International Telecommunication Union

The Fifth Pillar:
Republic of Mauritius
ICT Case Study

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1.   Introduction

This study looks at the diffusion of Information and communication technologies (ICT) in the Republic of Mauritius. It touches on issues such as isolation and undersized markets that Mauritius and other small island developing states face in adopting ICT.[1] The study also examines how Mauritius is evolving into an information society, particularly relevant in the context of the World Summit on the Information Society (WSIS) the first phase of which was held in Geneva, Switzerland in December 2003.[2]

The organization of this report is based on a framework developed by the Mosaic Group[3] for characterizing the state of the Internet in an economy. The scope has been widened to incorporate telecommunication networks such as the fixed-line and mobile telephone networks. Mosaic considers six factors as follows:

- **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, from none or a single city to nationwide availability.

- **sector 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 domestic backbone bandwidth, exchange points, and user access methods.

- **organizational infrastructure**: a measure based on the state of the Internet Service Provider industry and market conditions.

- **sophistication of use**: a measure characterizing usage from conventional to highly sophisticated and driving innovation.

The report also considers other factors not included in the above framework such as the evolution towards an information society, pricing, and government policies.

1   The ITU notes, that "small island nations and communities face particular problems in bridging the digital divide." See Resolution 129 (Marrakesh, 2002) in ITU. 2003. *Final Acts of the Plenipotentiary Conference (Marrakesh, 2002)*. Small island developing states (SIDS) form an official grouping in the UN system. For a list of the 45 SIDS see http://www.un.org/special-rep/ohrlls/sid/list.htm. [Accessed 21 July 2004].

2   For more on WSIS see the web site at: www.itu.int/wsis/index.html. [Accessed 21 July 2004].

3   Since the Global Diffusion of the Internet (GDI) project's inception in 1997, the Mosaic Group has studied the Internet in nearly 30 countries. See http://mosaic.unomaha.edu/gdi.html. [Accessed 21 July 2004].

2.   Background

Figure 2.1: Map of Mauritius

Source: www.reliefweb.int.
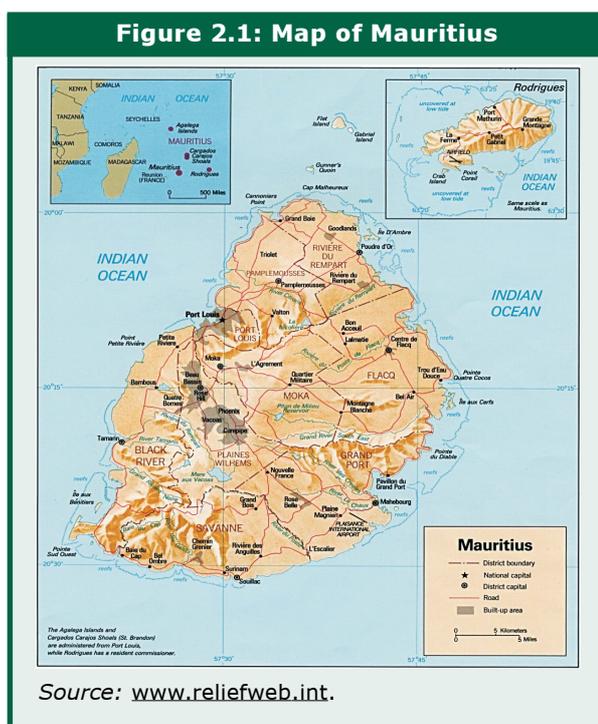
2.1   Geography[1]

The Republic of Mauritius is located in the Indian Ocean, 800 kilometers east of Madagascar and some 2'000 kilometers off the southeast African coast (Figure 2.1). Although various sailors visited Mauritius from the Middle Ages on, it was not until 1598 when the Dutch claimed possession. They named it Mauritius after Prince Maurice Van Nassau, Governor of Holland. The Dutch abandoned the island in 1710, and France took possession. Renamed Isle de France, Mauritius was a strategically important location in the colonial drive for dominance and used as a base for the French to attack British ships. The British captured the island, gave it back its original name and agreed in the 1814 Treaty of Paris to respect the customs and culture of the inhabitants. When slavery was abolished in 1835, Indian immigrants began arriving to work in the sugar cane plantations. A smaller group of Chinese traders later followed. The island obtained independence on 12 March 1968 and became a Republic 24 years later, in 1992.

The Republic of Mauritius consists of four islands: Mauritius (the largest at 1'865 square kilometers), Rodrigues (104 square kilometers), the Agalega Islands (70 square kilometers), and the Cargados Carajos Shoals (1.3 square kilometers).[2] The country is divided into municipalities and villages. It has five municipal councils in the urban areas and 126 village councils in the rural areas.

2.2   Population[3]

The population of Mauritius was 1'216'773 at December 2002, a growth rate of 0.9 per cent over the previous year. The country is densely populated,

Table 2.1: Population indicators

Item	2002
Total population	1'216'773
Growth over last year (%)	0.9
Urban population (%)	43
Population Density (per/km2)	596
Age distribution (%):	
0-14	25.6
15-64	68.2
65+	6.4

Note: All data refer to December 2002 except for urban population, which is from the 2000 Census.
Source: Central Statistics Office.

Figure 2.2: Multi-ethnic, multi-lingual

Distribution of population by ethnicity and resident population 12 years and over by languages read and written, 2000

Source: ITU adapted from The World Factbook and Central Statistics Office.

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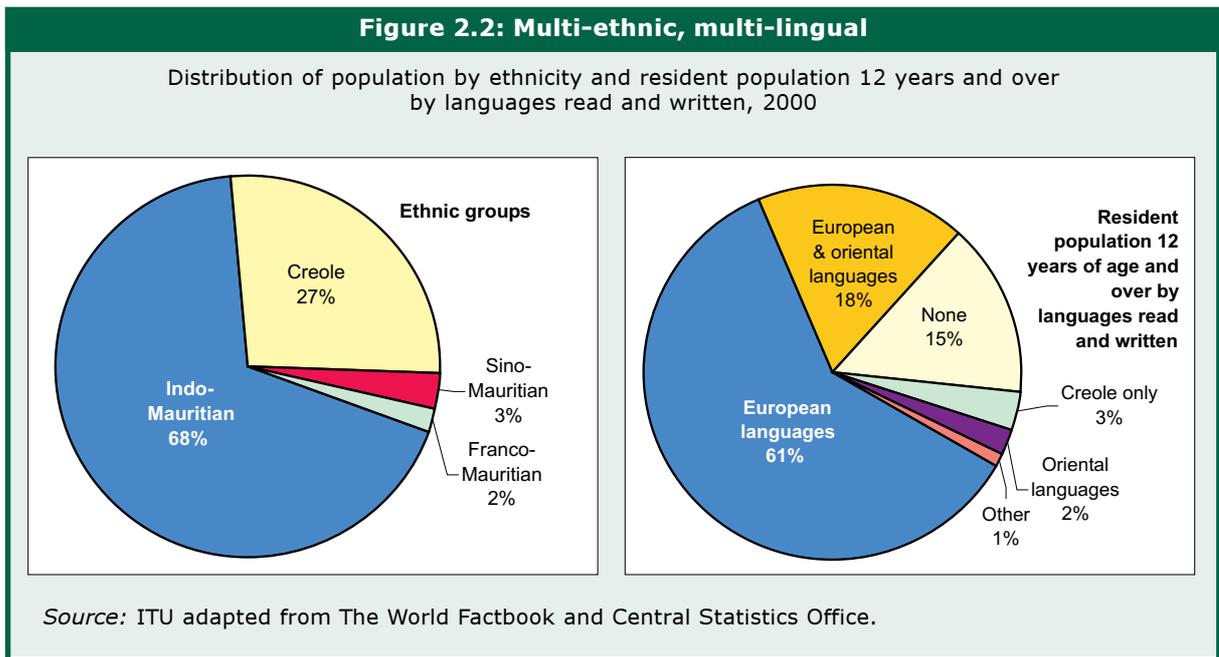
with 596 persons per square kilometre, the highest in Africa. Ninety seven per cent of the population reside on the island of Mauritius. The capital, Port Louis, has 129'400 inhabitants, 11 per cent of the population (Table 2.1). According to the Mauritian definition of *urban* (i.e., towns larger than 50'000 inhabitants), 57 per cent of the country is rural. The 2000 Census reported 297'881 households with an average size of four people.

Waves of immigration have created a multi-ethnic society and Mauritius includes people of Indian, African, Chinese and European origin (see Figure 2.2 left). English is the official language but Creole the most popularly used with 70 per cent of the population speaking it at home. Most people also speak French (to which Creole is related) and the main newspapers are in French. Mauritius, along with Canada, Seychelles and Vanuatu are the only countries that are members of both *L'Organisation internationale de la Francophonie* and the Commonwealth. Most Mauritians are multilingual with just three per cent of the population only able to speak Creole. Seventy-nine per cent of those aged 12 and older can read and write a European language (see Figure 2.2, right).

2.3 Economy[4]

Sugar has been the cornerstone of the Mauritian economy since the Dutch introduced cultivation in the 17th century. Sugar accounted for around 95 per cent of export earnings at the time of Mauritian independence in 1968 (see Figure 2.3, left). Concerns about remaining a *monocrop* nation, subject to swings in weather and global prices, led to a diversification of the economy. This included the creation of Export Processing Zones (EPZs, with an emphasis on textile manufacturing), promotion of tourism and the development of an offshore financial sector. The strategy paid off with GDP growth averaging 5.9 per cent a year between 1973 and 1999 and incomes more than tripling. Mauritius' economic success has been widely praised with some referring to it as an *African Tiger*, an allusion to fast-growing Asian economies such as the Republic of Korea and Singapore.[5]

Gross National Income per capita was Rs. 118'208 (US$ 4'066) in 2002, the fourth highest in Africa after Seychelles, Libya and Gabon. In terms of income at purchasing power parity, Mauritius is ranked first in Africa (US$ 10'530 in 2002). The World Bank

Figure 2.3: Sweet tooth

Mauritius: Sugar as percentage of total exports (by value), 1950-2000 and distribution of land by use

Sugar as % of total exports

Land utlization

- Roads & footpaths 2%
- Reservoirs, ponds, etc. 1%
- Built-up areas 20%
- Sugar Cane 41%
- Forests & grazing lands 31%
- Other agri-culture 5%
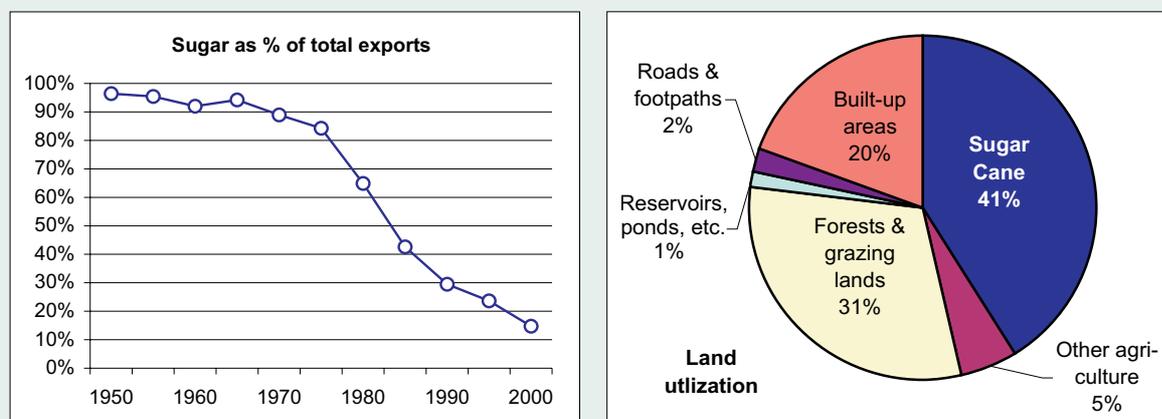
Source: ITU adapted from International Monetary Fund (IMF) and Central Statistics Office.

classifies Mauritius as an Upper Middle Income economy. The Gini coefficient, which measures the distribution of income, decreased from 0.387 in 1997 to its lowest level of 0.371 in 2002 reflecting a more equitable spread of wealth.[6]

Despite the country's successful economic growth, several challenges have forced Mauritius to re-think its strategy. The four pillars of the economy — sugar, EPZ, tourism and financial services — each have their shortcomings, such as the emergence of new low cost competitors, loss of preferential trade agreements or the environmental risks of over-expanding tourism. To diversify the economy the government is giving top priority to the development of the ICT sector to make it the fifth pillar of the economy.[7]

2.4 Quality of Life

The United Nations Development Programme (UNDP) ranked Mauritius 62nd out of 175 countries in its 2003 *Human Development Report*.[8] The ranking is based on a composite of four indicators: life expectancy, literacy, school enrolment and GDP per capita. The position of Mauritius, which places the country in the top quarter of the Medium Human Development group, is 12 points less than its GDP per capita rank, suggesting that it is lagging in other indicators. Two areas where Mauritius is behind other countries relative to its income are literacy and school enrolment (Table 2.2).

2.5 Government

Mauritius is a multiparty parliamentary democracy. Three major political parties, usually in a coalition of two, have led the government since the country's independence in 1968. The head of state, the President of the Republic, has mainly representative powers while the Prime Minister holds executive power. According to the World Audit organization, Mauritius is the third highest ranked developing nation in terms of democracy.[9] The ranking is based on factors such as corruption, human rights, political rights and the rule of law in 149 nations. Mauritius also ranks high on the World Bank's governance indicators with values higher than both the Sub-Saharan Africa and Upper Middle Income averages (Figure 2.4).[10] Good governance has been attributed as one of the reasons for Mauritius' economic success.[11]

Table 2.2: Ranking Mauritian human development

Based on 2001 data

Mauritius Human Development Indicators			Ranking within groups					
			Africa		*Upper Income*		*Small Island States*	
Rank	*Indicator*	*Value*	*Rank*	*Country*	*Rank*	*Country*	*Rank*	*Country*
62	Overall		36	Seychelles	43	Chile	49	Bahamas
72	Life expectancy	71.6	61	Libya	48	UAE	62	Mauritius
104	Literacy	84.8	62	Mauritius	58	Malaysia	71	St. Lucia
91	School enrolment	69	103	Cape Verde	62	Mauritius	81	Fiji
50	GDP per capita	9'860	111	South Africa	96	Turkey	86	Maldives

Source: United Nations Development Programme (UNDP).

