telecom operators currently contribute a percentage of their revenue to a telecommunication development fund. It has thus far not been used and the way the money will be used is still being discussed. One proposition is to give the right to provide services in underserved area to the lowest bidding company.

As in other countries, access to the Internet is being provided through a growing number of public access locations such as cyber cafés. ENTEL has established nine public access centres called *punto Entel* in La Paz and Santa Cruz where various telecommunication

Figure 3.2: punto Entel

An ENTEL telecommunication office including Internet access, La Paz, May 2000



Source: ITU.

services are offered, including pre-paid mobile phone recharges and Internet access. There is no official census of cyber cafés in the country and estimates

vary considerably. One company closed its cyber cafés in La Paz, claiming there was no more need since there were already two dozen in the city.

¹ Information about registering a .bo host is available from the BolNet web site at: www.nic.bo/final.htm.

4. Information & Communication Technology & the nation

4.1 Education

The performance of the education sector in Bolivia has been improving. For example, in 1998 the adult literacy rate stood at 84 per cent compared to 78 per cent in 1990.¹ Improvements in literacy are likely related to an increase in the percentage of budget allocated to education. Public expenditure on education stood at around five per cent of GDP in the period 1995-1997 but rose to 5.7 per cent in 1998—a much higher share than the average 2.5 per cent that low-income countries allocate to the sector.² Despite this progress, educational attainment in Bolivia is still below Latin American standards. In 1998, approximately 16 per cent of the Bolivian population over the age of 15 was illiterate, while the Latin American illiteracy average stood at 13 per cent.

The net *primary* enrolment ratio has also improved.³ The ratio for boys rose from 85 per cent in 1980 to 100 per cent in 1997, while for girls it went from 74 per cent to 95 per cent in the same period. Yet, while overall enrolment in primary school is high—97 per cent in 1997—attendance drops considerably for *secondary* school where enrolment stood at 40 per cent during 1997. Furthermore, although school attendance is compulsory between the ages of 7 and 13, there are reports that in practice, approximately half of the children in primary education often attend school for only a year or less.

The main obstacle to higher secondary school enrolment lies in widely prevalent child labour.⁴ Another factor is cost; although public schools are free, there are expenses such as registration fees, school supplies, uniforms, and transportation that can add up to a significant amount in a low-income country like Bolivia.

As in a number of other countries, the *higher* education sector in Bolivia was one of the first users of the Internet and has progressed further in this area than other sectors of the country. For example, while the Ministry of Education does not yet have a web site, the Vice-ministry of Superior Education, Science and Technology (VESCYT)—responsible for higher education—does (www.viceminedu.org). The web site of VESCYT provides information on higher education in the country.⁵ Users can access information such as the accreditation of professional diplomas, the approval of new university degrees and curricula, requirements for establishing private universities, etc.⁶ VESCYT is planning to further extend the statistical information available over the web. Although the initiative will benefit the public in general, the main goal of the project is to collect and manage educational data from all over the country in order to develop national policies and strategies to enhance the performance of the sector. Although the VESCYT web site is becoming increasingly rich in content, it is not yet interactive. Bolivians still have to go to the VESCYT headquarters or its branches—sometimes from remote places in the country—spending time and money that could be saved if those administrative transactions could be carried out over the web.

The Bolivian university system is split between public and private universities. The twelve major public universities are members of the Executive Committee of Bolivian Universities *Comité Ejecutivo de la Universidad Boliviana* (CEUB) (ns.ceub.edu.bo). These universities account for the bulk of higher education students, with over 160'000 registered students in 1997. Seven public universities had functioning web sites at the time of this report (see Table 4.1). There are

Table 4.1: Bolivian universities on the Web

Bolivian universities with web sites, September 2000

| University | Web site |
|--|--|
| Public | |
| Universidad Mayor de San Francisco Xavier | www.usfx.edu.bo |
| Universidad Mayor de San Andrés | www.umsanet.edu.bo |
| Universidad Mayor de San Simón | www.umss.edu.bo |
| Universidad Gabriel Rene Moreno | www.uagrm.edu.bo |
| Universidad Técnica de Oruro | www.uto.edu.bo |
| Universidad Juan Misael Saracho | www.uajms.edu.bo |
| Universidad Católica Boliviana | www.ucb.edu.bo |
| Private | |
| Universidad del Valle | www.univalle.edu |
| Universidad Privada Boliviana | www.upd.edu |
| Universidad Nur | www.nur.edu |
| Universidad Evangelica Boliviana | www.ueb.edu.bo |
| Universidad de Aquino Bolivia | www.udabol.edu.bo |
| Universidad Privada de Santa Cruz de la Sierra | www.www.upsa.edu.bo |
| Universidad Andina Simón Bolívar | www.uasb.edu.bo |

Source: ITU.

also close to 40 private universities of which at least seven have a web site. One difficulty in determining the number of private university web sites is that, unlike public ones, they do not all use the Bolivian educational domain name ('edu.bo'). Several of them are using the '.edu' top level domain name, which is generally used by educational institutions in the United States.

A number of universities are progressively advancing in Internet use and applications. The Universidad Católica Boliviana (UCB, www.ucb.edu.bo), for example, provides Internet accounts to all its staff and most of its students. It also allows them to carry out a number of academic and administrative tasks interactively, including online registration, interaction with faculty and access to the University library.⁷ The popularity of the system has led to a rapid growth of users (see Figure 4.1, left chart). To keep up with the pace of Internet growth, UCB has been expanding transmission capacity to the Internet; by May 2000 it reached 256 kbps (Figure 4.1, right

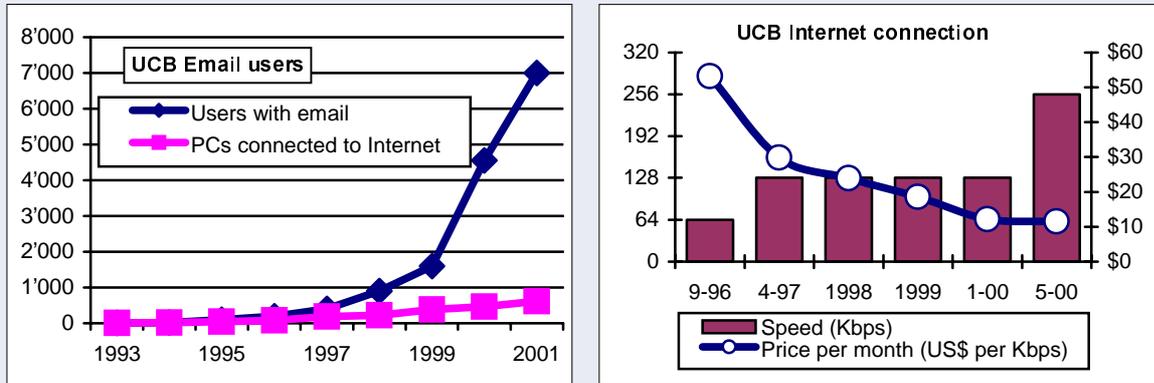
chart). While the price paid for the connection seems relatively cheap compared to only a couple of years before, the cost of bandwidth for the educational sector still remains relatively high and discounts, if available, are insignificant. While UCB would like to upgrade to a higher capacity connection, the present cost and quality do not make it practical.

The difficulties faced by the Bolivian educational sector in affording the cost of communication services are comparatively bigger than in other countries. In some countries, governments have programs to ease the cost of Internet access for educational institutions. No such programs exist in Bolivia. While some ISPs do provide lower tariffs to students and academic institutions, these are not widespread and do not generally include higher speed leased circuits, which are more suitable to an educational environment.

The Internet constitutes both an opportunity and a threat for Bolivian

Figure 4.1: University Internet development

Internet users, PCs with Internet access and transmission speeds and prices, Universidad Católica Boliviana (UCB)



Note: 2000 and 2001 are UCB projections. UCB had 13'350 students in 1997.
Source: Universidad Católica Boliviana.

universities. This is because of the Internet's potential for offering courses and degrees online. According to officials of the Bolivian Ministry of Education, a large number of those who are not selected for university in Brazil migrate to carry out their studies in Bolivia. The flow of Brazilian students is so significant that some private universities in Bolivia specialize in educational services for foreign students and even teach some classes in Portuguese.

With the Internet, Bolivian universities could increase the number of registered students by offering courses online to those that cannot afford to come to Bolivia. Yet, for the time being, the Internet seems to be emerging as a potential threat. Currently there are no universities in Bolivia that offer degrees or courses over the Internet. Those that do offer distance education—such as UCB and NUR—do it the traditional way, that is, supported by telephone, fax, and regular mail services.⁸ With a rising tide of Internet-based education offerings from other countries of the region, Bolivian universities that do not quickly follow this trend may find it harder to attract overseas students (and may even risk

losing Bolivian students to *virtual* overseas institutions).

A number of national educational institutions are progressively incorporating the Internet both as a communications facility and as an educational tool in pursuit of profiting from the benefits associated with the Internet and improving education standards in the country. In February 2000, the Centro de Informática Educativa, "Educational Informatic Centre" (CINE) project was launched. The aim of the initiative is to produce educational software and complementary material to enhance the use and knowledge of information and communication technology in the Bolivian educational system. Project CINE is carried out by the UCB with the financial support of the Arnaldo Schwimmer Foundation.

The Instituto de Investigación en Informática Aplicada (IIIA, "Institute of Applied Informatic Research") of the UCB, is another example of the way in which the Internet can help in the advancement of education and science in a developing nation. The IIIA has not only been quite active in the area of health—the purpose

Box 4.1: A profitable service to the local community

The Instituto de Investigación en Informática Aplicada (IIIA) was created in 1996 through a co-operation agreement between the Universidad Católica Boliviana (UCB) and two Swiss institutions: the University Hospital of Geneva, and the University of Geneva, Switzerland.

Aside from projects in the area of health, the IIIA has been quite active in pursuing a broad range of activities in areas not related to medicine. As of mid-2000 the IIIA had activities in areas such as: applied research in informatics; development and implementation of Internet related applications and services; courses, seminars, and workshops on the use of information and communication technology; and consulting and software development. In this latter area the IIIA has been providing support to various institutions of the Cochabamba area with the development of web sites and other Internet related applications as well as software development of stand alone applications. Some of the projects in which IIIA is involved include:

- *Improcons*: Development of an application for the management of sales, inventories, warehousing, purchasing, etc., for the import-export company Improcons.
- *Foreign Trade*: Development of a software for the administration of export/import procedures and the management of foreign trade statistics.
- *Foreign Investment*: Production of a multimedia presentation to promote Cochabamba's potential to attract foreign investment and business to the region.
- *Comteco*: Development of a web-based electronic mail application for the local telephone company Comteco.
- *Web sites*: Development of web sites for a number of local businesses and not-for-profit institutions.

for which it was created—but it has also successfully branched out into other areas and is currently offering services and products to the local community (see Box 4.1).

In contrast with the early progress achieved in some Bolivian universities, leading science and technology institutions, such as the Consejo Nacional de Ciencia y Tecnología (CONACYT) and the Dirección General de Ciencia y Tecnología (DCT), were only directly connected to the Internet for the first time as recently as September 1999. Since the end of 1999, DCT and CONACYT have developed a web page that will be linked to a number of databases that the organizations have developed (with data on scientific centres and scientists in the country, science and technology library, documents and publications, and a number of national science and technology indicators). The site is to become available some time in 2000.

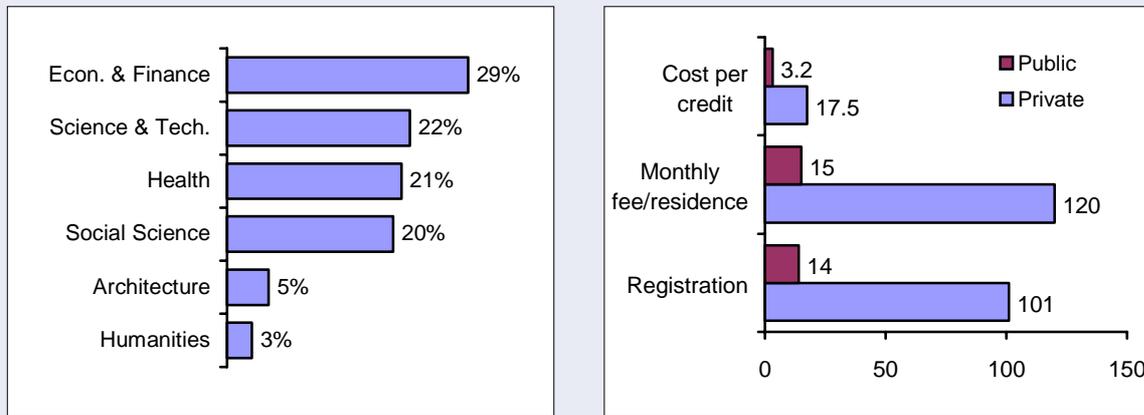
Similarly, the Ministry of Education reports that there are no Internet-related projects of significance in the primary or secondary school system of the country. This stands in sharp

contrast with the progress achieved in other neighbouring countries. In Chile, the "Enlaces" project (www.enlaces.cl) had by mid-2000 more than 4'000 schools interconnected amongst themselves and with the world through the Internet. It is also intriguing that, despite being one of the poorest countries of South America, Bolivia is still not part of the World project (www.worldbank.org/worldlinks)—an initiative of the World Bank to bring computing and the Internet to the schools of low and middle low-income countries in the world. The absence of Bolivia from the program is even more puzzling when one considers that World had wired secondary schools in most neighbouring countries including Brazil, Chile, Peru and Paraguay.

The relative youth of the Bolivian population can be a plus for the country in terms of building a knowledge-based society. The young grasp information technology quickly and are eager adopters and users of the Internet, if they can be provided access and appropriate training. It is encouraging to know that out of the 32'253 students registered in private universities during 1998, some

Figure 4.2: Educating for the future

Percentage of students registered in different courses, 1998 (left-hand chart).
Cost of education in public and private Bolivian Universities, US dollars, 2000 (right-hand chart).



Source: Viceministerio de Educación Superior Ciencia y Tecnología (edusuper@bolnet.bo).

22 per cent were enrolled in the area of science and technology—constituting the second most important area of choice among Bolivian students of private higher education institutions (see Figure 4.2 left-hand chart). Furthermore, private universities are taking the initiative to push further training in the area of computer networking. For example, the NUR in Santa Cruz has forged an agreement with the large networking multina-

tional Cisco to support the teaching of communication networking (see Box 4.2). Yet, given the cost of most private universities in the country (Figure 4.2, right-hand chart) and the relatively low per capita income of most people in Bolivia (US\$ 1'077 in 1998), access to knowledge on information and communication technology will certainly remain available only to a small group of the Bolivian society.

Box 4.2: Bring networking knowledge to the south

Profile of the NUR University and Cisco Local Networking Academy project

The agreement between Cisco Systems and the NUR University in Santa Cruz is part of the global Cisco "Networking Academies" initiative. The project aims at training young people in developing nations in the principles, design, assembly, and maintenance of computer networks. The NUR University Academy—which opened its doors in August 2000—has built, with the support of Cisco, labs with networking hardware to allow hands-on practice and practical knowledge. Training is on site twice a week and the cost of a semester stands at US\$ 525. The certificate granted by the Academy is internationally recognized.

Cisco has made agreements with educational institutions in each region of the developing world to set up local Networking Academies. In the Americas region the regional Academy is Fundación Proydessa, located in Buenos Aires, Argentina. In the case of Bolivia, NUR University has been chosen to set up the first Local Networking Academy in the country. The students that graduate from the two year program will be able to enter the labour market as technicians or pursue higher educational degrees. Access to jobs is enhanced by an internship program that places students with some of the main telecommunication and information technology companies in the region.

Source: NUR University (www.nur.edu/promo/cisco/index.htm).

4.2 e-commerce

The use of the Internet for selling products and services is still very nascent in Bolivia. Out of the some US\$ 200 million business-to-consumer (B2C) e-commerce sales in Latin America in 1999, it is unlikely that Bolivia accounted for more than a miniscule amount.⁹ Does e-commerce make any sense for a poor nation with a limited infrastructure such as Bolivia? Some would argue that a landlocked country like Bolivia is the epitome of nation that can benefit tremendously from e-commerce. Electronic trading would allow Bolivian business to overcome distance and time barriers to markets and sell their products and establish contacts.

Certainly Bolivia has things to sell such as handicrafts¹⁰ and agricultural and mining products. Furthermore, the country has great tourism potential and is trying to promote its unspoiled natural areas for eco-tourism. According to National Geographic, "More plant and animal species grace Bolivia's new Madidi National Park than any other preserve in South America."¹¹ Young foreigners tend to be intensive Internet users and thus precisely the target market for eco-tourism.

Table 4.2: The bumpy road to e-commerce

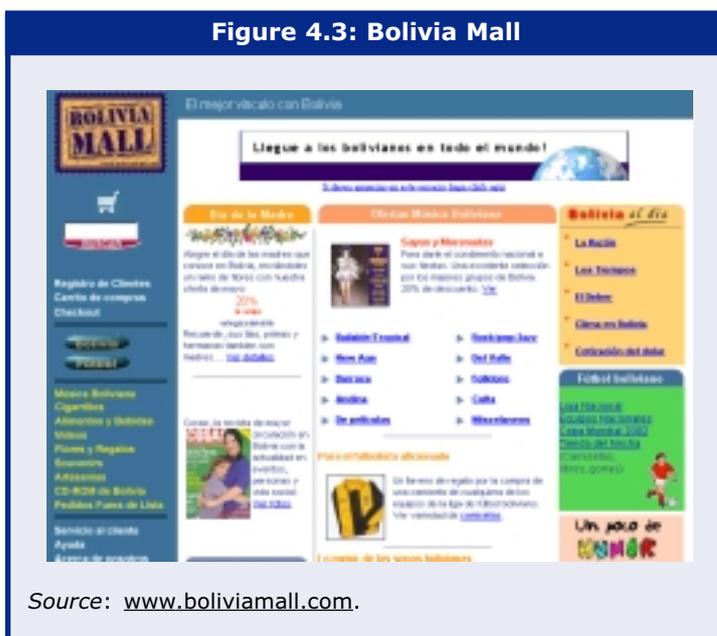
Status of various commercial web sites gathered from the Bolivia Business Online portal, July 2000

| Status of the site | Number of sites | Percentage of total |
|----------------------------------|-----------------|---------------------|
| Full e-commerce transactions | 0 | 0 |
| Basic commercial transactions | 4 | 6 |
| Static information | 21 | 31 |
| Broken sites | 15 | 22 |
| Only e-mail | 13 | 19 |
| No site | 11 | 16 |
| Faulty sites | 2 | 3 |
| Under construction | 1 | 2 |
| Total number of web sites | 67 | 100 |

Source: ITU adapted from Bolivia Business Online (www.boliviabiz.com).

In spite of the potential of e-commerce in Bolivia, the country has a limited number of web sites that could be truly categorized as e-commerce enabled. There are a few initiatives to promote online trade for Bolivian companies through establishment of directories on the web. Bolivia Business Online (www.boliviabiz.com) and Bolivianet (www.bolivianet.com) are two such portals. Although the number of companies with a presence on these business portals is encouraging, a closer look reveals that there is still some work to be done. On the Bolivia Business Online portal, limited information or e-mail only contact account for the majority of web pages. Sites with non-functioning links accounted for more than

Figure 4.3: Bolivia Mall



On the Bolivia Business Online portal, limited information or e-mail only contact account for the majority of web pages. Sites with non-functioning links accounted for more than

40 per cent of the total at the time of the survey (see Table 4.2). Only six per cent of the sites allow basic e-commerce transactions. None of the sites offer the possibility of carrying out a full e-commerce transaction including payment of products or services over the web. The furthest some of them go in having e-commerce capabilities is linking to e-commerce sites in the USA. For example, Bolivian sites selling books such as Los Libros (www.bolivianet.com/bookstore/index.htm) and Los Tiempos (www.lostiempos.com), have links to the North American bookstore Amazon, allowing clients to purchase books online. The other business portal—BoliviaNet—is more solid. Out of the 32 companies with a presence on the site, some 69 per cent of them provide just information but an encouraging 31 per cent offer some sort of e-commerce capability—including, for instance, the possibility of online credit card payment in various hotels.¹²

One of the most notable initiatives in the area of e-commerce offering full e-commerce capabilities is *Bolivia Mall*

(www.boliviamall.com). The web site launched in 1998 and is aimed at Bolivians abroad as well as others overseas interested in Bolivian products. It takes credit card payments, suggesting that the site is not hosted in Bolivia since the local credit card administration has not yet implemented credit card payments over the Internet. Bolivia Mall works with DHL to send the products ordered. The site is structured like a supermarket where users select the products they want and add them to a shopping cart. Products are classified by a number of areas such as music, videos, food products, souvenirs and handicrafts.

Another initiative is the new Bolivian portal (www.bolivia.com), which is to be launched in the near future.

Travel is one of the sectors of the economy where sites are becoming increasingly sophisticated, allowing clients to carry out basic transactions such as online reservations and credit card payments (see Table 4.3). One example is Fremen Tours (www.andesamazonia.com), which offers a site in

Table 4.3: Moving to online world

Selected Bolivian companies that are implementing e-commerce capabilities in their web sites

| E-Commerce | URL | Other Information | Type of Enterprise |
|---------------------|--|--|--------------------|
| Yotaú Hotel | www.bolivianet.com/yotau/index.htm | Online reservations— Credit card payments | Hotel |
| House Inn | www.bolivianet.com/houseinnhotel | Online reservations— Credit card payments | Hotel |
| Las Palmas | www.bolivianet.com/laspalmas/index.htm | Online reservations— Credit card payments | Hotel |
| Royal Lodge Hotel | www.bolivianet.com/royalhotel/index.htm | Online reservations— Credit card payments | Hotel |
| Hotel Arenal | www.bolivianet.com/hotelarenal/index.htm | Online reservations— Credit card payments | Hotel |
| Volar | www.bolivianet.com/volar/index.htm | Online subscription, cheque payment | Magazine |
| Barron's Car Rental | www.bolivianet.com/rentacar/index.htm | Online reservations, no payment options | Car Rental |
| Libros de Bolivia | www.bolivianet.com/bookstore/index.htm | Linked to Amazon.com | Bookstore |

Source: ITU adapted from Bolivianet.com.

four languages (English, Spanish, French and German), a wide range of tours and online reservations. In the lodging business, Camino Real Apart Hotel (www.boliviaweb.com/companies/caminoreal/) is one of the few among the 14 hotels with web addresses whose web site is available and offers online reservations.