Figure 2.4: Governance

Mauritius compared with regional and income category average, 2002
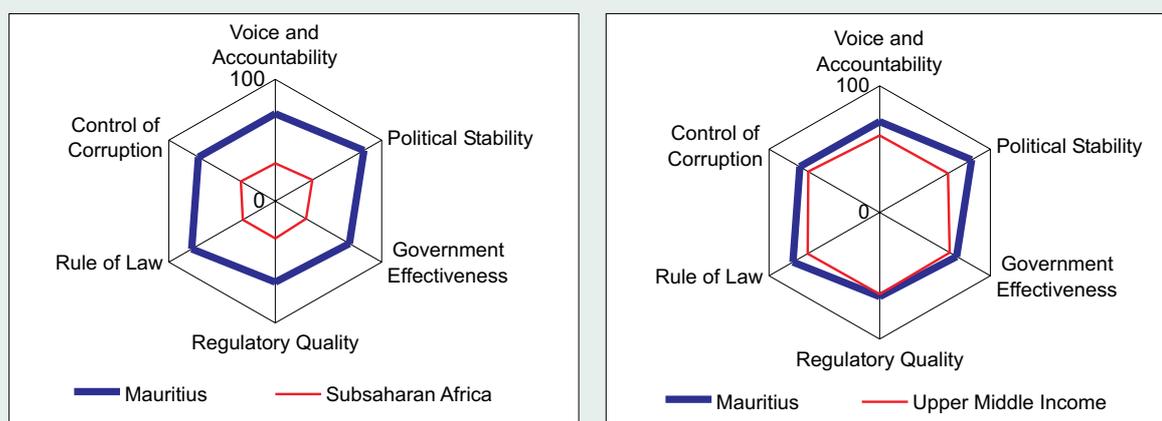
Note: The chart depicts the percentile rank on each governance indicator. Percentile rank indicates the percentage of countries worldwide that rate below the selected country in each component. Higher values imply better governance ratings.
Source: World Bank.

[1] Much of this section were adapted from "History and Information" from the Mauritius Mission to the UN: http://www.un.int/mauritius/history.htm. [Accessed 21 July 2004].

[2] The island of Rodrigues, situated at about 540 kilometres to the east of Mauritius, has some 35'000 inhabitants. The Agalega islands have a population of around 300 engaged in the production of copra and coconut oil. The Cargados Carajos Shoals consist of 22 islands and islets. One of its islands, Saint-Brandon, has a hospital and a weather station but only some fishermen periodically stay there. In addition, Mauritius also claims the Chagos Archipelago and Tromelin Islands within its Exclusive Economic Zone.

[3] Much of this section is adapted from data on the Mauritius Central Statistics Office web site http://ncb.intnet.mu/cso.htm. [Accessed 21 July 2004].

[4] Much of this section are adapted from "Sugar in Mauritius" from the Public Relations Office of the Sugar Industry. http://www.prosi.net.mu/simau97/simau97.htm. [Accessed 21 July 2004].

[5] Although many attribute Mauritian economic success to trade-oriented policies, the strength of domestic institutions and a multi-ethnic society also played a role. See Arvind Subramanian. December 2001. "Mauritius: A Case Study." *Finance and Development*. http://www.imf.org/external/pubs/ft/fandd/2001/12/subraman.htm. [Accessed 21 July 2004]. For references to Mauritius being an "African Tiger" see Faith Rubenstein and Mark Eaker. "Mauritius: Can an African Tiger change its stripes?" 1999. University of Virginia. http://faculty.darden.virginia.edu/eakerm/tiger.pdf. [Accessed 21 July 2004]. For a review of the Mauritian economy over the last forty years see: Ministry of Economic Development, Financial Services & Corporate Affairs (Mauritius). "Structural Transformation of the Mauritian Economy: 1960s — Beyond 2000." http://ncb.intnet.mu/medrc/beyond.htm. [Accessed 21 July 2004].

[6] Deven Padiachy. "2002: couldn't be better." *L'express*. 27 December 2002, at http://www.businessmag.mu/displayNewsContent.asp?NID=5661&CID=8. [Accessed 21 July 2004].

[7] Speech by Hon. D. Jeeha, Chairman of the National Computer Board, on the occasion of the opening of the seminar on ICT awareness at the University of Mauritius on 24 April, 2003. http://ncb.intnet.mu/mitt/ministry/speeches/incubat.htm. [Accessed 21 July 2004].

[8] UNDP. *Human Development Report 2003*. http://www.undp.org/hdr2003. [Accessed 21 July 2004].

[9] See the World Democracy rankings at http://www.worldaudit.org/democracy.htm. [Accessed 21 July 2004].

[10] See "Governance Indicators" at http://www.worldbank.org/wbi/governance/govdata2002/index.html. [Accessed 21 July 2004].

[11] "…the most economically productive African states, e.g., Botswana, Mauritius and the Seychelles, are also the continent's most legitimate states…" See African Studies Quarterly. Volume 7, Issue 1. Spring 2003. University of Florida. Center for African Studies. http://web.africa.ufl.edu/asq/v6/V6i1a16.htm. [Accessed 21 July 2004].

3.   Pervasiveness

This chapter examines individual, household and community access to ICT (fixed and mobile telephones, computers, Internet as well as radios and televisions) and compares the situation in Mauritius with other countries. It also analyzes universal service and access policies.

3.1   Telephony

Over the last decade, Mauritius has made rapid progress in *universal telephone service*, defined as a high level of household availability. In 1990, only an estimated 15 per cent of households had a fixed telephone line.[1] By 2001, over three quarters of Mauritian households had a fixed telephone (77 per cent) (Figure 3.1, left).[2] In addition, 28.1 per cent had a mobile phone, raising total household telephone penetration to 80 per cent (including 3.3 per cent which only had a mobile phone, Figure 3.1, right). Mauritius' household telephone penetration is the third highest in Africa (after Réunion and Seychelles) and is above the Upper Middle Income country average of 67 per cent.

Mauritius also has a high level of *universal access* to telephone service. The small size of the island of Mauritius makes it easy to cover with telecommunication facilities and all localities have telephone service. Almost the entire population is within range of a mobile cellular signal. According to the telecommunication regulator, "Coverage by both fixed telephone services and cellular mobile telephone services is available almost throughout the country."[3]

As in many countries, universal access policy in Mauritius has been based on subsidization of home telephone service with no change to local tariffs for many years.[4] Economic growth led to rising incomes and more people could thus afford telephone service. Lack of

Figure 3.1: Universal telephone service

Percentage of households with a telephone and distribution of home telephones by type, 2001

Note: In the left chart, values are estimated based on household survey data for 1996 and 2001 and changes in the number of residential telephone lines.
Source: ITU adapted from Mauritius Telecom, Central Statistics Office.
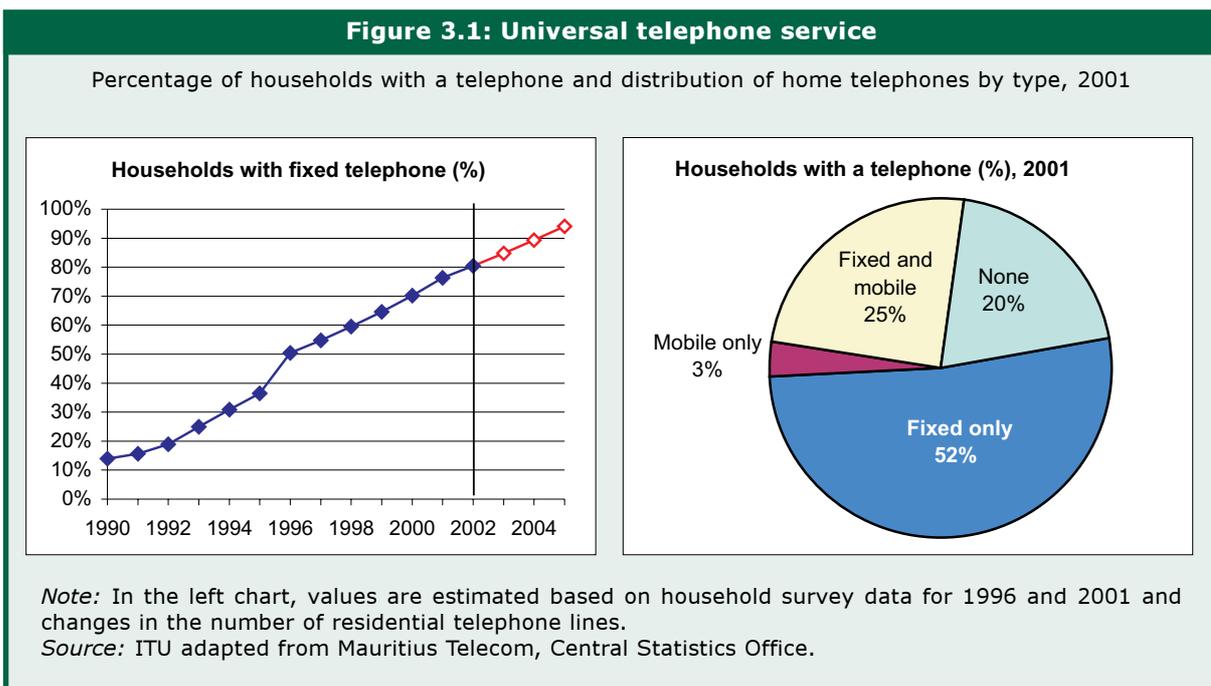
infrastructure is no longer a problem with the incumbent telephone operator, Mauritius Telecom, stating that almost all households can technically be connected to the telephone network. The waiting list for main telephone lines declined from 67'000 in 1993 to less than 10'000 by the end of 2001.

Affordability does not seem to be a pervasive barrier so it is surprising why more households do not have a telephone. This is based on analyzing how many households could afford the residential monthly telephone line rental of Rs 75 (US$ 2.50), which for low usage users includes 25 free local calls. Assuming the monthly telephone charge should not be more than three per cent of monthly income, then 98 per cent of Mauritian households could afford fixed telephone service (Table 3.1).[5] Usage charges are usually higher than the rental so the introduction of pre-paid service for fixed lines would probably boost the number of telephones in households. In any case, if current growth rates prevail, 95 per cent of homes will have a telephone by 2005 (Figure 3.1, left).

3.2 Computers and Internet

Both the Central Statistics Office (CSO) and the National Computer Board (NCB) carry out surveys on the availability of personal computers (PC) and Internet access in households.[6] According to the CSO, 18.0 per cent of Mauritian homes had a PC in 2002 compared to 13.3 per cent in 2001 (Figure 3.2, left). Some 70 per cent of homes with a PC also had Internet access (12.6 per cent of all homes).[7] Household PC ownership increased 33 per cent a year during 1997-2002.

Given that most households in Mauritius have a telephone, the main obstacle to having Internet access is a computer. The NCB survey reported that the primary reason put forth for not having a PC at home was access to one at work. According to the CSO data, the second largest reason for not having a PC at home was cost (reported by 34 per cent of households without a PC).

The government is keen to promote home PC ownership particularly since 80 per cent of Internet users access the Internet from the home. It launched the *A Computer in Every Home* campaign

Figure 3.2: Household ICT

Percentage of Mauritian homes with a PC, 1997-2005 and percentage of Mauritian homes with various ICT, 2002
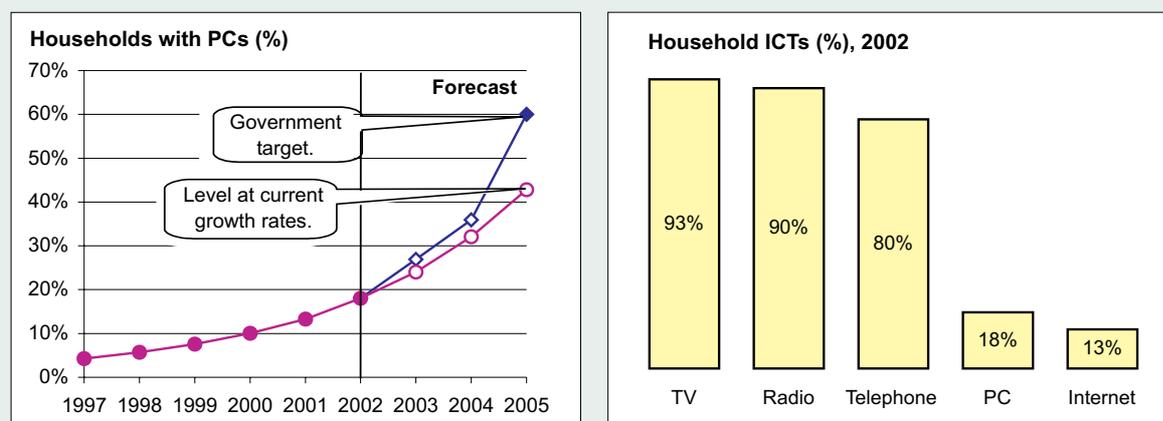
Note: In the left chart, forecasts based on growth rate to achieve government target of 60 per cent by 2005 and previous three-year average growth rate. In the right chart, TV and radio household ownership is estimated based on the latest household survey results.
Source: ITU adapted from CSO data.

in 2002 with the goal of achieving household PC penetration of over 60 per cent by 2005.[8] In addition to abolishing taxes on PCs, the government has encouraged state finance institutions to provide subsidized loans to government employees for purchasing PCs. The government has also called on companies to establish special funds to facilitate the purchase of PCs by their employees.

Despite the programmes noted above, it appears unlikely that the government target of 60 per cent home PC penetration by 2005 will be met. One problem is that many households do not know about the initiatives. The CSO reports that 42.2 per cent of households without a computer are not aware of special loan assistance. Achievement of the government target would require that the annual growth rate be raised to 50 per cent (from 33 per cent).

Based on current growth rates, the level of households with a PC would reach 43 per cent by 2005. In terms of affordability, a key assumption is what households will be willing to spend on a PC. Table 3.1 shows the cost of a PC (financed at three per cent interest over four years) as a percentage of monthly household income. The amount ranges from 44 per cent in the poorest households to less than two per cent in the richest. Determining the amount households are willing to spend for a PC is important for government goals and this question should be included on future surveys.

In terms of Internet access, 13 per cent of households reported having a connection in 2002, around double the rate two years earlier. Affordability was only cited as the third most important reason for not having home Internet

Table 3.1: Pricing ICT: Households and affordability						
Monthly telephone, Internet use and PC installment payment as a percentage of monthly household income, 2002						
			Monthly payment as % of income			
Monthly Income (Rs)	*Households (%)*	*Cumulative (%)*	*Telephone a Rs 75*	*Internet b Rs 250*	*PC c Rs 443*	*Total Rs 768*
Under 2000	1.7	1.7	7.5%	25.0%	44.3%	76.8%
2000 to < 3000	2.0	3.7	3.0%	10.0%	17.7%	30.7%
3000 to < 4000	3.4	7.1	2.1%	7.1%	12.6%	21.9%
4000 to < 5000	3.7	10.8	1.7%	5.6%	9.8%	17.1%
5000 to < 6000	5.2	16.0	1.4%	4.5%	8.0%	14.0%
6000 to < 7000	6.7	22.7	1.2%	3.8%	6.8%	11.8%
7000 to < 8000	6.6	29.3	1.0%	3.3%	5.9%	10.2%
8000 to < 9000	7.4	36.7	0.9%	2.9%	5.2%	9.0%
9000 to < 10000	6.8	43.5	0.8%	2.6%	4.7%	8.1%
10000 to < 12000	11.8	55.3	0.7%	2.3%	4.0%	7.0%
12000 to < 14000	8.9	64.2	0.6%	1.9%	3.4%	5.9%
14000 to < 16000	7.4	71.6	0.5%	1.7%	3.0%	5.1%
16000 to < 20000	9.6	81.2	0.4%	1.4%	2.5%	4.3%
20000 to < 25,000	7.3	88.5	0.3%	1.1%	2.0%	3.4%
25000 & over	11.5	100	0.3%	1.0%	1.8%	3.1%

Note: a. Residential monthly rental (75). Assumes Social Package of 25 free local calls (up to 100 minutes of conversation). b. Telecom Plus Discovery Package (10 hours per month including telephone charges). c. Monthly loan payment for Rs 20'000 PC (financed at 3% over four years).
Source: ITU adapted from Central Statistics Office, Mauritius Telecom, Telecom Plus, Development Bank of Mauritius.

access (after 'no equipment' and 'not interested'). Table 3.1 shows the cost of Internet access (assuming ten hours per month including telephone charges) as a percentage of monthly household income. Assuming a threshold of ten per cent of monthly income spent on all ICT products and services needed for Internet access (i.e., telephone line rental, Internet service provider charge and cost of PC), then around three quarters of Mauritian homes could afford a home Internet connection.

The number of Internet users was surveyed for the first time by the CSO in 2002. Some 12.8 per cent of the population aged 12 and over reported using the Internet, equivalent to 125'000 persons (10.3 per cent of the total population). This is some five per cent less than what had been estimated previously, derived from the number of subscribers (using a multiplier of 3.6 users per subscriber). Although Mauritius ranks among the top ten developing nations and is fourth among small island states in terms of Internet penetration, there is cause for concern. The 2002 growth rate was only 15 per cent, the lowest ever and a big drop from the 80 per cent registered in the previous year.[9] There are differences in Internet access based on location (rural, urban), gender, income, age and education, highlighting Mauritius' digital divide (Figure 3.3, right). This difference is particularly sharp depending on the activity of the user with those working

or at school having far higher Internet access rates than homemakers, the unemployed or the retired.

There are a number of facilities for public ICT access in Mauritius. In addition to computer labs with Internet access in some primary and all secondary schools, a government project called the *Gian Nath Computer Scheme* was launched to provide PCs and in some cases Internet access to 181 social welfare and community centres spread across the island (including ten on the island of Rodrigues). While the project has since officially ended, some of the centres continue to provide services. There is also *IT Coach*, two specially outfitted buses with ICT equipment. Launched in November 2000, the coach travels across the country and has provided free ICT training to some 20'000 people.

There are around 30 Internet cafés throughout Mauritius. Several are operated as branded chains by the ISPs such the TelecomPlus NetShops. The charges are Rs 72 (US$2.4) per hour with a minimum charge of Rs 18 (US$0.6) with students and regular users receiving a slight discount.

There are plans to provide Internet access at all of the island's 100 post offices. The idea is to provide each of the post offices of the recently corporatized Mauritius Post with PCs and Internet access. The facility would be housed in a separate part of the post office so it could remain open when postal services are closed.

The ICT Act 2001 calls for the establishment of a Universal Service Fund to which all telecommunication operators would contribute. The specifics of how the Fund will operate are still being developed but it is planned that it would help to promote Internet access. According to the Act, operators would be reimbursed for providing universal service.[10] The government's ISP Policy Statement also mentioned that ISPs would contribute to the universal service

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Figure 3.3: Internet

Estimated number of Internet users and percentage of population using Internet, 1996-2002 (left) and Distribution of Internet users by population group, 2002
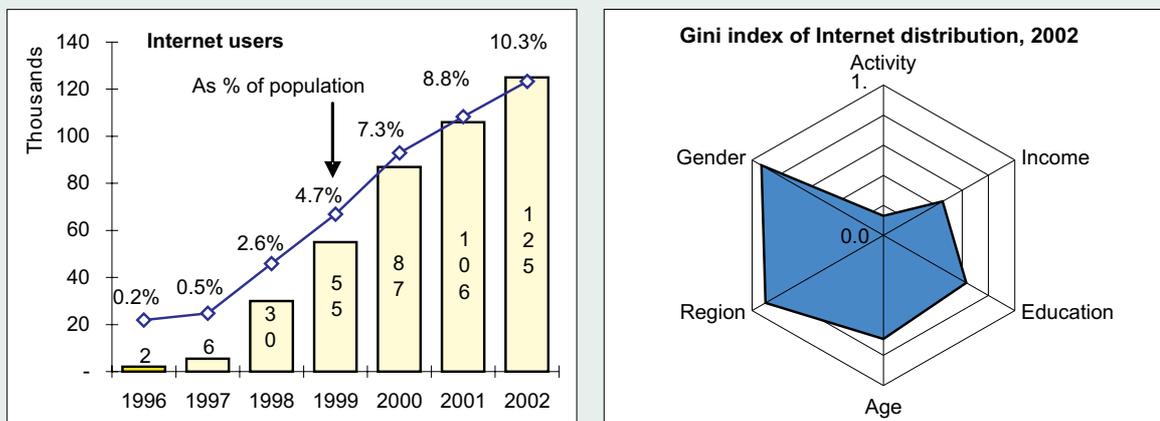
Note: The left chart is based on NCB estimates through 2000 and CSO survey data for 2002; data for 2001 were estimated as the average of 2000 and 2002 data. The right chart shows how evenly distributed Internet use is across different groups. The Gini Index is compiled by comparing the distribution of Internet users in the group to the population shares in the group. The closer the value to one, the more even the distribution.
Source: ITU adapted from CSO and NCB.

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fund "for the promotion of universal internet access at rates to be prescribed."[11]

3.3   Mass media

The most popular mass media in Mauritius is television. According to the CSO, 93 per cent of Mauritian homes had a television set in 2001 while the Independent Broadcasting Authority (IBA) reports that 98 per cent of the population aged 13 and over have access to television at home.[12] According to the latest CSO statistics, 88 per cent of Mauritian households had a radio in 1997. IBA data show that 97 per cent of those 13 years and older listen to the radio, since, besides the home, people listen to the radio in the car or at work.

The Mauritius Broadcast Corporation (MBC) operates three terrestrial television free-to-air channels, several terrestrial pay television channels and AM and FM radio stations. It publishes its programming schedule and provides live audio streaming of two radio stations and delayed video streaming of the evening television news on its web site (http://mbc.intnet.mu). In addition, four private operators provide pay television. Three use the MBC transmission network to broadcast their signal while the other provides pay television service through satellite.

According to the Government Information Office, there were 41 press titles in Mauritius in 2001 including six daily newspapers. UNESCO reports the number of daily newspapers printed at 138'000 or 11.9 per 100 inhabitants for the year 2000. The two leading daily newspapers both have web sites.

1   Household survey data is not available for that date. Instead, an approximation is made by dividing the number of residential telephone lines by the number of households.

2   Central Statistics Office. "Continuous Multipurpose Household Survey — 2001." August 2002. Available at http://ncb.intnet.mu/cso/ei384/intro.htm. [Accessed 21 July 2004].

3   Fax from the ICTA, 5 June 2003.

4   "The prices for basic telephone and other telecommunication services in Mauritius do not reflect the underlying costs of providing those services…In part, it is because the existing price structure reflects Government macro-economic policy decisions unrelated to the cost of providing telecommunication services (namely, that the cost of local telecommunication services should be subsidized by other services)." MITT. "Policy of the Republic of Mauritius with respect to the telecommunications sector." 8 October 1999. http://ncb.intnet.mu/mitt/ministry/policytel.htm. [Accessed 21 July 2004]. Note that local tariffs were revised in October 2002 as part of an ongoing rebalancing exercise. Another factor impacting universal service was the decision taken in the mid-1980s to corporatize the incumbent national operator, nationalize the international telecommunication operator and merge the two into one entity. These steps enhanced investment in the domestic network, since lucrative revenues from international service were controlled by the same operator providing local service.

5   CSO data show that the average household communication expenditure in Mauritius is 3.3 per cent of monthly income.

6   Central Statistics Office. "Continuous Multipurpose Household Survey — 2002." http://ncb.intnet.mu/cso/ei422/info.htm [Accessed 21 July 2004] and NCB. *ICT Outlook 2002: ICT Penetration within the Mauritian Society*. February 2003. http://ncb.intnet.mu/ncb/survey/hhold-02.htm. [Accessed 21 July 2004].

7   In contrast, NCB data for 2002 found that 29.4 per cent of households with a telephone had a PC. Furthermore, 23.8 per cent of households with a telephone were reported to have Internet access. Adjusting for the fact that the NCB survey is only conducted among households with a telephone and assuming that households without a telephone would not have a PC or Internet access, then the corresponding figures across all households would be 23.5 and 19.0 per cent correspondingly. Differences between CSO and NCB data could be due to the timing of the surveys and sample size.

8   "…the 2000 IT Household Survey reveals that the home computer ownership was 21% …we need to double these figures in the short run and ultimately treble this level in five years' time." Speech by the Prime Minister on the occasion of the Foundation Stone Laying Ceremony of the Ebene CyberCity and the Cyber Village at Ebene. 28 September 2002. Available at http://www.cdacindia.com/html/pdf/pmspeech.pdf. [Accessed 21 July 2004].

9   This is based on the estimated number of users provided by the ISP since the CSO data is only available for 2002.

10 "…out of which payments may be made to any licensee required by the terms of his licence, or otherwise directed by the Authority, to provide a universal service." http://www.icta.mu/icta/part4.htm. [Accessed 21 July 2004].

11 See "Policy Framework Internet Service Providers (ISPs) in the Republic of Mauritius." 6 February 2001. http://ncb.intnet.mu/mitt/ministry/ispolicy.htm. [Accessed 21 July 2004].

12 Independent Broadcasting Authority. *Audience Survey Executive Summary*. 13 December 2002. Available at http://iba.gov.mu. [Accessed 21 July 2004].

4. Sector absorption

This chapter examines the availability of Information and Communication Technology (ICT) in the education, business, government and health sectors.

4.1 Education

All Mauritian primary and secondary schools have computers. All 39 state secondary schools have computer laboratories with an average of 15 computers and Internet access from the school library. The average number of computers per primary school is just two and only a handful has access to the Internet. The computerization of primary schools will be accelerated through the *School Information Technology Project* (SITP), launched in 2000.[1] Carried out in collaboration between the Ministry of Information Technology and Telecommunications (MITT) and the Ministry of Education and Scientific Research (MESR), the SITP covers primary, secondary and vocational institutions. It consists of curriculum and infrastructure components and has a set of fixed goals. SITP calls for equipping all primary state schools with at least one computer lab. Each lab will have some 20 PCs connected over a Local Area Network

(LAN); accessories such as printers, scanners and digital cameras; and multimedia applications.

SITP will eventually connect all schools to *SchoolNet*, a Wide Area Network providing access to the Internet and online material. This will allow schools to share common applications and management systems. SchoolNet will provide all schools Internet access at a minimum speed of 128 kbps at reduced prices. The MITT will be in charge of providing technical assistance. Once all primary schools are connected to SchoolNet, SITP has the goal of increasing the computer to student ratio in state secondary schools to 1:1.

There are eight public tertiary institutions: two universities, two institutes, three polytechnics and one distance education institute. While there is no academic network, Mauritius' universities have LANs and high speed Internet access, which is free to students.[2] The universities have web sites where prospective students can fill out admission applications and existing students can obtain scholarship details, examination results and other information.[3]

	Institutions	Students	Teachers	Number of schools with PCs	Number of schools with Internet	Number of schools with web site
Total	433	232'119	10'809	433 (100%)	81 (18.7%)	22
Primary schools	290	132'432	5'256	290 (100%)	12 (4.2%)	4
Secondary schools	143	99'687	5'553	143 (100%)	69 (48.3%)	18

Table 4.1: Mauritius at school

Number of primary and secondary schools, students and teachers and number of schools with PCs, Internet access and a web site, 2002

Note: Includes both state and private schools.
Source: ITU adapted from Ministry of Education and Scientific Research.