The above cases are concrete illustrations of a nascent electronic trading marketplace in the Andean country. The growth of e-commerce in the country, however, is quite slow compared to other nations with similar socioeconomic indicators. As expressed by the Vice-Ministry of Industry and Internal Commerce, factors affecting the slow development of e-commerce in Bolivia include: low income, lack of awareness, limited and antiquated infrastructure, high cost of services, scarcity of local content, and an undeveloped digital legal framework.

Low income — Bolivia's per capita income of US\$ 1'077 makes it not only the fifth poorest country in the Americas region but also the poorest nation in South America.¹³ Some 30 per cent of the urban population and 80 per cent of rural dwellers live below the national poverty line. Many of Bolivia's citizens are focused on where their next meal is coming from rather than buying books from Amazon.com. Even if they were not, the majority of the nation's inhabitants cannot afford access to the communication facilities that enable online shopping.

Yet another barrier is the low level of credit card ownership in the country. There are less than 200'000 credit cards in circulation (2.3 per cent of the population).¹⁴ The number of cards and sales volume translate to less than 0.2 per cent of the Latin American region total. The country has just under 150 ATMs that accept VISA cards.

Furthermore, those with credit cards cannot use them to purchase products from web sites in Bolivia since the nation's credit card administrator has not enabled this facility in the

country. There is no pre-paid card systems (like the one available for cellular services) that could be used to purchase items and services over the web.

Low purchasing power means that Bolivian businesses also lack the resources to invest in the underlying software and hardware to enable them to advertise and sell products over the web.

Lack of awareness — Many of Bolivia's some 30-40'000 businesses, the government and citizens are unfamiliar or suspicious of the concept of buying and selling goods and services over the Internet. It is rare to see outdoor Internet-related advertising or companies listing a web site in their publicity.

Industry associations are trying to get the country more e-aware. The National Chamber of Commerce (*Camara Nacional de Comercio, CNC*) encompasses some 2'700 service-oriented industries. Established in 1890, the CNC has been participating in the Free Trade Area of the Americas' negotiating group on Joint Government-Private Sector Committee of Experts on Electronic Commerce (www.alca-ftaa.org/spcomm/commec_e.asp). The CNC is also interested in becoming a certificate authority for Bolivia. It offers some services over its web site <www.megalink.com/camara> and plans to expand this.¹⁵ Its "Oportunidades Comerciales" has received around 400 e-mails from all over the world. Around 40 per cent were inquires about contacting Bolivian companies. A growing number of CNC members have e-mail and CNC estimates that it sends its circular letters to around 30 per cent of its members by e-mail. It has also sponsored seminars since 1996 about the Internet for its members.

Established in 1931, the National Chamber of Industries (*Camara Nacional de Industrias, CNI* <www.bolivia-industry.com>) has some 1'000 industrial and manufacturing members. It estimates that

Box 4.3: "The future according to 'Don' René"

"Don" René, as everyone calls him here, is an unusual character. An UNCTAD expert, he travels the world with the single idea that increases in the planet's trade should contribute to the well-being of all and to progress and peace. Hence Don René's enthusiasm to seize the opportunity offered by UNCTAD with its creation of a world network of Trade

Points. The Trade Point at Cochabamba gives foreigners direct access to goods such as sumptuous alpaca pullovers woven by Indian women from the wool of llamas raised by many Indian farmers living precariously on the Andean Altiplano. This truly social, communal enterprise provides work for one thousand people.

Source: UNCTAD.

roughly half have e-mail. CNI first began using the Internet in 1994. It saw how the Internet was affecting business practice (e.g., e-mail replacing fax, e-commerce) and in 1997 it launched a web site. Their web site, which is hosted in the United States, gets over 60'000 hits a year of which 90 per cent come from outside Bolivia. The most visited part of the web site is the members' directory. It also hosts some members' web pages for free. CNI thinks that Bolivian industry is the only sector today that can carry out e-commerce from a practical point of view since it produces a tangible product. Some of its members have established trading relationships through the Internet. CNI members have listed the following barriers to a web presence: (1) lack of knowledge; (2) antiquated computers with no modems; and (3) lack of involvement by the country's ISPs.

The Vice-Ministry of Industry and Internal Commerce of the Ministry of Economic Development is responsible for industry and trade. It has Internet access and an e-mail address but no web site of its own (some pages about the vice ministry are hosted on the main ministry web site). Instead, several of its agencies have established web sites including UMA, OBA, INBOPIA, and SENAPI. The vice-ministry put forth the following factors affecting the development of e-commerce in Bolivia:

- The Internet is an incipient activity due to its high cost and therefore lack of mass access,
- There is a lack of awareness of the Internet,

- There is a shortage of content in Spanish,
- Uncertainty regarding the security and confidentiality of transactions,
- No legal norms that deal specifically with e-commerce,
- Domain names and trademarks on the Internet need to be protected,
- Intellectual property protection,
- Improvement of information availability regarding patents.

There is an informal national task force on e-commerce led by the Vice-President's office whose members include the chambers of commerce and industry, the national telecom regulator and main operator and others. The exact composition and mandate of this group remains vague.

Communications infrastructure and cost

— With a little over six telephone lines per 100 inhabitants, Bolivia has the second lowest telephone density in South America. This is a major impediment to e-commerce since the vast majority of Internet users in the country use dial-up access. While mobile density (5.2 per cent) is almost as high as fixed (spurred by a competitive market and wide spread availability of pre-paid cards), it is not a viable platform in the short run for e-commerce due to a number of technical and economic reasons. As of May 2000, there were around 30'000 Internet subscribers in Bolivia and an estimated user base of just under 100'000. While these figures are growing, they represent only a small portion of the country (less than

0.4 per cent subscribers and just over one per cent users).

Although, in early 2000, the price of a monthly subscription for full Internet was around the same price as in the United States, the purchasing power of the Bolivian population does not equate to that of consumers in the US. Since the cost of non-communication goods and services (such as real estate, labour, marketing, etc.) in the country are well below the cost of similar items in the USA, one would assume that what brings the price of Internet services to US levels is the cost of communication-related services, such as the price of leased lines. In the second half of 1999, for example, Bolivia had some of the highest leased line rental rates in Latin America. A 64 Kbps leased line to Brazil stood at almost US\$ 3'000, while the cost of a line in the opposite direction (i.e., Brazil to Bolivia) amounted to only US\$ 1'710 (for the cost of 2 Mbps lines, see Figure 4.4).

Legal environment and local content — Bolivian laws are not digital ready to deal with issues such as electronic signatures, privacy, consumer protection, taxes and jurisdiction. One problem is that waiting for the devel-

opment of laws will slow badly needed e-commerce experience (and the very expertise that is needed to develop the appropriate laws) and add to the cost of developing electronic trading in a country that is already short of resources.

The lack of an adequate legal framework to handle commercial relations on the Internet undermines consumer confidence in electronic transactions. One example is Intellectual Property Rights (IPR) where Bolivia has been accused of being lax. Its software piracy rate ranks it 13th worldwide and the highest in Latin America.¹⁶ Progress has been made in this area but this may come at the expense of the development of information technology in Bolivia since the country cannot afford market prices for software. One idea put forth is that the government should negotiate agreements with leading software suppliers to reduce prices for the Bolivian market in exchange for tighter IPR enforcement.

Even if most e-commerce-related prerequisites were in place, Bolivia, as many other Latin American countries, would still be facing a hurdle difficult to overcome: the scarcity of e-commerce enabled web

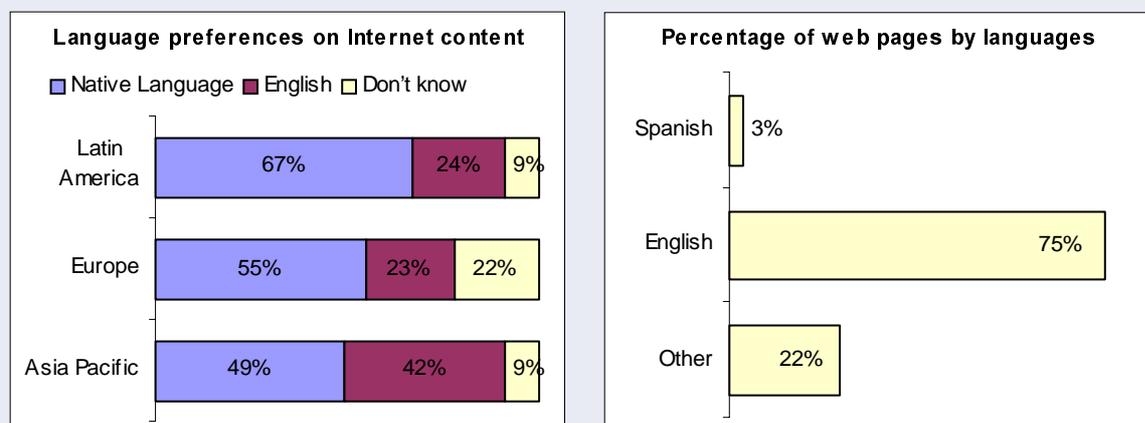
sites and a similar scarcity of local content. Although Latin American Internet users have strong preferences for web content available in their local language, web pages in Spanish still remain a small percentage of all web pages (Figure 4.5).¹⁷

Finally, it is essential that the government pay special attention to the modernization of the mail system of the country. In most developing countries inefficiency and high costs in shipping and delivery of goods has emerged as an important barrier to the development of



Figure 4.5: Trading in a foreign language

Language preferences on Internet content, by region, 1999;
and percentage of web pages by languages, 1999



Source: Adapted from IDC (right hand chart); and Terra Networks cited in ITU Americas Telecommunication Indicators 2000 (www.itu.int/ti) (left hand chart).

electronic commerce, within and beyond the border of nations. This is particularly true for small and medium size enterprises where transaction volumes do not enjoy the benefits of economies of scale. For that reason, it is important that national administrations search for mechanisms to improve the quality, cost, and efficiency of shipping and delivery services in the country. Allowing an increased participation of private sector companies and stimulating effective competition among them could improve the performance of this sector.

4.3 Health

Doctors at the Hospital Japonés in Santa Cruz are among a growing number of physicians in Bolivia that believe the Internet could allow the health sector of the country to *take the giant leap* (*dar el gran salto*). As a result they have been devoting resources to building Internet capabilities in their hospital. In doing so, they hope to improve the health ranking that Bolivia holds in the statistics tables of international organizations. For example, of the 174 countries included in the 2000

UNDP Human Development Index (HDI), Bolivia ranked 114.¹⁸ One of the key factors in the relatively poor ranking of Bolivia—besides a low per capita income of US\$ 2'269 (1998)—is the low life expectancy, 61.4 years.¹⁹ The average life expectancy for the South American continent is 69 years, while the world average is 66 years.²⁰ In developed countries like Japan, life expectancy is 80 years.