Table 4.2: Business ICT

Percentage of businesses with ten or more employees, 2001

		Businesses using the Internet	*Businesses with web site*	*Businesses receiving orders over the Internet*	*Businesses ordering over the Internet*
1	Denmark	94.8	71.0	24.1	46.5
2	Sweden	89.9	67.7	17.4	53.6
3	Japan	91.5	n.a.	22.5	18.1
4	Finland	90.8	59.7	13.7	34.5
5	Netherlands	79.0	47.0	36.0	40.0
6	Australia	86.0	47.0	16.3	31.8
7	Norway	82.0	55.0	17.2	29.5
8	Austria	83.7	54.3	10.8	13.5
9	New Zealand	84.0	42.0	10.1	26.0
10	United Kingdom	63.4	49.9	10.3	20.8
11	Portugal	72.0	30.3	6.5	12.2
12	Luxembourg	54.6	40.7	6.9	17.6
13	**Mauritius**	**75.0**	**21.3**	**3.6**	**8.0**
14	Spain	67.0	6.9	6.1	9.4
15	Italy	72.0	8.9	1.7	7.8
16	Greece	54.2	28.8	4.9	5.3
	OECD Average	**79.0**	**43.0**	**13.8**	**24.3**

Source: ITU adapted from National Computer Board, Organization for Economic Cooperation and Development.

4.2   Business

The National Computer Board (NCB) carried out a survey in August 2001 measuring the adoption of ICTs by businesses.[4] The sample size was 300 businesses with more than ten employees (based on a total of 2'312 such establishments in the country). Some 83.3 per cent of Mauritian businesses were found to have at least one computer. In terms of the percentage of Mauritian businesses with Internet access (75 per cent) or a web site (21.3), Mauritius does quite well considering its level of economic development. It exceeds several more developed countries (Table 4.2). However Mauritius still has some distance to cover to catch up with developed nations in the area of business purchases and sales over the Internet.

There are presently no official data on the size of the e-commerce market. The CSO had plans to launch a Census of Economic Activity survey in the second half of 2003 that would include e-commerce estimates. The results are expected towards the end of 2004.

4.3   Government

The Mauritius government has long recognized the importance of ICT in the public administration with a Data Processing Division in the Ministry of Finance established as far back as 1970.

Five institutions were established in the late 1980s to promote the use of ICT in the government:

i)   The National Computer Board (NCB, http://ncb.intnet.mu) was created to advise the government on the formulation of national policies for the development of the ICT sector and to promote IT in the country;

ii)   The Central Informatics Bureau (CIB, http://ncb.intnet.mu/cib.htm) was set up to manage computerization projects within the civil service;

iii)   The Central Information Systems Division (CSD, http://ncb.intnet.mu/cisd.htm) was established to provide technical assistance to government agencies;

iv)   State Informatics Limited (SIL, http://sil.intnet.mu) was originally set up to provide software development services to the public sector. This area was liberalized in 1996 and SIL now provides support and consultancy services to both the public and private sector; and

v)   State Informatics Training Centre Limited (SITRAC) (incorporated into the University of Technology in 2000) was in charge of providing training.

The synergies created by these institutions over the years have resulted in the formulation and implementation of various projects, the major one being the *Civil Service Computerization Programme* (CSCP). Initiated in 1989 CSCP continues to computerize ministries and government departments. The total cost of the project over the last 12 years was Rs 650 million (US$ 22 million) and another Rs 150 million (US$ 5 million) have been budgeted for the year 2002/2003.[5] CSCP has created some 50 major multi-user departmental systems (Table 4.3) with another 20 currently under implementation.

All ministries and most governmental bodies have web sites (though not always hosted in the agency). There is no government network and connections to the Internet are via dedicated leased lines for agencies that can afford it and dial-up for others. The Government Intranet System (GINS) project will link all government agencies via high-speed connections. The Government Email Services project was launched in 2001 and has provided 2'620 senior officers with email accounts. About 20'000 civil servants (out of 55'502) have been trained in office automation applications related to their specific activities. With some 4'300 computers in the government sector, the number of civil servants with a personal computer (PC) is relatively low, at 7.7 per cent. The figures for training and PCs need to be evaluated by the fact that not all civil servants may need ICT for their work and some were already computer literate before joining the civil service and thus do not require training. The government also provides loans to facilitate the purchase of PCs by government employees for home use.

4.4   Health

The Ministry of Health and Quality of Life (MOH, at http://ncb.intnet.mu/moh/index.htm) oversees the network of public health care institutions (Table 4.4) and works closely with the private health care sector, which provides an additional 14 clinics.

The MOH has implemented ICT to make the health care system more efficient. The National Health Information System, which includes the collection, processing and dissemination of data, has been set up at several institutions and by 2002 seven health centres and both clinics had been computerized. All hospitals were connected to the Internet, primarily for the use of email. Some of the data management systems were developed by the Mauritius Institute of Health (MIH, at http://ncb.intnet.mu/mih), a parastatal body under the umbrella of the Ministry of Health, which is responsible for

Table 4.3: ICT in government

Major multi-user departmental systems

Ministry/Department	Project Description	Operational since
Judicial, Supreme Court, Headquarters	Computerisation of follow-up of cases lodged till delivery of judgments Retrieval of past judgments by using Zyindex Text retrieval system	Sep 1994
Judicial, Supreme Court, Headquarters	Digital Court Recording System. Computerisation of Court Hearings (Recording and retrieval of Court Hearings at Supreme Court)	Jun 1999
Judicial – New Court House	Computerisation of activities of the Intermediate, Industrial & District Courts	Jun 2000
Judicial - Supreme Court	Computerised library system for accessing judgments and legislation through the internet	March 2002
National Assembly, Reporting Section	Computerisation of the Reporters' section and the library so as to enable members of Parliament to access previous National Assembly's Debates.	Nov 1998
Public & Disciplined Forces Service Commissions	Computerisation of Competition Section	Mar 1995
	Computerisation of Scrutiny, Personnel & Registry sections	May 1997
Electoral Commissioner's Office	Computerisation of Register of Electors, Staff Management & Election	Dec 1992
Local Government Service Commission	Computerisation of Competition, Implementation Sections, Registry and Text Retrieval System	Feb 1999
Prime Minister's Office, Cabinet Office	Implementation of a Text Retrieval System	May 2001
Prime Minister's Office, Police Department	Computerisation of Passports & Immigration Services	Jun 1992
Prime Minister's Office, Prisons Department	Detainees Information System	Jun 1994
Prime Minister's Office, Police Department	Computerisation of records of people filed at Anti Drug Smuggling Unit	Jun 1997
Prime Minister's Office, Police Department, Central CID	Automatic Fingerprint Identification System (AFIS) Phase 1- Computerisation of management of fingerprints and criminal records at Central CID	Feb 1999
	AFIS Phase 2 - Connection of remote Police Divisions and Police Stations to Crime Records Office	March 2001
Prime Minister's Office, Police Department	Tracking of police vehicles using Global Positioning System (GPS) Technology	January 2002
Prime Minister's Office, Pay Research Bureau	Computerisation of the Pay Research Bureau	Dec 1998
Prime Minister's Office, Home Affairs Division	Computerisation of Residence Permits, Citizenship & Visas, Property Restriction Act & Registry sections. Link to Passport & Immigration Office	Dec 1999
Prime Minister's Office, Civil Status Division	Computerisation of registration of birth, marriage & death at the Civil Status Division. It will eventually be extended to form the Central Population Database	Nov 2001
Prime Minister's Office, Meteorological Services	Computerisation of the weather forecasting division.	Dec 1997
Prime Minister's Office, Meteorological Services	Setting up of LAN at the Applied Division	Jan 2003
Ministry of Finance	Contributions Network Project. This comprises the setting up of an electronic one-stop shop for all payments and contributions of the private sector to Government. The electronic submission of Income Tax and VAT returns is operational May 2000. This has been extended to cater for contributions to NPS/NPF/IVTB since July 2001. E-filing and e-payment of corporate tax was launched in January 2002. It is proposed to proceed with the e-filing of corporate information and e-payment of fees to Registrar of Companies in the future.	May 2000
Ministry of Finance - Customs & Excise Department	TRADENET Phase I – Electronic authorisation by customs for delivery of goods	Jul 1994
	Phase II – Electronic submission of sea manifest by shipping agents	Jan 1995
	Phase III – 'Customs Management System' Electronic declaration & processing of bills of entry	Jul 1997
	Phase IV – Transfer of containers	Jul 2000
	Phase V – Import/Export authorisation by controlling agencies	Jul 2001
Ministry of Finance - Income Tax Department	Computerisation of activities of the Income Tax Department	Dec 1999
Ministry of Finance - VAT department	Computerisation of new Value-Added Tax (VAT) system	Sep 1998
Ministry of Finance - Revenue Authority	Electronic link with revenue collection departments - VAT, Income Tax and Customs	Jun 2000
Ministry of Finance - Accountant General	On-line system for Pension, Passage, Mission, Vote control, Financial Accounting & District cashier systems.	Aug 1999
Ministry of Finance - Registrar General Department	Case Hypothecaire System and Cashier System	July 2002
Large Taxpayer Department	Computerisation of Large Taxpayer Department. Common administration of Corporate Income Tax, Value Added Tax and PAYE of large tax payers.	June 2002

Table 4.3: ICT in government (cont'd)

Major multi-user departmental systems

Ministry/Department	Project Description	Operational since
Ministry of Agriculture, Food Technology and Natural Resources	Computerisation of Livestock technical system, services, control & regulatory.	June 2001
Ministry of Agriculture, Food Technology and Natural Resources	Computerisation of Personnel and Stores	Nov 1998
Ministry of Social Security and National Solidarity, Senior Citizen Welfare and Reform Institutions	Computerisation of the Local Offices. Partly operational at Rose Hill, Astor Court and Plaine Verte.	As from Dec 2000
Ministry of Social Security and National Solidarity, Senior Citizen Welfare and Reform Institutions	Computerisation of the Contributions Branch – contribution from employers/calculation of pension points	1993 (Reviewed in 1999)
Ministry of Social Security and National Solidarity, Senior Citizen Welfare and Reform Institutions.	Computerisation of Stores, Registry, Personnel and Finance	Jul 1994
Ministry of Social Security and National Solidarity, Senior Citizen Welfare and Reform Institutions	Computerisation of retirement, widows, invalids, orphans pensions, industrial injury and Medical Unit	Dec 1997
Ministry of Local Government and Rodrigues (Rodrigues Administration)	Computerisation of central administration at Rodrigues (Stores, Registry, Payroll and Personnel, Administration, Finance)	Dec 1999
Ministry for Local Government and Rodrigues (Local Government Division)	Setting up of LAN at the Solid Waste Management Unit (Moorgate House)	Aug 2003
Ministry of Public Infrastructure, Land Transport and Shipping - Central Stores and Plaine Lauzun Mechanical Workshop	Upgrade of stores computer system	Mar 1997 (Fort Georges) Apr 2000 (Plaine Lauzun)
Ministry of Public Infrastructure, Land Transport and Shipping - . National Transport Authority	Computerisation of Registration, Licensing & Carrier and Cashier & Motor Vehicle Licence Sections of the National Transport Authority (Registration module operational)	Nov 2001
Ministry of Public Infrastructure, Land Transport and Shipping - . Technical Division, Phoenix	Setting up of LAN at the Technical Division, Phoenix	Jul 2002
Ministry for Civil Service Affairs and Administrative Reforms	Civil Service Human Resource Management System. Phase I: Creation of Personnel Central System at the Ministry – Query of data & General Service Staff	Feb 2001
Ministry for Civil Service Affairs and Administrative Reforms	Electronic Attendance System	Apr 2003
Ministry of Foreign Affairs and Regional Cooperation	Computerisation of Registry, Personnel and Administration	Feb 2000
Ministry of Foreign Affairs and Regional Cooperation	Provision of Internet facilities through a proxy server	June 2002
Ministry of Health and Quality of Life - Central Supplies Division	Computerisation of stores activities	Jul 1994
Ministry of Health and Quality of Life - Jawaharlal Nehru Hospital	Integrated hospital & patient care system. computerisation of all the sections at Jawaharlal Nehru Hospital	Feb 1996
Ministry of Health and Quality of Life - Central Health Laboratory	All the sections of the Central Health Laboratory have been computerised. This involves recording of requests as well as results of tests.	Jul 1998
Ministry of Health and Quality of Life - Area Health Centres (AHC)	Implementation of an integrated system for the activities of Area Health Centres. 7 AHCs are involved including 2 sites in Rodrigues. (5 sites operational)	Jan 2002
Ministry of Economic Development, Financial Services and Corporate Affairs - Companies Division	Computerisation of license, cash, companies, partnerships, trusts, offshore & search procedures at Registrar of Companies Division	Sep 1997
Ministry of Economic Development, Financial Services and Corporate Affairs	Setting up of a Local Area Network system with Statistical Information Database at Central Statistical Office Headquarters	Dec 1997
Ministry of Housing and Lands	Cartography Modernisation Project. Installation of specialised equipment (Digitisers, plotters, powerful computers) mainly for the production of high quality maps & plans	Apr 1997
Ministry of Housing and Lands	Computerisation of Administrative, Archives modules and Revenue System	Mar 2000, June 2001(Revenue System)
Ministry of Training, Skills Development & Productivity - Work Permit Division	Computerisation of the activities of Work Permit Division	Jul 2000
Ministry of Youth & Sports	Computerisation of allocated stores of Ministry.	Apr 1999
Ministry of Youth & Sports	Computerisation of youth, sports and administrative sections	Jul 2000

Source: Central Informatics Bureau.

Table 4.4: Mauritius Health Infrastructure, 2001	
Hospitals (Regional, District, and Community)	9
Medi clinics	2
Area Health Centre	23
Community/Family Health Centre	115
Public/private hospital beds	4'391
-Population : bed ratio	303 : 1
Public/private doctors	1'107
-Population : doctor ratio	1'089 : 1
Public/private dentists	149
-Population : dentist ratio	8'090 : 1

Source: Ministry of Health & Quality of Life.

research and training activities. The MIH and the MOH web pages feature statistics, policies, and information on current issues. The MIH's Information Gateway also provides links to online medical journals and an interactive request form to obtain offline journals.

Several ICT projects for health are under implementation or planned. This includes a pilot Integrated Hospital Management System project at the Cardiac Centre that will eventually be extended to all regional hospitals. The project includes office automation, email, Internet access and the creation of a web site. It also includes a database with patient details that will automatically generate discharge letters. Another project is the computerization of blood transfusion services at hospitals and mobile blood collection vans. The aim is to enhance blood donations, be able to easily trace blood donors and better manage blood stock and use.

One of the major plans is the *Integrated Information System and Smart Card* project. This personal identification card will contain a computer chip with every citizen's health record. It will be used to track the patient's medical record, use of services, and note appointments and reviews. This centralized system would allow the MOH to obtain more information on health care services, analyse public expenditure and track illnesses.

Though telemedicine would hold much potential for Mauritius, considering its geographic isolation, there have been difficulties implementing projects (Box 4.1).

Box 4.1: Telemedicine troubles

The first telemedicine project was launched in Mauritius in 1997.[6] The objective was to support remote diagnosis by facilitating the transmission of images (e.g., x-rays and scans) from one of the main hospitals in Mauritius to hospitals abroad, over an ISDN network. One of the benefits was that one channel of the ISDN connection could be used for image transmission and the other for discussion between the health experts. In the end, the telemedicine equipment was not used. The main reasons are the following:

1) Training: Health care staff is often not computer literate. A telemedicine project needs to go hand in hand with extensive training. In the case of Mauritius, the equipment was moved several times because the staff was not trained.

2) Awareness: Health care professionals are often unaware of the benefits of telemedicine. Unless they have a good reason to use the equipment, they may not be supportive. In the case of Mauritius, radiologists refused to use the equipment because it was not described in their duties.

3) Language: Telemedicine projects between different countries can encounter language barriers. Medical staff trained in one language may find it difficult to communicate in another language. In the case of Mauritius, the international link was with France whereas the Mauritian doctors were trained in English.

4) Costs: The cost of the equipment and network connection can be a constraint particularly if the link is with an overseas hospital. In Mauritius, the high cost of international calls was a constraint.

5) Technical support: Telemedicine equipment is complex as is the networking component allowing transmission of images. Inadequate support will result in delays if there are problems with the equipment or network. In the case of Mauritius, technicians had to come from Reunion, delaying use of the equipment for some six months.

The Mauritian experiment with telemedicine began as way back as 1997 and many of the barriers were teething problems associated with such a new service. Since then equipment has improved, it has become easier to use and prices have dropped. Awareness of the benefits of telemedicine has also grown. Mauritius has learned from its experience and today a number of telemedicine systems are developed in areas such as neo-natal care and heart disease treatment.

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[1] *The School Information Technology Project*. Available at http://ministry-education.gov.mu/sitproj.htm. [Accessed 21 July 2004].

[2] For information about the University of Mauritius network, see: http://www.uom.ac.mu/cits/index.htm. [Accessed 21 July 2004].

[3] University of Mauritius http://www.uom.ac.mu [Accessed 21 July 2004] and University of Technology http://www.utm.ac.mu. [Accessed 21 July 2004].

[4] NCB. *ICT Usage Survey 2001. A survey on the ICT adoption of businesses in Mauritius*. 2002. http://ncb.intnet.mu/ncb/survey/ict2001.htm. [Accessed 21 July 2004].

[5] National Audit Office. *Annual Report 2000-2001*. Available at: http://gao.gov.mu/rep01/telecommunication.htm. [Accessed 21 July 2004].

[6] This box is based on *Implementation of Telemedicine in the Republic of M*auritius, at: http://www.itu.int/ITU-D/fg7/case_library/documents/med001.doc. [Accessed 21 July 2004] and Parliament of the Republic of Mauritius. *Parliamentary Questions and Answers*, at: http://mauritiusassembly.gov.mu/pnqs/2002/w101405.htm. [Accessed 21 July 2004].

5. Connectivity

5.1 International and domestic backbone

Mauritius first connected to the Internet in January 1996 with a 128 kbps satellite connection.[1] Since then, bandwidth had grown in small amounts due to the high cost. In addition, periodic cyclones have occasionally necessitated bringing down the satellite antenna, effectively cutting off Mauritius from the world. In June 2002 Mauritius connected to the South Africa-Far East (SAFE) fibre optic submarine cable. The implications of this connection are far reaching with the cable an umbilical cord to the global digital economy providing a cornucopia of bandwidth. As the Prime Minister of Mauritius noted during the inauguration of the cable:

"As regards the modernisation of the telecommunications infrastructure, the South Africa Far East (SAFE) Submarine Cable Project will bring high-speed connectivity to our region. Under this project, a submarine fibre optic cable of 28,800 km will interlink Europe, South Africa and Malaysia via Mauritius and Reunion Island. It is a US$ 600 million project involving the participation of over 40 countries and it will offer a faster, more efficient trading channel between the continent and international markets."[2]

The visionary decision to participate in the SAFE cable dates back to 1993—

Figure 5.1: Feeling SAFER

SAT-3/WASC/SAFE fibre optic submarine cable system

Landing Points

1. Portugal
2. Spain
3. Senegal
4. Côte d'Ivoire
5. Ghana
6. Benin
7. Nigeria
8. Cameroon
9. Gabon
10. Angola
11. South Africa
12. South Africa
13. Reunion
14. Mauritius
15. India
16. Malaysia
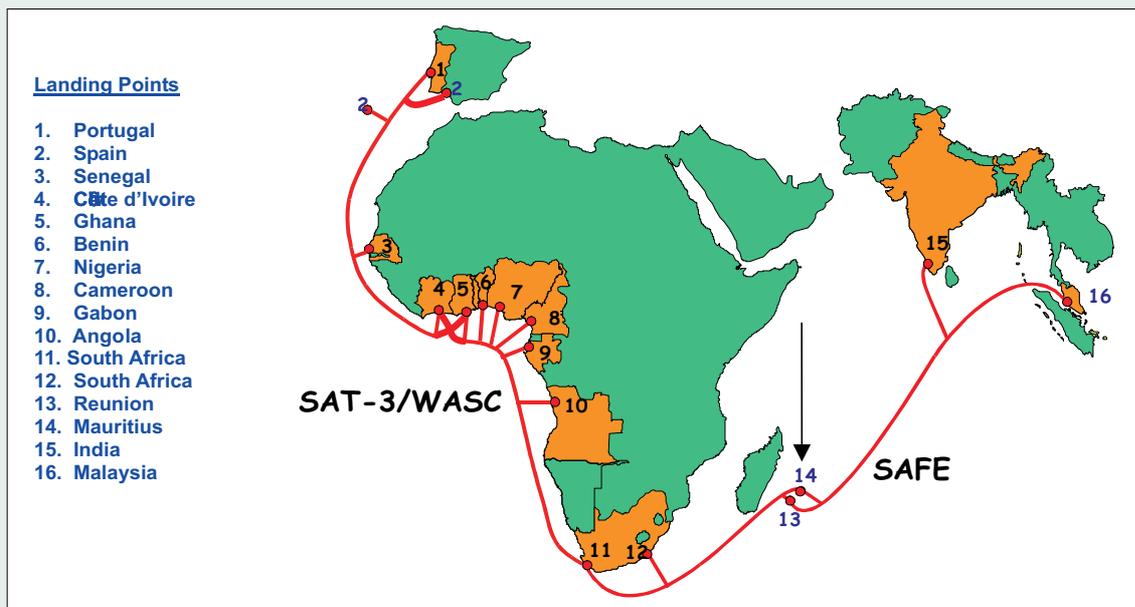
SAT-3/WASC

SAFE

Source: SAT-3/WASC/SAFE.

one hundred years after the first submarine telegraph cable connected Mauritius to Zanzibar and Seychelles— when Mauritius Telecom joined Telekom South Africa and Telkom Malaysia as initial investors in the project. Mauritius Telecom's investment in the US$ 600 million SAFE cable was US$ 96 million (equivalent to 20 per cent of its capital expenditures from 1993-2001).[3] SAFE has five landing points with the 13'500 kilometre cable stretching from South Africa to Malaysia (Figure 5.1). The South Africa landing point connects to the South Atlantic Telephone–West African Submarine Cable (SAT3/WASC), the fibre optic submarine cable that runs up the west coast of Africa to Portugal. SAFE can support 6.3 million simultaneous telephone calls and provides ten Giga bits per second (Gbps) capacity which can be upgraded to 130 Gbps.

At the end of 2002, MT had 34 Mbps of symmetrical international Internet bandwidth over SAFE, an increase of 240 and 750 per cent over its previous incoming and outgoing satellite bandwidth. Despite this massive increase in bandwidth, there are still reasons to believe that it is not enough. With a per capita bandwidth of 28 bps, Mauritius only ranks eighth among small island states. Another measurement of international Internet bandwidth is the Bit Minute Index (BMI). This assumes that the demand for international Internet bandwidth approximates that for international telephone traffic. The closer the value is to one, the more likely that Internet bandwidth matches demand. The value for Mauritius is 0.37.

The cost of international Internet bandwidth has been declining considerably. MT reports paying US$ 40'000 per month for two Mbps two years ago; last year it was US$ 20'000 and today, with SAFE, it is US$ 10'000. The Internet traffic MT carries over SAFE transits the SAT3/WASC cable and then goes via fibre from Portugal to Paris where it terminates at Telehouse, a hosting facility used by a number of major operators for Internet peering.

Although MT had a monopoly over international communications until the end of 2002, Business Parks of Mauritius Ltd. (BPML), the administrator of software parks was allowed to provide international communications to its customers. BPML has four Mbps of international bandwidth via the Thaicom satellite. Another ISP leases international bandwidth from MT.

A February 2001 government policy statement indicated that ISPs would be allowed to provide international connectivity via a cooperative VSAT facility managed by MT until December 2003. The status of that guideline is uncertain in light of the full liberalization of the market and the connection to the SAFE cable. The new telecom environment allows for international licenses and there have been a number of applicants. It is unlikely that new licensees could have direct access to the SAFE cable since MT owns the landing point. Their options would include leasing capacity from MT or procuring their own satellite bandwidth.

MT has a well-developed national backbone consisting of several fibre optic rings with a few microwave links. It connects Rodrigues through satellite. Available data protocols include Asynchronous Transfer Mode (ATM), Internet Protocol (IP), Frame Relay and X.25.

5.2   Exchange points

The need for a national Internet exchange in Mauritius has thus far not been necessary. Since MT controlled the international link, it performed the same function as long as it only routed overseas traffic abroad. In addition, most Mauritian Internet traffic is to web sites abroad given the English and French proficiency of the population and the volume of content available in those languages overseas. However, with liberalization of the market (e.g., more ISPs and more international gateways) and the development of local content (e.g., e-government project, on-line banking, domestic e-mails), it is logical to create a national Internet exchange.

Otherwise, locally destined traffic will be routed abroad, adding to expensive international Internet connectivity charges. While not mandating interconnection, the government's February 2001 ISP policy document states: "ISPs will be encouraged to promote local routing between their network through an Internet Exchange."[4]

5.3   User access methods

Over 95 per cent of Internet subscribers use dial-up. At the end of 2002, there were 55'000 dial-up subscribers in the country compared to 193 leased line and 1'300 Asynchronous Digital Subscriber Line (ADSL) subscribers. There were also 1'988 Integrated Services Digital Network (ISDN) subscribers (1'747 basic rate and 241 primary rate) with the majority probably connected to the Internet.

Broadband Internet access is still in its early stages. ADSL was launched in July 2002, immediately upon connection to SAFE. Service was available at six of Mauritius' 62 local telephone exchanges and plans are to have ADSL available at 24 exchanges by the end of 2003. The initial exchanges targeted are in high-density business areas. MT forecasts that ten per cent of telephone lines will be ADSL by the end of 2005 (around 30'000 based on December 2002 number of main lines) compared to 0.4 per cent today.

As cable television is not available, there is no high-speed Internet access available via cable modem. The appetite for multi-channel television is instead satisfied through satellite dishes and MMDS. An Indian company, Horizon Television Ltd., received approval from the Independent Broadcasting Authority (IBA) to provide cable television in December 2001 and subsequently applied for a license. Horizon plans to partner with the Central Electricity Board to utilize the latter's fibre optic network. Preliminary details suggest that the hybrid fibre coaxial cable network would also support cable modem access to the Internet. According to Horizon, it could quickly wire main cities covering around half of all television homes in the country.[5]

Mobile and other wireless access to the Internet is limited. There are less than 1'000 Wireless Application Protocol (WAP) users although it has been available since May 2002, and most handsets sold are now WAP-capable (it is estimated that perhaps one third of mobile handsets in circulation can support WAP). One reason is that speeds are limited to 9.6 kbps. There are no near term plans to introduce General Packet Radio Services (GPRS) that would provide faster speeds. Wireless Local Area Networks using the popular IEEE 801.b standard (i.e., WiFi) are not yet commercially available.

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[1] The Export Processing Zone Development Authority had a private link to Compuserve prior to 1996 and South Africa reported a 64 kbps satellite link to Mauritius in November 1995. In October 1995, TelecomPlus introduced experimental access to the Internet. In January 1996, Mauritius Telecom established its Internet connection, commercial Internet access became available and the .mu domain name started to be utilized.

[2] http://ncb.intnet.mu/ncb/infotech/2000/speech1.htm. [Accessed 21 July 2004].

[3] Mauritius Telecom obtained a US$ 28 million loan with from the Export-Import Bank of the United States to finance a portion of the SAFE link. Export-Import Bank (US). "EX-IM Bank Finances Mauritius Portion of Africa-Asia Undersea Cable." *Press Release*. 10 May 2000.
http://www.exim.gov/pressrelease.cfm/D4848BCC-DD2C-9519-6EB88A10E3683202/.
[Accessed 21 July 2004].

[4] Ministry of Information Technology and Telecommunications (Mauritius). *Policy Framework for Internet Service Providers (ISPs) in the Republic of Mauritius*. 6 February 2001.
http://ncb.intnet.mu/mitt/ministry/ispolicy.htm. [Accessed 21 July 2004].

[5] "Horizon bags Rs 60-cr Mauritius TV project." The Hindu Business Line. 20 April 2002.
http://www.thehindubusinessline.com/bline/2002/04/22/stories/2002042201230200.htm.
[Accessed 21 July 2004].