A number of problems that underlie low life expectancy rate are related to preventable diseases. Of the 52 million deaths that occurred worldwide during 1996, over 40 million of them occurred in the developing world. More than 12 million were children under the age of five, most of which died of preventable causes (see Box 4.4). But with one doctor per 2'564 people, only 69 per cent of the population with access to some type of health service, and limited financial and human resources, preventative programs in Bolivia are limited.²¹

In an attempt to tackle some of these problems more effectively, the government passed the Community Involvement

Box 4.4: Health in Bolivia

The number of infant deaths per 1'000 births in Bolivia in 1996 was 59, while the number of maternal mortalities in 1997 was 390.²² The major causes behind maternal deaths are often preventable problems related to limited access to family planning methods and adequate care during delivery.

The most common communicable diseases that have been reported in Bolivia include malaria, dengue fever, plague (in December 1996 with a fatality rate of 15 per cent), cholera, and yellow fever. Chronic communicable diseases like tuberculosis prevail in the country and the number of tuberculosis-related care services increased six-fold between 1993 and 1995. The leading cause of mortality, and the second highest cause of death among children are acute respiratory infections.²³ The first case of AIDS in Bolivia was reported in 1985. From 123 cases in 1996, the number of AIDS patients in 2000 increased to an estimated 100'000.²⁴ A number of the health problems of the

country are based on the fact that some 25 per cent of the population in 1999 still had no access to safe water.

Since 1989, Bolivia has reported 461 cases of yellow fever, with the most recent outbreak in 1999. Sixty-three cases were reported in 1997 and fifty-seven in 1998. The areas that were primarily affected in 1997 were Cochabamba, and Beni. In 1998 the areas were the Department of La Paz, and west counties of the Department of Santa Cruz. This indicates that the disease has been spreading southward. Vaccinations were implemented during the 1997 and 1998 outbreaks, which have resulted in a lower reporting of cases outside of Santa Cruz. However, the constant presence of the *Aedes aegypti* mosquito in Santa Cruz presents a serious risk to the urbanization of yellow fever. Bolivia is working with the Pan American Health Organization (PAHO) in building a strong immunization program over a period of five years.²⁵

ment Act in 1994. The Act transferred responsibility for infrastructure services from the central government to municipalities with the aim of achieving a more efficient use of resources. Municipalities are in charge of providing community services and using the revenue generated to formulate plans for social and economic development, including the improvement of health.

In 1998 the Ministry of Health and Social Welfare formulated a model for the country that defines a universal access system based on primary care. The public health system is funded from the national budget. The system has a network of services, consisting of health centres, basic hospitalization services, highly specialized consultations, hospital care, and national reference and technical support centres.

The Ministry—which is primarily in charge of the administrative and regulatory aspects of the health sector in the country—is progressively incorporating Internet services into its daily activities. Access to its web site has been available since 1996. The National Health Information System "Sistema Nacional de Información en Salud" (SNIS: www.sns.gov.bo) is an interactive database available over the

Internet that collects, compiles, and disseminates health indicators from all over the country. The system generates two monthly reports: one on epidemiology and another on the general activities of health centres throughout the country. A more sophisticated and detailed database (with disaggregated data at the level of each health institution in the country) is available on an Intranet in the Ministry of Health for consultation by authorized health professionals. The SNIS was developed with the financial support of United States Agency for International Development in collaboration with the Data for Decision Making project of Harvard University (www.hsph.harvard.edu/Organizations/ddm/country/country.html). The initiative aims at collecting and distributing national health information over the Internet. Officials in charge of the project are looking at the potential of providing some sort of Internet access to most health sites across the country.

As of mid-2000, efforts in the Ministry were being devoted to the establishment of a local area network (LAN) in its main headquarters. The LAN will extend Internet access currently provided through three dial-up connec-

tions. By the end of the year, the 70 employees working at headquarters are expected to have access to some 50 PCs. Progress in this area is slow, mainly due to the scarcity of financial and human resources—there are only two IT professionals. The Ministry has some 12'000 employees throughout the country, most of which do not have access to PCs or the Internet.

Government Internet health informatics initiatives are complemented by a number of initiatives by non-governmental organizations (NGOs) and the private sector. Some of the leading private universities, clinics, and hospitals in the country have been quite aggressive in incorporating Internet into their service delivery mechanisms. An interesting aspect of this development is that some of the most active players are located in the interior of the country, in places like Santa Cruz and Cochabamba.

In Santa Cruz, for example, the Hospital Japonés is one of the few institutions in the country that has fully embraced the Internet for carrying out a number of its activities. The hospital not only trains medical students in the practice of medicine but also in computer science and communications. Medical students practicing at the hospital are required to take a number of Internet-related courses. After graduation new doctors that

move to health institutions in other parts of the country, can maintain close contact with professionals at the hospital through the Internet. Consultation in difficult cases can be provided over the Internet by specialists at the hospital. The hospital has also moved part of its educational program to the Internet to supply training to professionals located outside of Santa Cruz. The hospital has staff capable of providing the institution with most of its Internet services and products (such as web page development).

In Cochabamba, the Instituto de Investigación e Informática Aplicada (IIIA) of the UCB has been successful in implementing cooperation agreements with foreign counterparts to develop and implement a number of health related initiatives (see Box 4.5).

NGOs with a mission in the health sector are also moving part of their services to the web. For example, Marie Stopes International—a European NGO devoted to reproductive health—set up a Health Center in Santa Cruz in 1994 (in collaboration with the local Public Health Unit).²⁷ The Center provides services related to reproductive health to more than 1'700 patients a month. In 1997 the Center provided services to less than 7'000 people during the year, while in 2000 they are expecting to serve some 32'000 patients a year. The NGO

Box 4.5: Health on the Bolivian Net

In cooperation with the University Hospital of Geneva, and the Centre for Informatics of the University of Geneva, Switzerland, the Instituto de Investigación e Informática Aplicada (IIIA) is currently involved in projects of applied research, such as MELANIE, and others aimed at expanding Bolivia's access to health information, such as EXPASY.

MELANIE is a support system for the diagnosis of illnesses based on images. MELANIE is available in various platforms. The Spanish version for PC was fully developed in Bolivia by the IIIA. EXPASY is the most important molecular biology Web

server in the European region and has three mirror sites around the world located in Australia, Canada, and Taiwan. As of early 2000 IIIA was in the process of migrating the site to a Linux platform to set up a fourth mirror site in Cochabamba, Bolivia (expasy.ucbcba.edu.bo).

IIIA is also involved in the adaptation of medical software, such as Osiris, for distribution in the local market. Osiris is a software package aimed at the analysis and manipulation of medical images to aid diagnosis. The software allows doctors to manage, measure, visualize in 3D, zoom in, and archive medical images of various types.²⁶

Source: Universidad Católica Boliviana, Instituto de Investigación e Informática Aplicada (www.ucbcba.edu.bo).

Box 4.6: For free on the web

Selected examples of medical services available for free on the Internet, 2000

The Familial Cancer Database, for example, is a medical resource that is available for free to physician all over the world. The system has been developed as a stand-alone interactive computer program with the intention to assist doctors in making a genetic differential diagnosis in cancer patients. The program tries to match tumor and non-tumor features observed in patients and their families with any of the more than 300 disorders presently contained in the database and to provide a clinical synopsis for each of these disorders. The database is updated on a regular basis.²⁸

A similar resource in this area is the "Your Cancer Risk" web site provided by Harvard University that, based on an interactive system, allows us-

ers to calculate cancer risk of various sorts at no charge.²⁹

Some health professionals in the country are not only benefiting from the Internet as consumers of free medical and health information but have also become providers of local content through sites on the web that grant space and net resources to create and store web pages at no cost. Dr. Andres Zapata, a doctor at the Hospital Japones in Santa Cruz, for example, has built a site (<http://medicina.cjb.net>) with information on internal medicine and intensive care issues, using the free service of Xoom.com which offers free unlimited web space, free email accounts, and the use of HTML-free Easy Page Builder 2.0.

has set up a presence on the web but, as is the case with most health-related organizations in Bolivia, web services are at this time limited to information about the organization, its activities, and the possibility of contacting the institution through email.

Religious organizations and Catholic churches are also using the web to provide health education for their followers. That is the case of Centro de Educación Especial San Francisco de Asis, (www.bolivianet.com/educacion-especial/index.html) run by Father Mottola in the city of Tarija.

As the case with e-commerce sites, health sites in the country are growing but suffer from unstable connections. Several of the sites, including Centro Medico del Dolor de Espalda in Santa Cruz (www.cemde.com.bo) and Próvida Bolivia (www.geocities.com/Eureka/5156/index.html) are either not available or have "broken links".

4.4 Government

The adoption of Information and Communication Technology (ICT) by the Bolivian government is hampered—as in many other developing countries—by the high cost of both hardware and software. Some of these costs, such as hardware, are difficult to overcome, other than through subsidized or do-

nated equipment. There are a wider range of alternatives for reducing other costs, such as software and communication services. A number of governments around the world are adopting open software systems to avoid the high costs associated with proprietary systems and to become less reliant on a few foreign software providers. Despite the limitations imposed by the relatively high costs of info-communication components for the public administration of a poor country such as Bolivia, the government has managed to overcome some of the barriers through a number of creative—and legal—solutions. These initiatives are not based on official policy but are pursued on an ad-hoc basis, for small projects, at a grass roots level (Box 4.7).³⁰ Both bottom up and more formal approaches are leading to a growing number of government offices and institutions on the web (see Table 4.4).

Despite the growing number of government web sites, most still suffer from a lack of interactivity. Many are currently designed as broadcasting vehicles through which government offices provide information about the institution itself with perhaps access to selected documents of the institution. Several of the sites offer e-mail contact. Although this may be seen as a rather limited use of the Internet,

Box 4.7: Overcoming scarce resources

The Bolivian Accreditation Organization "Organismo Boliviano de Acreditación" (OBA), is a unit of the Vice-Ministry of Internal Industry and Commerce, whose main activity is to certify national companies based on international standards. OBA is an example of ingenuity overcoming resource limitations in order to establish Internet presence. With a limited annual budget and a small number of staff devoted to information and communications related activities, the entity suffers from a scarcity of resources. Although OBA has been successful in installing a number of PCs in its premises, it lacks the financial resources to connect the computers to the Internet. In a rather "Internetish" type of approach (i.e., "shared and free") staff of OBA have

convinced their counterparts in the Cochabamba Chamber of Commerce to host their web site for free (www.camind.com/oba/welcome.html). OBA uses popular free electronic mail and discussion list services to contact counterparts. OBA has also convinced a private business to let it use their Internet account for free during early morning and lunch periods. Most of these initiatives were not spearheaded by some high-level committee but by Nicolas Molina, an OBA Technical Assistant, according to whom there is talk about big projects in Bolivia but what the country really needs are fast, concrete results. The government should be more imaginative and people more action-oriented, adding "We do what we can do with what we have."

it is a considerable step forward for a nation where citizens often have to travel hours or sometimes even days to obtain basic public information.

The legislative branch is arguably further ahead than the executive in promoting e-government. The National Congress web site provides citizens access to a large volume of information related to laws, status of particular bills, news, and other information. There are links to the Library of Congress and to the Historical Archive of Congress, both of which provide a number of services to both internal users and the general public. The site also opens a door for citizens to express their views and send proposals and complaints to the Congress as well as specific senators. The latter is possible through the publication of e-mail addresses of all representatives as well as other contact information for their offices. The site also takes Bolivian youth into account by providing an area with educational information and an easy way for children visiting the site to send letters to Congress.

In spite of the progress achieved by a number of government agencies, there are a few notable online absences, such as the Ministry of Education. The Ministry is working on a plan to incorporate the Internet into its daily activities and services. There is an initiative to link up all educational institutions to an Intranet of the Ministry through which a number of

services—such as the free online retrieval and printing of books and other educational material—would be provided to teachers and students in schools throughout the country. Yet, for the time being, the Ministry has been rather slow at embracing the Internet as a tool for development.

The fact that the Internet has not yet become an important component of the development equation among high government officials is reflected in the fact that the highest representative of the communication sector within the government is the Direction of Communication, under the jurisdiction of the Viceministry of Transport, Communications, and Civil Aviation, who, in turn, is dependent on the Ministry of Economic Development. A number of other developing countries are instead in the process of raising the status of their communication and information technology agencies within the government to the status of Ministries and have attempted to articulate broad national policies that place the Internet at the driver's seat of their development plans. The "Connectivity Agenda" program of the Colombian government is probably one of the most notable examples in this regard.³¹

Although there is still much work to be done to bring government to the Internet, the Bolivian public administration has nevertheless taken some valuable first steps in this direction.

Table 4.4: Bolivian government web sites

June 2000

| Government office | Web site |
|---|--|
| <i>Congreso Nacional</i> [National Congress] | www.congreso.gov.bo |
| <i>Vicepresidencia de la República</i> [Vice Presidency of the Republic] | www.vicepres.gov.bo |
| <i>Ministerio de Capitalización</i> [Ministry of Capitalization] | www.bizinfont.com/bolivia-pensions |
| <i>Ministerio de Desarrollo Económico</i> [Ministry of Economic Development] | www.desarrollo.gov.bo |
| <i>Viceministerio de Energía e Hidrocarburos (VMEH)</i> [Vice Ministry of Energy and Hydrocarbons] | www.energia.gov.bo |
| <i>Ministerio de Relaciones Exteriores y Culto</i> [Ministry of External Relations and Worship] | www.rree.gov.bo |
| <i>Ministerio de Comercio Exterior e Inversión</i> [Ministry of External Trade and Investment] | www.mcei.gov.bo |
| <i>Ministerio de Información Gubernamental</i> [Ministry of Governmental Information] | www.comunica.gov.bo |
| <i>Ministerio de Salud y Previsión Social</i> [Ministry of Health and Social Provision] | www.sns.gov.bo |
| <i>Ministerio de Gobierno</i> [Ministry of Interior] | www.mi.gov.bo |
| <i>Vice ministerio de Defensa Social</i> [Vice Ministry of Social Defence] | www.kolla.net/defsoc |
| <i>Ministerio de Desarrollo Sostenible y Planificación (MDSP)</i> [Ministry of Sustainable Development and Planning] | www.rds.org.bo |
| <i>Viceministerio de Planificación Estratégica y Participación Popular</i> [Vice Ministry of Strategic Planning and Popular Participation] | www.vppfm.gov.bo |
| <i>Servicio Nacional de Impuestos Internos (SNII)</i> [National Service of Internal Taxes] | www.snii.gov.bo |
| <i>Instituto Nacional de Estadística (INE)</i> [National Institute of Statistics] | www.ine.gov.bo |
| <i>Superintendencia Agraria</i> [Agricultural Superintendence] | www.si-a.org |
| <i>Superintendencia de Hidrocarburos</i> [Superintendence of Hydrocarbons] | www.superhid.gov.bo |
| <i>Superintendencia de Bancos y Entidades Financieras</i> [Superintendence of Banks and Financial Companies] | www.superbancos-bo.org |
| <i>Superintendencia de Pensiones, Valores y Seguros (SPVS)</i> [Superintendence of Pensions, Securities and Insurances] | www.spvs.org |
| <i>Banco Central de Bolivia</i> [Central Bank of Bolivia] | www.bcb.gov.bo |
| <i>Contraloría General de la República (CGR)</i> [General Comptroller of the Republic] | www.cgr.gov.bo |
| <i>Corte Nacional Electoral</i> [National Electoral Court] | www.bolivian.com/cne |
| <i>Vice ministerio de Educación Superior Ciencia y Tecnología</i> [Vice ministry of Higher Scientific Education and Technology] | www.viceminedu.org |

Source: ITU adapted from www.gksoft.com/govt/en/ug.html.

The online availability of public agencies such as the National Institute of Statistics (www.ine.gov.bo) constitutes an important window to the world providing a wealth of statistical information on the country. That in-

formation will certainly help to make Bolivia better known in the international community and will allow investors and visitors to take more informed decisions about the possibilities that the country offers.

The Bolivian government, however, has yet to become fully aware that emerging information and communication technologies, such as the Internet, are key development tools that cut across all segments of the national economy and society. Lack of attention to the potential offered by this new technology to fight poverty and enhance economic development might increase the internal and external knowledge and wealth gap and leave the country in an even more difficult situation than what it faces at the turn of the century.

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- ¹ The literacy rate is the percentage of population over the age of 15 who can read or write a language. During 1998 the illiteracy rates for males and females stood at 9 per cent and 22 per cent respectively compared to 1990 figures of 13 per cent and 30 per cent. The difference between male and female adult literacy rates fell from 25 per cent in 1970 to 14 per cent in 1998. See the World Bank's "Bolivia at a Glance." Available at: www.worldbank.org/data/countrydata/aag/bol_aag.pdf,
 - ² World average public expenditure on education between 1995-97 was 4.8 per cent of GDP, and the average for Latin America and the Caribbean was 4.5 per cent. See UNDP. *Human Development Report 2000*. Available at www.undp.org.
 - ³ Net primary enrolment ratio is the ratio of the number of children of official school age (as defined by the education system) enrolled in school to the number of children of official school age in the population.
 - ⁴ While Bolivian law prohibits the employment of children under the age of 18 in "dangerous, unhealthy, or immoral work", and schooling is "compulsory" until the age of 13, the labour code is rather ambiguous and does not mention the conditions of employment of children between the ages of 14 and 17. To complicate things even further, the law permits the apprenticeship of children between these ages, which conflicts with school attendance. Children and teenagers are generally paid less than a third of what an adult would earn. See Gabriela Inchauste. "Educational Choices and Educational Constraints: Evidence from Bolivia." *IMF Working Paper*. March 2000.
 - ⁵ In 1995, VESCYT and the National Institute of Statistics (INE) launched a joint project to collect data and to build a database with a range of indicators on national private universities and technical institutes. Data was collected since 1996 and updated periodically in the server that VESCYT has allocated for that purpose. In 1999 an initiative emerged to make the database and all its information available over the Internet to interested users.
 - ⁶ The availability of this information in a standardized format and accessible from any location in the country is of great importance at this time in which a number of new private universities are being set up. Lack of access to detail and precise information on the requirements to open a private educational institution and subsequent mistakes in the process of doing so, led in 1998 to the closing of three private Universities that had not fulfilled the pre-requisites to officially open to the public.
 - ⁷ The UCB has access to e-mail since 1992 through BolNet. In September 1996, the first direct 64 Kbps line was installed at the La Paz campus. By May 2000, UCB Internet access speed had reached 256 Kbps in La Paz, 128 Kbps in Santa Cruz and Cochabamba, and 64 Kbps in Tarija. To enhance its communication capabilities, the UCB is planning to deploy a fibre optic network connecting the main buildings at its campus in Cochabamba.
 - ⁸ UCB and NUR are in the process of developing a "virtual university" in the case of UCB and a "distant interactive classroom" in the case of NUR.
 - ⁹ Seven large countries accounted for 96 per cent of the US\$ 194 million in online spending in Latin America in 1999. Remaining countries in the region, including Bolivia, accounted for US\$ 8 million. See Jupiter. "Low PC Penetration, Low Credit Card Usage and Infrastructure Hinder Latin American Internet Markets." *Press Release*. 15 February 2000. Miami, Florida. www.jup.com/company/pressrelease.jsp?doc=pr000215.