6.   Market

6.1   Overview

In 1997, the *Ministry of Information Technology and Telecommunications* (MITT) was created to formulate and implement policies for the Information and Communication Technology (ICT) sector. In late 2001 the ICT Act was passed by Parliament, replacing the 1998 Telecommunication Act. The ICT Act called for the establishment of the *Information and Communication Technologies Authority* (ICTA) to regulate the ICT sector, replacing the Mauritius Telecommunications Authority. ICTA started operating in August 2002 when the Chairman was appointed by the Prime Minister and the remaining members by the MITT. Its mandate is laid out in the ICT Act (Box 6.1). A

separate institution, the *Independent Broadcasting Authority* (IBA), regulates the broadcasting sector. The Chairman of the ICTA is also the Chairman of the IBA.

There has been limited competition in the ICT sector. Mauritius Telecom had exclusivity for fixed and international services (scheduled to terminate in December 2003) and there was a duopoly for mobile (since 1996) and Internet (since 2001) services. However, in November 2001, the government announced that it was advancing liberalization to begin from 1 January 2003 with Mauritius Telecom to be reimbursed for early termination based on losses it is supposed to determine. A public tender inviting applications for licenses was launched

Table 6.1: Telecommunication licenses

February 2004

Licence description	Existing licences (up to 31/12/02)	New licences (after 01/01/03) Applications received	New licences (after 01/01/03) Issued	Total licences as at 04/02/04
Public Switched (Fixed) Telephone Network	1 - Mauritius Telecom	1	MTNL	2
Public Land Mobile Network	2 - Cellplus, Emtel	2	MTNL	3
International Long Distance	1 - MT	19	Emtel, DCL, Hot Link, MTNL, City Call	6
Internet Service	8 - Clusterway Ltd, Data Communications Ltd, Harel Mallac & Co Ltd, MFDC Ltd, Paging Services Ltd, Rogers Telecom Ltd, SITA, Telecom Plus Ltd	11	Africa Digital Bridges Networks Ltd. , City Call Ltd., Mauripost.Net Ltd	11 1
Internet Telephony Service		9	PAGING SERVICES LTD	

Source: MIT&T.

Box 6.1: ICT Act

The Information and Communications Technologies Act (ICT Act 2001) is the main legal instrument governing the ICT sector in Mauritius. The Act outlines the establishment, management, power and duties of three institutions:

- The Information and Communications Technology Authority (ICTA) as the institution responsible for regulating the sector, replacing the MTA (Mauritius Telecommunications Authority);

- The ICT Advisory Council, to advise the Minister on matters related to ICT; and

- The ICT Appeal Tribunal to hear and dispose of any appeal against a decision of the Authority.

The Act also lays down principles and mechanisms for:

Source: ICT Act 2001.

- Regulation of the information and communication technologies sector including (i) telecommunications; (ii) the use of the Internet; (iii) development of an information society and online services; (iv) the protection and security of data; and (v) the facilitation of convergence;

- The democratization of information and communication technologies for the promotion of a knowledge-based society;

- The transition towards a fully liberalized and competitive market in the information and communication sector; and

- Establishment of a General Fund to which all regulatory payments and dues shall be paid and the creation of a Universal Service Fund.

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in November 2002. Complementing that was a Reference Interconnection Model from ICTA and a Standard Interconnection Agreement issued by Mauritius Telecom.

Although there were a number of license applications, including over a dozen for international telecommunication services, no licenses had been issued by mid-2003.[1] In the second half of the year, the situation changed and by the end of 2003, licenses had been awarded for fixed, international, mobile and Internet services (Table 6.1). ICTA also issued a number of Telecommunication Orders to supplement and clarify the ICT Act. The orders cover various issues such interconnection charges and tariff rebalancing that should help to facilitate liberalization of the sector.

A National Telecommunication Policy (NTP-2004) document was issued by the MITT in August 2003 covering the far-reaching changes that have taken place and establishing policy objectives and targets through 2008 (Box 6.2).[2]

6.2   Fixed networks

The first telephone was installed in Mauritius over 100 years ago in October 1883. Like a number of developing countries, national and international telephone services in Mauritius were separated. A government department operated national services and Cable and Wireless of the United Kingdom operated international services. However unlike many countries, posts and telecommunications were never combined in Mauritius.

Though Mauritius became independent in 1968, it was another 17 years before it took control of international telecommunication services in 1985. The integration of national and international services into the corporatized Mauritius Telecom in 1992, led to the fastest growth period in Mauritian telecom history. Between 1992 and 1996, the fixed line network grew over 20 per cent a year and teledensity rose from 7.3 to 19.4. Mauritius Telecom was partly privatized in November 2000, through the sale of 40 per cent for Rs 7'200 million (US$ 275 million) to strategic partner France Telecom.

Although Mauritius Telecom had an exclusive license until December 2003 (which was brought forward to December 2002), it has faced indirect competition, particularly in the case of international telephony. Callback

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Box 6.2: NTP-2004

This policy document establishes the vision and mission for the evolution of the Information and communication technologies (ICT) sector of Mauritius. This document further outlines the overall policy objectives and targets for the telecommunications sector and spells out the strategies to be adopted. It also sets out the methodology to ensure fair, effective and sustainable competition for the new market paradigm.

The salient features of this policy comprise the following:

- Transformation of the telecommunication market structure and regulation towards a more liberal, technologically-neutral and competitive one;

- Creation of a conducive environment to attract new investments and players;

- Establishment and promotion of the National Information Infrastructure;

- Consolidation of the independence of the regulatory authority;

- Provision of adequate info-communications services access at affordable prices;

- Development of management strategies for the use of scarce resources;

- Introduction of code of practice for service providers;

- Promotion of technology innovation and competition.

The major pillars of the NTP-2004 include implementing and fostering competition in the telecommunications services market, over the coming years and will also provide the basis for faster development of the telecommunications sector coupled with rapid technological changes. It will also pave the way for the adoption of the concept of convergence of Information Technology, media, telecommunications and consumer electronics.

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appears to be having an impact on international telephone traffic streams with outgoing traffic showing negligible growth over the last few years while incoming traffic has been growing. Internet telephony has also been growing although, legally, it requires a license to offer the service.

6.3 Mobile services

Mauritius was the first nation in the Southern Hemisphere to have mobile cellular service when EMTEL launched operations on 29 May 1989. However this milestone was short-lived and today Mauritius is no longer a trendsetter in mobile communications for developing nations. The number of mobile subscribers only surpassed fixed subscribers in 2002, a milestone that a majority of countries had achieved earlier. There are a number of reasons to explain this. First, there was a lack of competition. Although Mauritius granted a mobile license to a private company rather than the incumbent telecommunication operator, it did not introduce competition at that time. Instead, EMTEL was given an exclusive license for seven years. Mauritius

Telecom entered the market as the second operator only in 1996. A second factor is the widespread availability of the fixed network. Unlike many other developing nations, mobile was never a substitute for fixed telephony but rather a supplement. A third factor was market constraints such as the Receiving Party Pays (RPP) system.

The mobile market is currently a duopoly between EMTEL and CellPlus, the Mauritius Telecom cellular subsidiary. EMTEL is a joint venture between Currimjee Jeewanjee, a Mauritian business group and Millicom, the Luxembourg-based mobile operator with operations in a number of developing countries. Although EMTEL started earlier, CellPlus is now the market leader with a 72 per cent share at December 2002. The total number of subscribers at December 2002 stood at 348'000 for a density of 28.8 per cent. By December 2003 it had increased to 462'000 subscribers and a density of 37.9.

There are market and regulatory limitations in the mobile market. As mentioned, Mauritius uses the RPP. Persons receiving a call must pay if

Table 6.2: Mauritius telecommunications milestones

Oct. 1883	Installation of first telephone line in Mauritius.
Nov. 1893	Telegraph submarine cable connecting Mauritius to Zanzibar and Seychelles.
Sep. 1901	Second telegraph cable connecting Mauritius to South Africa and Australia.
1939	Department of Electricity and Telephones (later called Department of Telecommunications) created to operate telephone service.
Dec 1975	Satellite earth station established.
Jan. 1985	Overseas Telecommunication Services (OTS), government-owned operator takes over international communications from Cable and Wireless (UK).
July 1988	Establishment of Mauritius Telecommunication Services (MTS) as corporate entity taking over from Department of Telecommunications.
May 1989	Launching of analogue mobile cellular service by EMTEL.
	All main telephone lines connected to digital exchanges.
July 1992	Merger of MTS and OTS into Mauritius Telecom.
Feb. 1996	Launching of commercial Internet services.
Nov. 2000	Mauritius Telecom partly privatized with sale of 40 per cent to France Telecom.
July 2002	Launching of Mauritius' end of SAFE submarine fibre optic cable.
Dec. 2002	Mauritius Telecom monopoly legally ended.

Source: ITU adapted from MT, other sources.

Figure 6.1: Mauritius telecom history

SAT-3/WASC/SAFE fibre optic submarine cable system
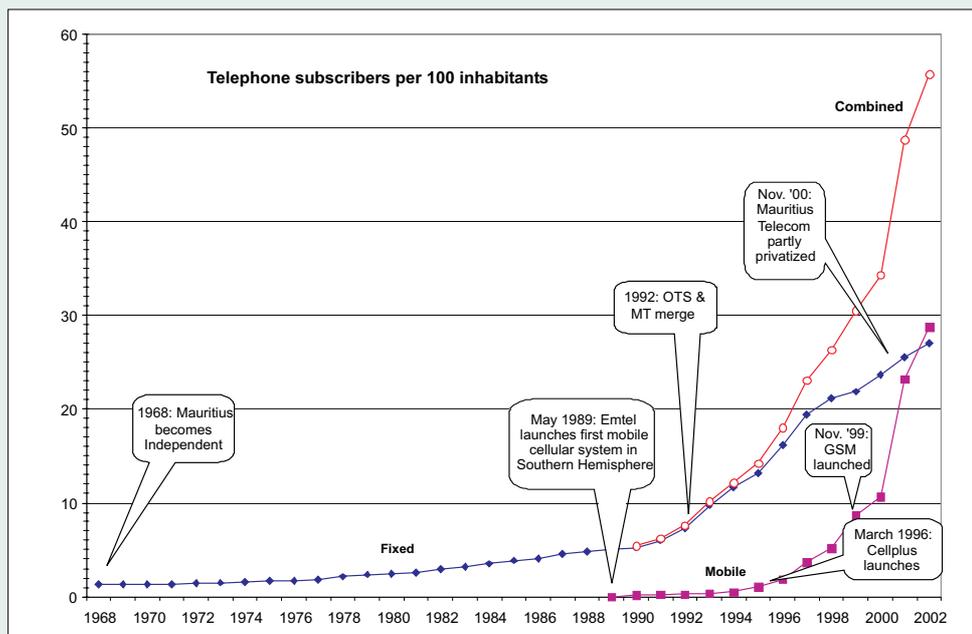
Source: ITU.

the call originated on the other mobile network or the fixed network. RPP is often the result of a failure to achieve acceptable interconnection terms by shifting the burden to the mobile subscriber. There has been a new dynamism in resolving mobile problems. For example, a recent decision by the ICTA has led to direct interconnection between EMTEL and CellPlus (before they had to go through the Mauritius Telecom network). This will result in lower costs with tariffs forecast to drop 40 per cent.[3] This should spur the mobile market, with forecasts of 500'000 subscribers within the next two years. Additionally, an agreement on inter-operator SMS became operational in May 2003.

Both operators are using the 900 MHz frequency band for their GSM networks. EMTEL recently converted all of its remaining subscribers to GSM whereas the CellPlus network has been GSM from the start. CellPlus was awarded a slice of EMTEL's frequency since its network has grown larger. CellPlus has applied for frequency in the 1800 MHz range whereas EMTEL is using that frequency for its backbone microwave network. At least one new company has applied for a mobile cellular license. There has been little regulatory direction in the area of third generation (3G) wireless services. Although UMTS, the European Union standard for 3G, has been mentioned as a possible type of license, no consultation or discussion papers have been issued. EMTEL has applied for and received several new licenses under the new liberalization environment including international telecommunication services.

6.4 Internet access

Telecom Plus, a Mauritius Telecom (MT) and France Telecom joint venture, introduced commercial Internet services

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Box 6.3: Music or Mauritius?

In the early days of the Internet domain names, based on the two letter codes used to identify a country — so-called country-code top-level domain (ccTLD) — were allocated on an informal basis. Responsibility for allocating ccTLDs lay with the Internet Assigned Numbers Authority (IANA). Many developing country governments were not active in Internet issues in its early days and as a result responsibility for the ccTLD often went to whoever applied. This was typically someone active in networking in the country, usually from the academic sector. Some governments now find it difficult to reclaim their ccTLD because ICANN (the Internet Corporation for Assigned Names and Numbers that today is in charge of IP address allocation) has often been reluctant to change administrators. Ironically, while much effort has been devoted to protecting commercial interests on the Internet such as trademarks in domain names the same transparent resolution process does not exist for what is essentially a country's property as much as its flag or national anthem.[4]

Mauritius is one of those countries where the government is not in control of its ccTLD. Responsibility for the MU Internet domain name was assigned to an individual in October 1995.[5] Although the official contact information for the .MU domain refers to a server in South Africa for domain name registrations, other companies are also performing this. For example, a US based company operating out of Los Angeles, California claims to be the manager of the MU top-level domain name. It is marketing .MU as the "Global Music Domain" given that the word for music begins with the letters MU in many languages. It sells a MU domain name for US$ 50 per year and states that tens of thousands have been registered ranging from Aerosmith.mu (a US rock band) to VictoriaBeckham.mu (a singer and former Spice Girl).[6]

In the meantime the Government of Mauritius is at the mercy of those controlling its domain name. It has reportedly had difficulties obtaining reasonable domain names, for which is has to pay, of course. The dilemma has forced the government to use awkward URLs, such as http://ncb.intnet.mu/govt, for the government or http://ncb.intnet.mu/mot for the Ministry of Tourism.