- ¹⁰ There are around 10'000 members of the Bolivian Institute of Small Industry and Artisans (INBOPIA) [which includes handicraft manufacturers. This institute estimates that many of its members will avail themselves of INBOPIA's computerized export system.
- ¹¹ See Steve Kemper. "Madidi National Park." *National Geographic*. March 2000.
www.nationalgeographic.com/media/ngm/0003/index.html.
- ¹² All links in the site are working, there are no "email-only" or "under construction" sites.
- ¹³ CEPAL. *Anuario estadístico de América Latina y el Caribe*. Edición 1999. Santiago, Chile.
www.cepal.org/espanol/Publicaciones/anu99/anu99.htm
- ¹⁴ See VISA web site at www.visalatam.com/e_media/stats/bol.lhtml
- ¹⁵ A relevant side issue is that many Bolivian companies prefer the word "Bolivia" in their URL rather than using the .bo TLD. Even the CNC is changing over to a web site called www.boliviacomercio.org. Another mitigating factor is that generic domain names are cheaper to obtain than the national .bo TLD.
- ¹⁶ According to the United States Software & Information Industry Association (SIIA), 87 per cent of software used in Bolivia in 1998 was pirated. While this seems high, in absolute terms it amounted to under US\$ 5 million (less than 0.5 per cent of the total for Latin America (and more than 500 times less than the United States). See SIIA. *1999 Global Software Piracy Report*. May 1999. Available on the SIIA web site at: www.sii.net/piracy/pubs/99g.asp.
- ¹⁷ Spanish speaking population in the world stands at 332 millions, while English speakers amount to 430 million.
- ¹⁸ The HDI is a measure of development calculated by taking into consideration the life expectancy at birth, adult literacy rate, combined enrolment ratio, and adjusted per capita income in purchasing power parity – North American dollars. See UNDP *Human Development Report 2000*. Internet. Available at: www.undp.org/hdr2000/english/book/back2.pdf.
- ¹⁹ UNDP available at: www.undp.org/hdr2000/english/book/back2.pdf.
- ²⁰ The average life expectancy rates for men and women at the time of birth are 59 years and 62 years respectively. The average figures for South America are 66 years and 73 years respectively. Data for 2000 by the Population Reference Bureau indicates that only 4 per cent of the population lives over the age of 65 while the South American average is 5 per cent. The population annual growth rate since 1990 has been 2.04 per cent per annum and that for the rest of the continent is 1.7 per cent. However, the number of deaths per 1000 population (mortality rate) in Bolivia is 10 per cent as compared to the average 6 per cent for South America. Bolivia's population in 1999 was 8.1 million and it was estimated that by mid-2000 would be reaching 8.2 million people. For more detail on these indicators, see *World Health Report 2000*. World Health Organization, available at: www.who.int/whr/2000/en/statistics.htm; and *2000 World Population Data Sheet*, Population Reference Bureau, available at: www.prb.org/pubs/.
- ²¹ Bolivia. IPPF Country Profile. Internet. Available at: www.ippf.org/regions/countries/bol/.
- ²² Bolivia. Pan American Health Organization. Internet. Available at: www.paho.org/english/saha/prflbol.htm.
- ²³ *Bolivia: Basic Country Health Profiles, Summaries 1999*. Pan American Health Organization. Internet. Available at: www.paho.org/english/sha/prflbol.htm.
- ²⁴ Bolivia. IPPF Country Profile. Internet. Available at: www.ippf.org/regions/countries/bol/.
- ²⁵ *Disease outbreaks reported. Communicable Disease Surveillance and Response (CSR)*. Internet. Available at: www.who.int/disease-outbreak-news/n1999/feb/n11feb1999.html.
- ²⁶ Marie Stopes Internacional is an NGO with headquarters in London funded by voluntary contributions, the British government, and the European Community. The organization had in 2000 operations in 36 countries around the world. In Latin America is currently working in Bolivia, Haití, México, Nicaragua and Perú.
- ²⁷ For further information on these and other UCB projects, contact Dr Reynaldo Vargas Altamirano vargas@ucbcba.edu.bo or ijia@ucbcba.edu.
- ²⁸ The Familial Cancer Database is part of the *UICC Familial Cancer and Prevention Project*. More background information on the Database and its underlying software can be found in the FaCD User's Manual, which can be downloaded from www.facd.uicc.org.
- ²⁹ For more details see www.yourcancerrisk.harvard.edu.
- ³⁰ While advertised-sponsored, free Internet access has not yet reached Bolivia, there are other free services and open software initiatives that it and other developing countries can take advantage of. For example there are numerous sites around the world offering free e-mail and discussion lists (e.g., Yahoo, Hotmail, etc), free domain names (www.namezero.com) and free web hosting. Linux, the free operating system, is widely used in developing countries.
- ³¹ For more details see, Departamento de Planeacion Nacional and Ministerio de Comunicaciones, Republica de Colombia. "Agenda de Conectividad", Santa Fe de Bogota, 9 February 2000.

5. Summary & recommendations

5.1 State of the Internet in Bolivia

The Mosaic Group (<http://mosaic.unomaha.edu/gdi.html>), has developed a framework for characterizing the state of the Internet in a nation. They consider six dimensions, each of which has five ordinal values ranging from zero (non-existent) to four (highly developed). The dimensions are as follow:

- pervasiveness: a measure based on users per capita and the degree to which non-technicians are using the Internet.
- geographic dispersion: a measure of the concentration of the Internet within a nation, from none or a single city to nationwide availability.
- sectoral absorption: a measure of the degree of utilization of the Internet in the education, commercial, health care and public sectors.

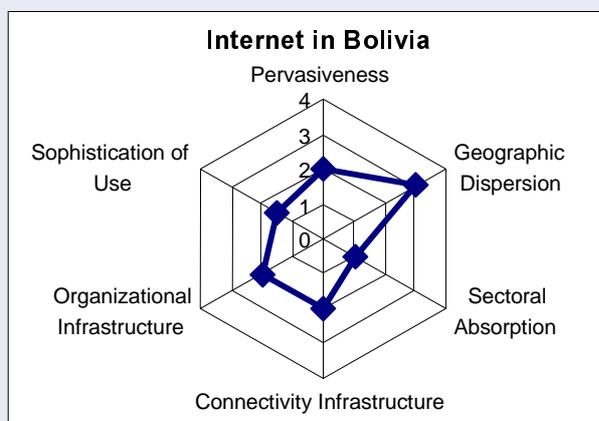
- connectivity infrastructure: a measure based on international and intranational backbone bandwidth, exchange points, and last-mile access methods.
- organizational infrastructure: a measure based on the state of the ISP industry and market conditions.
- sophistication of use: a measure characterizing usage from conventional to highly sophisticated and driving innovation.

Bolivian values for these dimensions are shown below.

Pervasiveness is rated at level 2, *Established*. There are an estimated 75,000 users out of a population of 8.3 million for a user rate of 0.9%. The Internet is growing in popularity. Cyber cafés are spreading and the growing availability of Spanish content is driving interest. Many users are exposed to the Internet through Bolivia’s extensive university system.

Figure 5.1: The Internet in Bolivia

| Dimension | Value |
|-------------------------------|-------------|
| Pervasiveness | 2 |
| Geographic Dispersion | 3 |
| Sectoral Absorption | 1 |
| Connectivity Infrastructure | 2 |
| Organizational Infrastructure | 2 |
| Sophistication of Use | 1.5 |
| TOTAL | 11.5 |



Note: The higher the value, the better. 0 = lowest, 4 = highest.
Source: ITU.

Geographic Dispersion is rated at level 3, *Highly dispersed*. The Internet is available in all nine departments of the country. The degree of dispersion is reflected by the fact that there are more users in the 2nd largest city, Santa Cruz de la Sierra, than in the capital La Paz. Some ISPs provide department-wide telephone prefixes for the Internet so that all calls are charged as local even though the POP may be located in only one city. However, this system is not available in all departments. That factor, coupled with limited availability of telephone lines in rural areas, prevents a value of 4, *Nationwide*, being assigned.

Sectoral Absorption is rated at level 1, *rare*. The ranking is a function of the type of connectivity in business, government, health care and education. There is moderate connectivity at the university level but almost none at the public primary and secondary school level. Other sectors such as health, government and business have low levels of leased line use and few have their own servers.

The Connectivity Infrastructure is at level 2, *Expanded*. There is a fiber-optic link connecting the La Paz-Santa Cruz-Cochabamba corridor with spurs to submarine cables in Peru and Argentina. Remaining domestic backbone is covered by microwave. There is 12 Mbps of international links via satellite and fiber submarine cable.

There is no Internet exchange. Most access is via dial-up but demand for high-speed leased lines is growing and usage would be higher if pricing was more affordable.

The Organizational Infrastructure is at level 2, *Controlled*. There is free entry to the ISP market. ISPs must register and pay around one per cent of annual revenue to the regulatory authority. There are around ten ISPs in operation. There is limited competition in the provision of domestic infrastructure; ISPs can only resell leased lines provided by telephone companies. Outgoing international connectivity is the exclusive franchise of two carriers until November 2001. However, ISPs can provide their own incoming international links but few have availed themselves of this option.

Sophistication of Use is at level 1.5, between *Minimal and Conventional*. The most popular applications appear to be e-mail and chat; Spanish language portals such as StarMedia and Yupi are popular launching points. Businesses are increasingly using e-mail to replace fax and letters. Some universities have implemented on-line registration systems. Noteworthy government applications include the "Virtual Parliament" where users can consult laws and an electronic forum for providing input to the decision-making process. Environmental

Table 5.1: Bolivia and other countries

| | Date | P | GD | SA | CI | OI | SU | Total | Source |
|---------|-------|---|----|----|----|----|-----|-------|--------|
| Bolivia | 5-00 | 2 | 3 | 1 | 2 | 2 | 1.5 | 11.5 | |
| Chile | 12-99 | 3 | 2 | 2 | 3 | 4 | 2 | 16 | Q |
| Mexico | 12-99 | 3 | 3 | 2 | 2 | 3 | 3 | 16 | Q |

Note: **P:** Pervaseiveness, **GD:** Geographic Dispersion, **SA:** Sectoral Absorption, **CI:** Connectivity Infrastructure, **OI:** Organizational Infrastructure, **SU:** Sophistication of Use. Values range from 0 (lowest) to 4 (highest).

Source: **Q:** unvalidated questionnaire result, Press, Larry, Second Internet Diffusion Survey, *OnTheInternet*, Vol. 5, No. 6, November/December, 1999, som.csudh.edu/cis/lpress/gdiff/otidevnations.htm.

groups have extensively used the latter. One newspaper has continually evolved the sophistication of its site. But apart from isolated examples, there is not widespread sophistication of Internet use. Most web sites are static with descriptive information. E-commerce is practically non-existent, held back by a lack of digital laws and non-acceptance of credit cards for online transactions.

This framework has been applied in case and questionnaire studies in several other nations, including some in the region. The dimension values for other nations in the region are shown in table 5.1 for comparison with Bolivia.

5.2 Recommendations

5.2.1 Market Liberalization

Short-term policy options for enhancing Internet diffusion in Bolivia are constrained by the legal monopoly enjoyed by local telephone cooperatives and ENTEL. This monopoly is due to expire in November 2001. In the meantime, the government can develop policies that are not affected by the monopoly as well as lay the groundwork for when the monopoly expires. The latter will help to ensure that the day the market is open to competition, new policies can be implemented immediately. Furthermore, the government should ensure that the date for full opening of the market is kept to.

Because of the current monopoly and the likely repercussions of forthcoming full competition, recommendations that are affected by the current situation are not mentioned since they will undoubtedly be redressed by competitive market forces. For example, a recommendation to allow ISPs to provide their own national and international facilities would be unnecessary since theoretically this would be allowed once the market is open to competition. However, it would be advantageous for the government to clearly define what will be allowed in order to avoid confusion or possible legal objections.

The policies to be defined by SITTEL concerning the liberalization of the Bolivian telecommunications industry will have profound impacts on the long-term prospects for universal access to Information and Communication Technology (ICT). In a competitive market, in which new carriers may be licensed to provide all forms of telecommunications, there are likely to be a variety of new ideas and opportunities to develop for providing affordable telecommunications services in Bolivia. SITTEL should support the potential for experimentation and innovation in the market.

Some of the possible new market arrangements that could occur in a liberalized environment include:

- Joint ventures between new licensed operators and telecentre owners to provide enhanced infrastructure and services;
- A consortium of new service providers (telecentres or ISPs) applying for a license to offer national and international telephone services using VoIP, with the profits flowing back into the respective businesses;
- New Universal Service/Access Obligations for license applicants, including broadband connection of public access points (e.g., telecentres, schools, libraries, etc.) to high capacity networks and services;
- Joint ventures between telecentres, new telecom licensees, and other investors such as e-commerce entrepreneurs to offer full-service ICT access, content, and business venture options to rural communities;
- Specialized start-up companies, such as public payphone providers, ISPs, VSAT operators, etc., establishing new points of access models, with SITTEL's support (and in some cases subsidy).

These scenarios are merely ideas that could occur in the wake of an opening

of the broader market for the provision of telecommunications in Bolivia. SITTEL's liberalization policy could be structured to encourage these kinds of activities, tapping the vast potential of the unserved and under-served markets of Bolivia to create the most appealing incentives for those with ingenuity and vision to bring both economic development and social equality to all Bolivians.