Mauritius' Information and Communication Technology Act (2001) assigns responsibility for its domain name administration to an Internet Management Committee within the telecommunication regulator, ICTA. According to Section 18 (y) of the Act, one of the functions of the ICTA is to "authorize or regulate the registration, administration and management of domain names for Mauritius."[7] Before ICTA can carry out its domain name duties, it must have control of the MU domain name. To obtain it, the Mauritian government will have to request ICANN to change the sponsoring organization for the .mu Top-Level Domain to ICTA.

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in February 1996. Telecom Plus had a monopoly until April 2001 when the government opened up the Internet Service Provider (ISP) market. Although some 20 licenses were issued, only one company had initiated commercial operations by the end of 2003. This was Digital Communications Limited (DCL) that launched in December 2001. In addition, Business Parks of Mauritius Limited (BPML) has permission to provide Internet access to customers located in the information technology zones it manages (see Section 7.1). At the end of 2002, Telecom Plus and DCL counted 55'000 subscribers between them.

Thus far, ISPs have not been allowed to install their own infrastructure and must lease it from Mauritius Telecom. The incumbent operator had an interconnection offer of Rs 0.33 cents per minute for ISPs wishing to transfer dial-up traffic over its network. MT also offers ADSL at wholesale prices. A Telecommunication Order issued in late 2003 reduced the Internet interconnection charge to Rs. 0.10 per minute. Furthermore, under the new regulatory environment, ISPs can provide their own infrastructure provided they have the appropriate licenses.

[1] On 26 November 2002, the telecommunication regulator, ICTA, issued a press release calling for license applications by 12 December 2002 and indicated that they would be issued by 31 January 2003. See http://www.icta.mu/images/ictapub1.jpg. [Accessed 21 July 2004].

[2] Ministry of Information Technology and Telecommunications. *National Telecommunications Policy 2003*. Draft. August 2003.

[3] Patrick Hilbert. "Les appels entre les opérateurs du mobile baissent dès le 1er mai." L'express.

[4] The resolution of trademark disputes in generic top-level domains (e.g., .com) is handled by an inter-governmental organization, the World Intellectual Property Organization. However the resolution of disputes over the administration of country level top-level domains is handled by a non-profit organization and must be approved by the US government.

[5] The Mauritius entry in the IANA ccTLD Database http://www.iana.org/root-whois/mu.htm [Accessed 21 July 2004] refers to Internet Direct as the Administrative Contact. The Founding Director of Internet Direct is Yann Kwok. See http://www.aftld.org/admin/excom/meeting_min_dec2002.html. [Accessed 21 July 2004].

[6] "Music Biz Embraces New Global Dot-MU Internet Music Domain." *BUSINNESS WIRE*. 8 January 2001. Available at: http://www.businesswire.com/webbox/bw.010801/210080032.htm. [Accessed 21 July 2004].

[7] See The Information and Communication Technologies Act 2001 available at http://www.icta.mu/icta/. [Accessed 21 July 2004].

7.   Information Society

Mauritius has exciting plans for becoming an information society or, in its own words, a *Cyber Island*.[1] The concept of building an information economy goes back to the early 1990s.[2] However it is only recently that top-level commitment backed by funding for specific Information and Communication Technology (ICT) projects has given Mauritius a new momentum. This is manifested in the government's intention to make information and communication technology the fifth pillar of the Mauritian economy alongside sugar, Export Processing Zones, financial services and tourism.[3] Thus, a key ingredient for the development of an information society — high-level government recognition and support — is present.

Institutionally, the information society is guided by the Ministry of Information Technology and Telecommunications (MITT) and umbrella agencies such as the National Computer Board (NCB) and the Information and Communication Technology Authority (ICTA). In addition, the Inter-Ministerial Committee on Information and Communication Technology, chaired by the Prime Minister, overlooks major ICT initiatives and has three task forces reporting to it:

- Cyber City chaired by the Deputy Prime Minister and Minister of Finance;

- E-Government chaired by the Ministry of Information Technology and Telecommunications; and

- E-Education and E-Training chaired by the Ministry of Education and Scientific Research.

Table 7.1: Mauritius e-laws

Laws governing the Information and Communication Technology sector, chronological order

Law	Description	Date passed
The Computer Misuse and Cybercrime Bill	Combat criminal activities perpetrated through computer systems.	May 2003
Information and Communication Technologies Act	Lays out institutional and procedural guidelines for regulation of ICT sector	December 2001
Electronic Transaction Act	Covers legal recognition and regulation of electronic records and signatures.	July 2000
Copyright Act	Protection of software and electronic databases	September 1997
Information Technology (Miscellaneous Provisions) Act	Deals with admissibility of electronic documents as evidence in court cases; data protection and security, computer misuse and patenting of software.	December 1998

Note: Full text of the laws can be downloaded from http://ncb.intnet.mu/mitt/ministry/legis.htm [Accessed 20 January 2004].
Source: ITU adapted from Ministry of Information Technology and Telecommunications.

A number of laws have been passed that facilitate the development of the information society such as the recognition of digital signatures, protection of copyrights and combating computer crime (Table 7.1).

7.1   Cyber City

Perhaps the most visible manifestation of Mauritius' push to become an information society is the *Cyber City* project.[4] Spread over 172 acres of former sugar cane plantation near the village of Ebene in the centre of the island, the project is a symbol of the transition from *sugar cane to computers*. Start-up financing for the facility comes from a US$ 30 million loan from the Indian government. Construction of the flagship 13-story Cyber Tower started in June 2002 and is planned for completion by March 2004. Information technology companies, government ministries and academic and research

organizations will construct their own low-rise buildings and the Cyber City will host a housing complex, shops and a hotel. When fully completed in 2007, the Cyber City is expected to employ some 20'000 people including 5'000-7'000 computer professionals. The project is expected to have a spill over effect and spread ICT throughout Mauritius, from the Cyber Tower, to the Cyber City and finally to the Cyber Island. The project is supervised by Business Parks of Mauritius Limited, the administrator of two other high-tech facilities offering call centres, data entry, software and web development, telemarketing and image capture and information processing operations.

7.2   Economic impact

There are no recent statistics on the size of the overall ICT sector in Mauritius. Data from 1997 suggest that the ICT sector accounted for 3.3 per cent of total sales in the economy.[5] Another measure of the sector's economic impact is telecommunication service revenue as a percentage of GDP. In 2002, communication services were estimated to have contributed Rs 4.1 billion or 2.9 per cent to Gross National Income (GNI). This is not particularly high considering that in many island economies telecommunication services account for a far larger share. One reason is that despite the historical existence of a monopoly, telecommunication prices in Mauritius are relatively low. This is in contrast to other economies where a high share of telecommunication revenues to GNI is partially due to high prices. Furthermore, while the share of the telecom sector per se may seem low, the widespread availability and low prices contribute to growth in other sectors. Indeed Mauritius' other economic pillars are all export oriented and dependent on efficient and competitively priced telecommunication services.

Telecommunications in Mauritius has had a major impact on foreign direct investment (FDI). The November 2000 sale of 40 per cent of Mauritius Telecom to France Telecom netted the government

Rs 7.2 billion (US$ 275 million), an amount equivalent to half of all FDI over the last ten years.

7.3   Employment impact

Another criterion for a country's evolution to an information society is its ability to produce or attract the necessary number of ICT workers. On the one hand ICT workers provide the required knowledge base to allow this transition. On the other hand the ICT sector represents a new and growing source of employment. This is particularly important in Mauritius where employment in the traditional sectors of the economy such as sugar and the EPZs is starting to decline and where growth in the financial sector appears to have stagnated. The employment benefits of the information sector in Mauritius look promising. It is estimated that of the five pillars, only the tourism and ICT sectors showed a growth in employment in 2002. According to a government study, employment in the IT sector alone could total between 15'000–25'000 by 2005.[6] If so, the

IT sector would be the second largest employer of the five pillars (after the EPZs).

7.4   Social impact

Another way of gauging the status of an information society is to measure the impact of electronic information on citizen's lives. Almost all Mauritians aged 13 and over watch television or listen to the radio and 92 per cent of households have a television in their home. There is however a gap between *old* (TV, radio and fixed telephone) and *new* (mobile telephone, PC and the Internet) ICT. While eighty per cent of households have a telephone, only 18 per cent have a personal computer and 13 per cent have Internet access. Usage also reflects this gap with the average Mauritian spending almost 30 hours a week watching TV but only one hour surfing the Internet.

For those using newer ICT, changes are occurring in lifestyles. Almost half of those with a PC at home use it for email and 23 per cent use it for doing office work at home. Education and entertainment are also popular applications. Personal financial activities using electronic services are also popular. The ratio of credit cards to the adult population stands at a high 91 per cent suggesting that most Mauritians are accustomed to making electronic payments. The nation's 261 Automatic Teller Machines (ATMs) processed 2.5 million transactions in December 2002 (or 2.8 per adult population[7]). Some seven per cent of households with Internet access shopped online for its *convenience*.

Many are still not aware of the benefits of ICT and there is a significant digital divide between poor and rich, male and female and educated and less educated. More than 80 per cent of households do not have a PC. Of those that do but do not have an Internet connection, 32 per cent stated they were not interested. In the year 2000, half the households without a computer stated that they did not see the necessity for one. These reasons outnumber affordability with 19 per cent of households saying the reason for not having Internet access was that it was too expensive. This reflects a lack of awareness and shows how much ground remains to convince the sceptical of the benefits of the information society. One of the key ways to change thinking is through education.

Figure 7.1: Education and ICT

Relationship between Gross National Income per capita (Purchasing Power Parity, US$ 2002), fixed telephone penetration 2002 and Internet users per 100 inhabitants 2002 (left) and tertiary school enrolment and post-secondary educational attainment, selected countries (right)
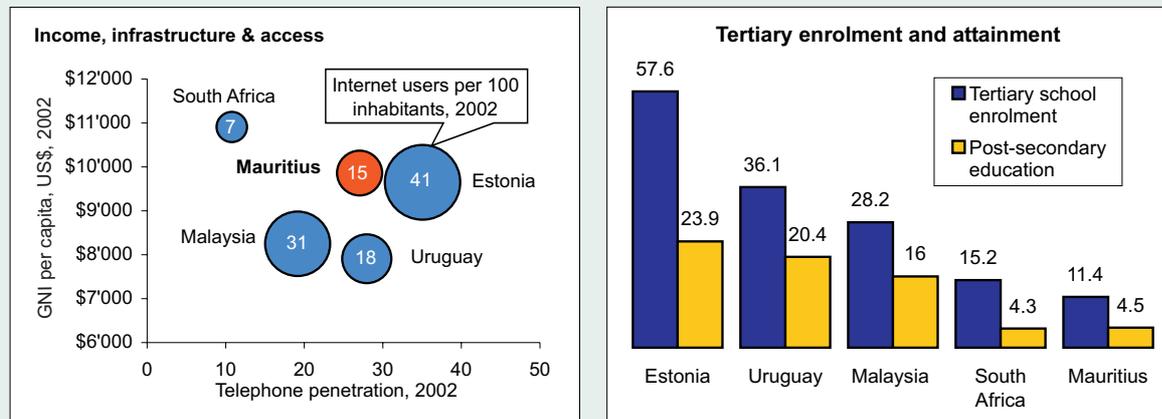
Note: In the left chart, the size of the bubble reflects the relative penetration of Internet users. Figure for Mauritius is from the NCB and does not reflect 2002 survey data reported by CSO.
Source: ITU adapted from GNI: World Bank. Telephone penetration and Internet penetration: ITU. School enrolment data: UNESCO. 2001. Educational attainment data: Mauritius 2001 household survey. Estonia 2000 Population and Housing Census. Malaysia Population and Housing Census 2000. Uruguay 2001 Household survey (localities with more than 5'000 inhabitants). South Africa 1996 Census.

7.5   Education

### 7.5.1 Why education matters

A significant determinant of a country's ability to transition to an information society is its knowledge base. Indicators such as educational attainment and school enrolment help determine the potential for ICT use. They also suggest whether a country's digital divide is predominantly market-based or whether people lack the necessary skills to exploit ICT. There are signs that Mauritius lags in this area. In terms of Internet access, Mauritius performs less well compared to countries of similar economic level. For example, while Mauritius has a higher telephone penetration than Malaysia, Malaysia's Internet penetration is double that of Mauritius. One reason is Mauritius' relatively weaker knowledge base. Mauritius has the lowest tertiary enrolment level of peer countries and the second lowest level of educational attainment (Figure 7.1, right).

The link between knowledge and Internet use in Mauritius is confirmed by data mapping usage to the level of education attained (Figure 7.2, left). While those with a post-secondary education only account for 4.5 per cent of the overall population, they account for a third of Internet users. At the other extreme, those with primary or less education account for 53 per cent of the population but for just five per cent of Internet users. While almost all of those with a post-secondary education use the Internet, only 1.5 per cent of those with a primary education are online (Figure 7.3, right).

Similar results are found when the data is analyzed by whether the user is a student or not. Around one third of Mauritian Internet users are students. Here there is considerable untapped potential since only an estimated 20 per cent of students are using the Internet.

Higher-educated Mauritians are more likely to use computers because they have access to a PC at work or at school. The lack of awareness of the

Figure 7.2: Internet access and educational attainment

Distribution of Internet users by highest level of educational attainment (left) and percentage of population using Internet by educational attainment (right), Mauritius, 2002

Internet User Profile by highest educational level attained (%), 2002

- Primary or below
- Secondary
- Post secondary

33
62
5

Post secondary — 100%

Secondary — 24%

Overall — 15%

Primary or below — 2%

Mauritius: Per cent of population using Internet by educational attainment, 2002

Source: ITU adapted from National Computer Board, Central Statistics Office.

benefits of the Internet plays an important role. According to the NCB's *ICT Outlook 2002*, there are three main reasons for not having Internet access from at home. While 57 per cent say they do not have the equipment, and 19 per cent say access is too expensive, 32 per cent assert that they are simply not interested in accessing the Internet from at home. The report concludes, "*In order to become an ICT literate nation, the population must be aware about how to use a computer, the benefits they can obtain from making use of ICT and how ICT will change their life in the future.*"

7.5.2 Government strategy

Education in Mauritius has top-level support: "*Our growth prospects will be shaped mainly by our ability to invest massively in our people and develop their full potential.*"[8] While there is a special focus on Information and Communication Technologies (ICT), the idea is to reform the entire educational system by increasing the number of secondary schools and students, providing more scholarships, and standardizing degrees offered by non-public institutions. The 2001/2002 budget included a number of ICT-specific investments, including over 350 new computer labs in primary schools, training for teachers, investment in the new University of Technology and provision of basic computer skills for school-leavers.