5.2.2 Internet-friendly tariffs

ISP charges for Internet access in Bolivia are comparable to other countries in the region. However, local telephone usage charges must be factored into ISP pricing in Bolivia. An Internet user in La Paz would pay the ISP charge plus between US\$ 0.90-2.10 per hour for local telephone charges. At an average usage of 30 hours per month, this would add between US\$ 30-60 to the user's Internet bill. While it is true that free minutes are often bundled in with Bolivian telephone subscriptions, using them for Internet access takes away from their use for talking. Also, though COTAS in Santa Cruz charges a flat rate for local calls (US\$ 0.08), it also charges a higher fee for unlimited Internet access (US\$ 35 per month) than other ISPs.

When considering lower incomes in Bolivia than in other countries, ISP charges plus the local telephone usage charge make Internet access unaffordable for many. There are a number of strategies to lower Internet access prices.

- One is to encourage ISPs and local telephone cooperatives to share the local telephone usage charge and eliminate the ISP charge. Though telephone usage charges for Internet access have been reduced in La Paz and some other cities, the ISP charge still applies.¹
- A related strategy is to investigate why free Internet access, which is now prevalent in other Latin American countries, is not available in Bolivia. For example

Terra Networks, the pan-American ISP, offers free access in Chile and charges only US\$ 5 per month for unlimited access in Peru.

- Included in this effort should be a strategy to eliminate or change the current cooperative membership fee system, which creates an enormous barrier to widespread access to telecommunications services.

Prices for high speed lines also need review. This includes wholesale tariffs charged by ENTEL and the cooperatives for connection services provided to ISPs and public points of access (such as telecentres and schools). Specifically, with respect to the Internet market in Bolivia, tariffs for data transmission and private line services have become a point of concern. Growing use of Internet and e-mail has increased demand by many small businesses and individual customers for high speed data transmission. Therefore, the availability, quality, and especially price of these data services, now has a direct and important impact on an increasing number of regular customers, as opposed to the few large corporations that traditionally used private line and data services. In particular, ISPs must purchase high capacity links between their computers and the Internet backbone to provide access to the global Internet as well as resell high speed lines provided by the telephone companies. The price that ISPs pay to telephone operators for these data circuits will directly affect the price that end users must pay for Internet services. This fact, and the general importance of data communication in today's international economy, underscores the importance of competitive pricing for private line and data services.

5.2.3 Universal Access

Bolivia does not presently have a specific policy for universal Internet access. This is a major policy vacuum since the majority of Bolivians cannot afford individual Internet access

or a personal computer needed to access the Internet. A policy promoting shared Internet access from public locations should be developed. This would also have the ancillary benefit of providing a community setting where training could be available, an important factor if the Internet is to be used successfully.

Though there are a growing number of cyber cafés in the country, most are located in the largest cities and cater primarily to foreigners and students. Also they are relatively expensive.

- As a first step towards promoting affordable access at community locations, the Bolivian government should require telecom providers and ISPs to provide discounts for community access points such as schools and libraries.
- Another way of enhancing mass access is to encourage public Internet access franchises. For example, ENTEL might be encouraged to expand its *punto Entel* telecommunication centres into underserved areas.²
- Another possibility is to encourage telecom operators, ISPs and organizations with a large network of offices such as banks or the post office to work together to provide Internet access.

5.2.4 Making Internet a top policy issue

It is important that the Bolivian government embrace the Internet and the development of ICT as a top item on the policy agenda. As discussed throughout this report, the government has a crucial role in promoting and supporting these strategies. It should be involved in the development and implementation of policies that facilitate the increased use of the internet in various areas, such as education, health, e-commerce, etc. Concrete proposals are identified in the recommendations on e-government.

5.2.5 e-commerce

While Bolivia is making progress towards e-commerce, the pace is slow. Given that e-commerce is set on a path of no return, it is important that Bolivia develop adequate policies so as not miss out on the benefits. In this regard, given the global nature of e-commerce, it would be wise to articulate national policies that are synchronized with main global trends and standards, so as not to discourage potential overseas investors or consumers. The following recommendations could help to accelerate the process of e-commerce development:

- *Government leadership:* The government needs to get behind e-commerce to give it badly needed authority, confidence and awareness. There are four major areas where it could help:
 - a. Accelerate the development of e-commerce relevant legislation. In particular, this includes areas related to digital signatures and contracts, intellectual property, taxation, encryption, privacy, network security and computer crime, liability, and consumer protection.
 - b. Support visible Government-to-Business projects such as electronic payment of taxes, custom's duties, public procurement, etc.
 - c. Develop Government-to-Consumer applications such as agricultural trading markets that are relevant to a significant part of the Bolivian society.
 - d. Legitimize and consolidate the numerous business and trade directories that currently exist for the country.
- *National coordination:* Cohesion and coordination is needed to unify the various e-commerce

initiatives taking place nationwide. The Bolivian e-commerce task force that has been having meetings should be formally recognized and a web site established with links to relevant information, projects and partners. This task force should also be involved with the wider high level task force on the digital economy (see the e-government section for further comments and possible goals and activities of such a task force).

- *Awareness raising and education:* The government should reinforce those activities of the local Chambers of Commerce related to the provision of ICT knowledge and support for business. This includes raising awareness among the business community of the potential of ICT for their firms. In this regard, the diffusion of successful e-business models, development of pilot projects, and a toolkit on how to set up an e-business will help to improve the prospects for e-commerce development in the country.
- *Credit and pre-paid cards:* Make the necessary legislative and institutional reforms to enable credit card payments over Bolivian web sites. Given the limited availability of credit cards in the country, it is worth exploring the possibility of developing—through an alliance of private and public sector interests—the use of e-commerce pre-paid cards (a concept similar to the successful model used in cellular mobile services).
- *Micro-loans:* Small-scale services and products can often more adequately meet local needs but are unable to attract capital because of the small sums required. Given the scarcity of venture capital available in Bolivia to local small and medium size entrepreneurs with e-commerce initiatives, the government and local financial institutions might consider the

possibility of micro-credits for specific e-commerce initiatives.³

- *Shipping and delivery:* Inefficient shipping and delivery of goods often undermine the competitiveness of small and medium size companies in developing countries. Given its land-locked territory, Bolivia probably suffers more than other low-income nations from this barrier. For that reason, it is important to pay special attention to this logistical aspect of trading. One action to improve the situation could be to promote cooperation among e-commerce companies to achieve economies of scale in the delivery of their products. Furthermore, it is important to seek lower costs and increased efficiency among shipping and transport companies by allowing increased competition in this sector.
- *Local content:* Support, through special tax and credit incentives, the development of local web sites in economic sectors in which Bolivia has competitive advantages, such as mining, agriculture, tourism, etc. The production of local content and a national e-commerce sector could be enhanced by establishing incubators in geographical areas with the adequate conditions and with the cooperation of research and development units of private sector, universities, and public institutions.

5.2.6 e-government

Experience around the world has shown that the rapid diffusion of ICT in a country is often closely associated with the level of government support. In the case of Bolivia, the expansion of Internet infrastructure and services could speed up significantly through a national program supported at the highest level of government. The following recommendations outline the role of government in this area:

- *Digital Economy Task Force:* Provide support for ICT at the highest level of government and

establish a National Task Force headed by the President of Bolivia and composed of well-respected individuals in the country. The Task Force would serve as the focal point for the high-level coordination of a number of national initiatives, such as:

- a) Track the development of the digital economy in the country, through the establishment of a *Digital Economy Observatory* to identify points of strength and weakness, and supply possible solutions to the problems and ways of enhancing the existing strengths. A framework for the periodic measurement and evaluation of progress could be developed in association with this initiative.⁴ A web site should be established providing information on the range of programs, opportunities, and experiences related with the usage of Internet in various aspects of the life of Bolivian citizens;
- b) Coordinate activities of the various sectors of society involved in the deployment and use of ICT. Improved coordination of isolated initiatives would allow the development of national policies and programs to enjoy economies of scale, avoid wasteful duplication and enhance the deployment of ICT infrastructure and services in the country;
- c) Serve as an advisory board to the President on the various policy issues related to the ICT revolution;
- d) Organize awareness seminars on the potential of the digital economy to showcase success stories—in education, health, busi-

nesses, and public service—identify challenges, and take stock of progress. The initiative could serve as a high-profile mechanism that would attract the attention of the national press, academia, and other key players nationwide;

- e) Establish and promote a well-developed e-government site. This should build on existing sites developed by various ministries and state organizations by providing appropriate links and more consistency. It should also include the expansion, through public access points to the Internet, of the availability of government information to the general public. The same mechanisms could increasingly serve as an avenue to augment the electronic interaction of public servants with Bolivian citizens. An existing example is the electronic parliament.⁵

- *Higher profile for ICT:* To reinforce the importance of the digital opportunity it might be useful to establish a cabinet-level ministry with overall responsibility for digital opportunity issues. With such institutional arrangements in place, the government could seek to establish coherent, multi-dimensional, and forward-looking national strategies that transcend the vested interests and perspectives of any one ministry.⁶
- *Government as a user:* Governments should lead by example through intensive usage of ICT to carry out its public service functions. Government as an active ICT user would simultaneously increase its own efficiency and demonstrate the gains that can be realized through new information and communication technology. Some areas in which the Bolivian government can pursue this leadership function are through:

- a) The establishment of a transparent electronic procurement system available to all interested parties on the Internet;
- b) The deployment of intranets and networked team practices aiming at the assimilation of modern work practices typical of networked learning organizations;
- c) The use of ICT, in particular the Internet, in public services that still depend heavily on government management and policy making—such as public health, education, employment, transportation, and energy.

5.2.7 e-education

Education is a critical component for successful Internet adaptation and use. Bolivia might want to consider some of the following strategies to enhance the performance of the country's education sector, and prepare its population for becoming an Information Society:

- *Teaching teachers:* Experience around the world has shown that progress in the area of ICT will be limited if teachers are unaware of or reluctant to accept information technology as an educational tool. The resistance to embrace ICT in the classroom is often rooted in a lack of knowledge of the technology and its possibilities. In Bolivia, there is not yet a national program to train teachers in the use of ICT for education. This can become a significant bottleneck in preparing the population for the information age. It is essential that public and private institutions establish a national program to familiarize teachers at all educational levels with basic knowledge about and the potential of ICT.
- *Moving education to the Web:* Distance education has great

potential for countries with limited resources and significant rural areas such as Bolivia. There is a need to provide further support to projects like CINE and other national initiatives aimed at building knowledge and experience in the provision of education over the Internet.⁷

- *Curricula:* Until recently most Latin American countries, including Bolivia, had—due to their long-standing European tradition in education—placed considerable attention and resources on non-technical training. Given the central role that technology plays in the generation of wealth today, ICT training and applications should be integrated into every stage of the educational process, e.g., primary and secondary school, higher education, and vocational training and become part of the national curriculum.
- *Wiring education:* Many governments have recognized the value of ICT in education and are devoting considerable resources to wiring schools and connecting them to the Internet. Bolivia is lagging behind in this regard. It would be a step in the right direction if the country brought the connecting of schools to the Internet to the forefront of the public agenda.⁸ This commitment could include concrete deployment goals per annum.
- *Overcoming the high cost of services:* The cost of communication services is quite high for most school and university budgets. There is no formal requirement to provide low-cost communication access for the educational sector and few of the telecommunication companies in Bolivia have special pricing or discount plans for educational institutions and users. The government should seek to implement mechanisms to promote the delivery of communication services at low cost to educational institutions nationwide. These could

include special tax consideration for telecommunication carriers, direct subsidies to schools in the take off period, and other schemes such as *adopt a school* programs that could be promoted among international organizations.⁹

- *Attracting international assistance:* Government, local private sector, and civil society organizations should seek the support of the international business community to fund programs to provide technology tools (such as new and recycled computers, software applications, books and other instructional materials, etc) and state-of-the-art knowledge on information and communication technologies and applications.¹⁰ On this latter issue, CISCO, the Internet equipment manufacturer has worked with UNDP to establish Network Training Academies in a number of developing countries. In the case of Bolivia, NUR University in Santa Cruz, has recently signed an agreement with CISCO to set up a Networking Local Academy.

5.2.8 e-health

The health sector in Bolivia—as in most other parts of the world—lags behind other sectors in the country in adopting ICT. Much of this slow pace in the adoption of new information and communication technologies to carry on activities and provide services is associated with a lack of awareness among the medical community of the cost/benefit relation that underlies the adoption of new technologies like the Internet. For that reason it is advisable that the following measures be considered:

- Develop an awareness campaign to highlight with precise data to the health sector, the cost and benefit relation if technologies like the Internet are adopted;
- Launch a yearly seminar on “Telemedicine in Bolivia” or “Telemedicine in the Andean region”, where experiences are pre-

sented and opportunities offered by new communication technologies are discussed;¹¹

- The government should be a leader in the adoption of new technologies for the health sector. In the management of health information, the national administration has a great opportunity to set up a show-case on the benefits of the Internet;¹²
- Identify, at the international level, the institutions that are currently providing support (through soft, long term loans, and philanthropic projects) for the advancement of telemedicine in developing nations and solicit their support for the implementation of specific pilot projects in the country;
- Incorporate health-related functions, applications, and links to the Internet-connected telecenters that are being created throughout the country. Promote such opportunities among the local health community.

5.2.9 Internet traffic exchange

Perhaps the major operating cost of providing Internet access is infrastructure connectivity to both national and international backbones. In this respect, the government might want to consider three issues:

- Competition in the provision of domestic and international connectivity should be promoted. The government might consider “buying out” the current exclusivity of ENTEL and TELEDATA to provide outgoing international connectivity;
- One factor that adds to the expense of international connectivity is the fact that countries must pay for the full cost of a circuit to the United States. The Bolivian government might want to consider participation in forums debating this issue to promote the development of a more equitable international Internet pricing structure;

- Domestic Internet traffic (e.g., an email sent from one user in Bolivia to another) is currently being routed to other countries, adding to the cost of international connectivity. This is due to the lack of a national traffic exchange. While national traffic is currently low, it will increase. Therefore, the government should encourage the development of a national traffic exchange.¹³

5.2.10 Technology neutral regulation

The current focus of specifically describing each communication infrastructure and service has found the government in the awkward position of micro-defining regulations. Considering the rapid evolution of the Internet, the convergence of voice, data and broadcasting, and the variety of applications, which are likely to emerge from it—many of which are unknown today—it would be advisable for the government to adopt technology neutral regulations, which do not address specific techniques but rather general issues. For example, once the voice market is open to competition, it should be of no concern to the regulator whether the service is provided by circuit-switched or packet-switched technology.

5.2.11 Mobile Internet

The recently adopted ITU IMT-2000 recommendation means that for the first time there is an international standard for mobile telephony. IMT-

2000 will, among other things, provide for high-speed Internet access from mobile phones. Considering the success of mobile in Bolivia, the government should carefully follow the development of IMT-2000 around the world, including the issue of licenses and technology, as mobile Internet could provide a leading way for Bolivian consumers to access the Internet. In this regard, the government should begin developing plans for licensing this new technology, including a timetable and milestones.

5.2.12 Market research

There is very little publicly available information on the spread and usage of information technology in Bolivia. Unlike other countries, neither the national statistical institute nor market research firms in Bolivia compile this kind of information. SITTEL has made a start in this direction by collecting telecommunication statistics as well as the number of Internet subscribers. This needs to be expanded and developed into a system capable of disseminating regular reports. The information generated is invaluable for designing policies and monitoring the development of the Internet in the country. A national task force, under the guidance of SITTEL and including the national statistical institute, relevant government ministries (e.g., health and education) and market research institutes, should be created to oversee this project. This task force might be integrated with the Digital Economy Observatory described earlier.

- ¹ Alternatively, local dial-up charges might be reduced, eliminated or charged on a flat-rate system such as exists in the city of Santa Cruz.
- ² A relevant example comes from Chile, where the fund used to finance rural telephony has been expanded to include the installation of community Internet telecentres. www.subtel.cl/noticias/acceso-internet.htm
- ³ Experiences of the Grammeen Bank in Bangladesh would be relevant.
- ⁴ The United Nations and the Inter-American Development Bank are working towards the creation of regional observatories on the digital economy – funding might be available from them to develop a national institution of this nature.
- ⁵ See the Singapore e-citizen site <http://www.ecitizen.gov.sg> which could be used as an example.
- ⁶ The United Kingdom, for example, has created a number of posts or transformed existing ones to grant high relevance to the adoption of information and communication technology in their daily activities and public services. There is, for example, a e-Government Minister, a e-Envoy, and a Director of e-Government. Detailed information about their functions, tasks, and other related matters can be found at www.e-envoy.gov.uk, www.citu.gov.uk, and www.cabinet-office.gov.uk. Another example is Singapore, which has an e-commerce web site at www.ec.gov.sg.
- ⁷ In February 2000 the Department of Education (government of Bolivia), in cooperation with the Department of Informatics and the Department of Exact Sciences of the Universidad Católica Boliviana (with the financial support of the Arnoldo Schwimmer Foundation), launched project CINE (Centro de Informática Educativa). The aim of the initiative is to produce educational software and complementary material to enhance the use and knowledge of information and communication technology in the Bolivian educational system.
- ⁸ The Bolivian government should also become involved in multilateral e-programs, such as the The World Bank's WorLD project (www.worldbank.org/worldlinks) aimed at providing computers and Internet access in schools of low and low-middle income nations. WorLD has projects with secondary schools in most of Bolivia's neighbours—including Brazil, Chile, Peru and Paraguay—but no project with Bolivia itself.
- ⁹ For example, the United States 'e-Rate' program provides discounts of between 20-90% for telecom and Internet access. See www.sl.universalservice.org/apply/step1.asp#step1a." At just three years of existence the e-rate program has been qualified as a definitive success. The federal government's E-rate program is fulfilling its aims, helping to close the digital divide, and improving education standards across the country, according to a new report from the Education and Library Networks Coalition (EdLiNC). The E-rate program provides schools and libraries with \$2.25 billion in annual funding for affordable access to the Internet. The program has already helped wire some 46 U.S. communities and has encouraged parents in these communities to become more technologically adept, according to the report. 'The report released today by EDLiNC is another confirmation that the E-rate program is a very powerful tool in leveling the playing field for everyone in our country, regardless of economic or geographic background,' said FCC Chairman William Kennard." (Newsbytes, 2000 July 10)
- ¹⁰ There are numerous examples from other countries of these kinds of initiatives. For example there is a program on a Caribbean island through which donated used computers from North America are distributed to local schools.
- ¹¹ Currently in Bolivia there are some interesting and innovative projects in the health area that could be replicated in several other places in the country that are little known by the wider national health community. In Cochabamba, for example, the Instituto de Investigación e Informática Aplicada (IIIA) of the UCB (www.ucbcbba.edu.bo) has been quite successful in implementing cooperation agreements with foreign counterparts to develop and implement locally a number of health related initiatives. In Santa Cruz the Hospital Japonés (www.hospitaljapones.org.bo) is very active in the adoption of the Internet for their services to the local community.
- ¹² Internet could lead to significant savings in the current high expenses that the government incurs in telecommunications and post (telephone, fax, and regular mail) to collect, process, and distribute health information across the country. Those savings are the most genuine source of finance to cover the cost of setting up, maintaining, and expanding an-Internet based health communication system throughout the country.
- ¹³ If necessary, this might be mandated like in Chile (www.subtel.cl/noticias/dicacion-nt.htm). International assistance might also help; the OAS helped establish a national traffic exchange in Panama.

List of meetings

15 May 2000

08:30 - 09:30 Viceministerio de Comunicaciones, Transportes y Aeronáutica Civil.
09:30 - 10:30 Viceministerio de Educación
11:00 - 12:00 Viceministerio de Industria y Comercio
14:30 - 15:30 Viceministerio de Salud
15:30 - 16:30 Empresa Nacional de Correos

16 May 2000

08:30 - 09:30 Empresa Nacional de Estadísticas
09:30 - 10:30 Cámara Nacional de Comercio
11:00 - 12:00 Cámara Nacional de Industria
14:30 - 15:30 Universidad Mayor de San Andrés
15:30 - 16:30 Universidad Católica Boliviana

17 May 2000

08:30 - 10:00 Cooperativa de Teléfonos La Paz (COTEL)
10:00 - 11:30 Cooperativa de Telecomunicaciones Cochabamba (COMTECO)
14:30 - 16:00 Cooperativa de Telecomunicaciones Santa Cruz (COTAS)
16:00 - 17:30 ENTEL S.A. (Larga Distancia y Entelnet)

18 May 2000

08:30 - 10:00 BOLNET
10:00 - 11:30 TELECEL S.A.
11:00 - 12:00 MEGALINK
14:30 - 16:00 UNETE.COM DE BOLIVIA

19 May 2000

08:30 - 09:30 SOCIEDAD DE INGENIEROS DE BOLIVIA
09:30 - 10:30 ACADEMIA NACIONAL DE CIENCIAS
10:30 - 11:30 COLEGIO DE INGENIEROS ELECTRONICOS
14:30 - 15:30 SISTECO
15:30 - 16:30 IBM

Acronyms and abbreviations

| | |
|------------------------|--|
| Boliviano (Bs.) | The currency used in Bolivia. At 30 June 2000, one United States dollar was equivalent to 6.14 Bolivianos. |
| COMTECO | Cooperativa Mixta de Telecomunicaciones Cochabamba. |
| COTAS | Cooperativa de Telecomunicaciones Santa Cruz. |
| COTEL | Cooperativa de Teléfonos La Paz. |
| ENTEL | Empresa Nacional de Telecomunicaciones. |
| GDP | Gross Domestic Product. |
| GNP | Gross National Product. |
| ICT | Information and Communication Technology. |
| ISP | Internet Service Provider. |
| IT | Information Technology. |
| SITTEL | Superintendencia de Telecomunicaciones. The telecommunication regulator. |
| TELECEL | Teléfono Celular de Bolivia. |
| UNDP | United Nations Development Programme. |
| UNESCO | United Nations Educational, Scientific and Cultural Organization. |
| VSAT | Very Small Aperture Terminal (used for satellite communications). |

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