One of the three task forces of Mauritius' top ICT body, the *Inter-Ministerial Committee on Information and Communication Technology*, is *E-Education and E-Training*. Headed by the Minister of Education and Scientific Research (MESR), the task force's activities include assessing the nation's ICT manpower requirements and developing a national training strategy that covers not only students, but also other segments of the population. In order to pursue these goals, several sub-committees were formed and their findings released in an interim report issued at the end of 2001.[9] The report analyses ways in which the country could produce more and better ICT manpower. It also notes the inadequate level of IT training for teachers. While all teachers are obliged to follow IT classes "i*t would seem that this module only makes the teachers computer literate rather than enabling them to use IT for teaching across the curriculum.*" The

report emphasizes the need to standardize certification of computer training courses. These are mushrooming across the country but without the necessary quality control.

7.5.3 Primary and secondary education

Mauritius' primary and secondary school system has recently gone through a major reform to make education more accessible and increase the number of students. Under the previous system, a selection process limited the number of students who could continue secondary education. Under the new system, which will establish some 50 new schools through the year 2006, all students will be able to continue after primary school. The number of years of compulsory education has also been raised from seven to eleven years or until about the age of 16. These steps should boost the secondary gross enrolment rate that stood at 64 in 2002.

ICT courses were made compulsory in secondary schools in 1995 and students are expected to be proficient after the third year. The MESR has established definitions for different levels of proficiency (Table 7.2). Some 330 primary school teachers were hired in 2001 and completed a nine-month ICT training course. From 2003 on, they will teach ICT courses in every primary school.

The use of ICT as an educational tool is limited. A pilot project, funded by the MESR and the British Council, was launched in 1997 to supply seven schools with two multimedia PCs, one printer and educational software. Specially trained teachers used ICTs for math and language courses. The evaluation of the project was positive. There are plans to use ICT as a pedagogical tool across the curriculum from 2006, by when all teachers will have received the necessary ICT training. The planned academic network, SchoolNet, is to be a source of education software, which will be developed by the National Centre for Curriculum and Research Development, part of the MESR. The tender for the first phase of the School IT Project also includes a package for educational content. There are also private sector initiatives to provide online educational packages.

To encourage students to use and apply ICT, the National Computer Board (NCB) organizes annual software competitions with cash prizes. Students have to think about how the Internet can be used as a research tool and create a corresponding web site. All secondary schools in the country can participate in the competition, which started seven years ago.

Table 7.2: How ICT literate are you?	
Classification of ICT literacy levels	
Level	*Competencies*
1. Computer Awareness	Basic understanding. Use email and browse Internet. Use printer, floppy drive, CD drive.
2. Computer Literacy	Use software, such as word processing, graphic function. Retrieve information through the Internet.
3. Computer Proficiency	Understand all parts of the PC. Produce documents using spreadsheet software. Use multi-media tools and create presentations. Use simple databases.
4. Computer Studies	Passed O-levels in computer studies.
5. Computing/ Associate Computer Professionals	Passed A-level in computing and completed a post secondary certificate course in IT.
6. Computer Professionals	Tertiary course of 2 years or more in IT.
7. IT Specialists	Have a computer science degree and more than 4 years experience and be specialized either through a post-graduate degree or further experience.

Source: Ministry of Education and Scientific Research.

7.5.4 Tertiary education

Mauritius has made efforts to increase the number of higher education students, especially in the ICT sector. Since 1988 a specialized government entity, the Tertiary Education Commission (TEC, at http://tec.intnet.mu) has been in charge of enhancing Mauritius' post secondary education. Its main tasks are to monitor human resource development, promote new post-secondary education and training facilities, supervise public and private institutions and advise the Minister of Education on tertiary education policies. Since tertiary education depends on the secondary sector, TEC closely monitors the high school curriculum, especially with regards to computer science courses.

During the 2002 school year there were 22'292 students enrolled in tertiary education (including overseas) representing 18 per cent of the tertiary age group.[10] The goal is to increase this number to about 35 per cent over the next five years.

The University of Mauritius, the country's largest university, has expanded the number and scope of its ICT courses and the University of Technology was set up in 2000 to help Mauritius achieve its new objectives. In addition the government is negotiating with the Indian Institute of Technology to establish a campus in Mauritius. To increase the pool of ICT manpower, there are plans to facilitate accreditation for private institutions and to devise an incentive scheme for private providers to offer tertiary education. TEC closely works with Business Parks of Mauritius, the administrator of the Cyber City project, to identify the number and type of ICT degrees that will be needed. While Mauritius currently faces a shortage of ICT graduates, the government has clear goals on where is needs to go, how it can get there, and the progress it is making (Box 7.1).

Table 7.3: Computer Science students			
Students enrolled in computer science programs at tertiary level, 2002 school year			
	Number of Students		
Institutions	Total	Of which Computer Science	As % of Total
University of Mauritius	5'310	662	12.5
University of Technology	718	366	51.0
Mauritius Institute of Education	2'151	-	-
Mahatma Gandhi Institute	489	-	-
Mauritius College of the Air	164	6	3.7
Polytechnics	1'058	318	30.1
Other	369	154	41.7
Publicly funded institutions	**10'259**	**1'352**	**14.7**
Distance Education	7'242	1'962	27.1
Overseas	4'791	618	12.9
Total	**22'292**	**4'086**	**18.3**

Source: ITU adapted from Tertiary Education Commission.

7.5.5 Distance education

The Mauritius College of the Air (MCA) is the nation's public distance education institution. Established in 1985, MCA has a long history of using distance education methods through a combination of correspondence courses, radio and television. A national resource centre creates audio and video programmes. MCA collaborates with overseas institutions such as the Indira Gandhi National Open University of India to deliver distance education courses. The MCA has been slow to adopt newer ICT-based training tools; it does not have its own web site and computer-based training appears limited. There are just a few ICT courses available and in 2002, only six students were enrolled in the Computer Studies field. The total number of students enrolled at MCA was 164 in 2002.

Numerous overseas universities also provide distance education with an enrolment of 7'242 in 2002. Distance education accounted for the largest share of tertiary Computer Science students with 1'962.

A major concern with distance education is how quality can be ensured. In this respect, Mauritius has standardized exams for distance education. Examinations for a number of overseas institutions offering distance education are carried out at the Mauritius Examinations Syndicate (MES). In addition, organizations such as the Chamber of Commerce and British Council also conduct examinations on behalf of overseas institutions.

7.5.6 The ICT workforce

In addition to increasing enrolment of computer programmes at the tertiary level, Mauritius has several other initiatives for expanding the ICT workforce:

- To help recent graduates acquire work experience, the NCB, together with the Ministry of Finance, has set up the *IT Skill Development Scheme for Young Graduates*. So far 23 trainees have been enrolled and posted in government organizations while others have been recruited by the private sector.

- Private sector companies can apply for a scheme, through which the government pays 50 per cent of a new ICT graduate's salary.

- Companies investing in training Mauritians in ICT may get up to 70 per cent reimbursed from the government.

Mauritius also has to rely on foreign ICT workers to complement its workforce. To this end, it has facilitated the process for obtaining a work permit. Through the *Scheme to Attract Professionals for Emerging Sectors*, which was passed in August 2002, the government provides professionals with incentives to work and live in Mauritius. This includes accelerating the application process, granting residency, and allowing spouses to work. The number of foreign ICT specialists who received a work permit increased from one hundred in 2001 to 117 in the year 2002.

7.5.7 ICT for the public

While the need for ICT in educational institutions is accepted and promoted, countries need to think about alternative ways of providing ICT skills to other members of society. This applies to people who do not use ICT

Box 7.1: Analyzing IT workforce supply and demand, today and tomorrow

In 2000 it was forecast that by the year 2006, Mauritius would need between 7'000 to 13'000 Information Technology (IT) specialists, an estimate based on demand for computer professionals working in the new Cyber City as well as in other areas of the economy. [12] Mauritius will require a large increase in IT skilled staff to meet this demand. In 2000, the National Computer Board (NCB) carried out a survey and estimated that there were 1'900 IT professionals in the country. Three years later, in 2003, the number had increased to 3'200.

The Tertiary Education Commission (TEC) has compiled data on the number of students in IT fields that are expected to join the workforce over the next few years. The data is further aggregated by type of institution (e.g., public, private, etc. (Box Figure 7.1, left)), degree and type of studies. In 2000, TEC estimated that 388 newly trained IT graduates joined the workforce. Based on an assumption of 15 per cent annual growth in IT enrolment in public institutions, government officials conclude that: "*At the current rate, the output of the Tertiary Education Sector would be inadequate to supply the projected demand of Computer Professionals and Specialists*."[13] Together with the statistics on demand for IT specialists in the coming years (Box Figure 7.1, right), the government can estimate the IT workforce gap and act appropriately. Depending on the scenario, Mauritius will just meet the need for IT professionals by 2006 (assuming a low estimate for demand and a rapid acceleration of training); in the worst case, the country could face a shortage of over 8'000 IT professionals. Steps to overcome the gap include expanded IT training by the private sector as well as overseas labour (both Mauritians abroad and foreigners). The effort already seems to be paying off with a 175 per cent increase in IT degree enrolment between 2000 and 2001 (from 1'291 to 3'569). However, the government will have to ensure that the quality of training is not sacrificed in a rush to increase the supply of IT graduates.

Most data on the number of IT professionals is based on estimates. To get a better overview of the IT professional sector, the NCB has established a database on Mauritian IT professionals as well as IT students. To encourage professionals to register, prizes are awarded. One aim is to create a network within the local IT community, and to inform participants about seminars, conferences and other events. The NCB also posts a list of IT vacancies received from the Ministry of Employment on its web site.

Box Figure 7.1: Supply and demand for Mauritian IT professionals

Distribution of enrolment in tertiary computer science studies by type of institution, 2001 (left) and forecast demand and supply of IT professionals, 2000-2006 (right)

Enrolment in tertiary education computer science studies, distribution by type of institution, 2001

Private / distance education 61%
Overseas 10%
Publicly funded institutions 29%
Total: 3'569

Forecast supply and demand for IT professionals

Demand for IT professionals (1)
Demand for IT professionals (2)
Supply of IT professionals (3)
Supply of IT professionals (4)
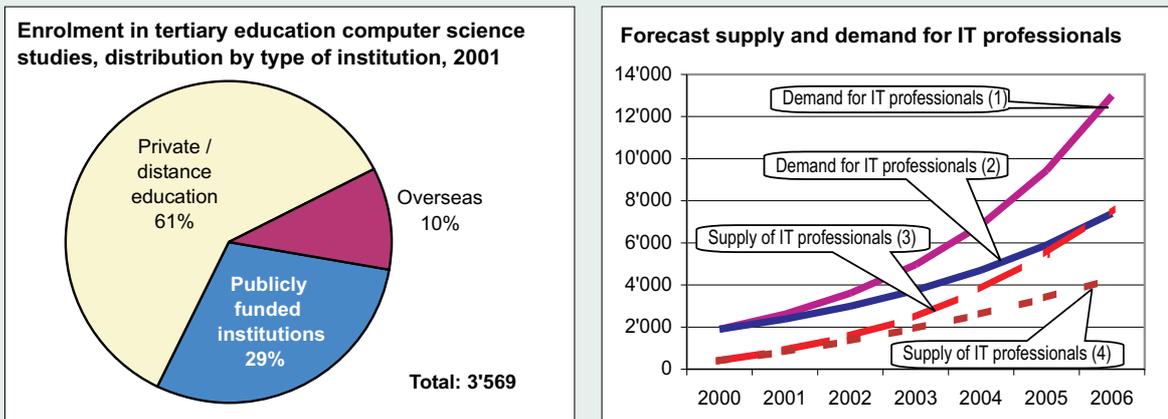
Note: In the right chart: (1) Based on forecasts of ICT turnover; (2) Based on forecasts of ICT value-added; (3) Based on assumption of acceleration of IT training; and (4) Based on growth in IT enrolment of 15 per cent a year.
Source: ITU adapted from Central Statistics Office, Ministry of Education and Scientific Research and Tertiary Education Commission.

at school or work, and includes the elderly, homemakers and the unemployed. Mauritius has identified different groups that government actions have to target (Figure 7.3). The analysis highlights the number of

people in each group and the level of ICT literacy that they should achieve (Table 7.1). For example, every unemployed person and 50 per cent of others (e.g., homemakers, disabled, retired) should be trained to be computer literate.

ICT training for the public is carried out through the Computer Proficiency Programme (CPP), introduced in 2000. Training is offered in some 35 secondary school computer labs after school hours. Participants attend a 48-hour course spread out over six days during a month in classes of twenty. The courses are aimed at those with no computer skills and teach office automation applications and how to use email and the Internet. Participants pay a modest fee (Rs 700/US$ 23). So far some 9'000 people have received training and the goal is to boost this to 20'000 people a year.

The main body in charge of promoting ICT in the country is the National Computer Board (NCB). It has a number of programmes for increasing ICT awareness among citizens. Around 20'000 people have received introductory ICT courses thanks to the two *IT coaches* that have visited 285 community centres, schools and libraries. The project was launched in 2000. With nine PCs and two animators per bus, users can chose between three types of classes (ICT literacy, ICT awareness and an ICT programme for children). The courses are free (the receiving institution paying electricity and telephone charges for Internet access). The NCB also organizes an ICT week, a public event that includes workshops on the impact of the Internet. The Resource Centre, located at NCB headquarters in Port Louis, provides PCs with Internet access to the public. The

Figure 7.3: Targeting different groups

Population segments identified for different types of ICT training
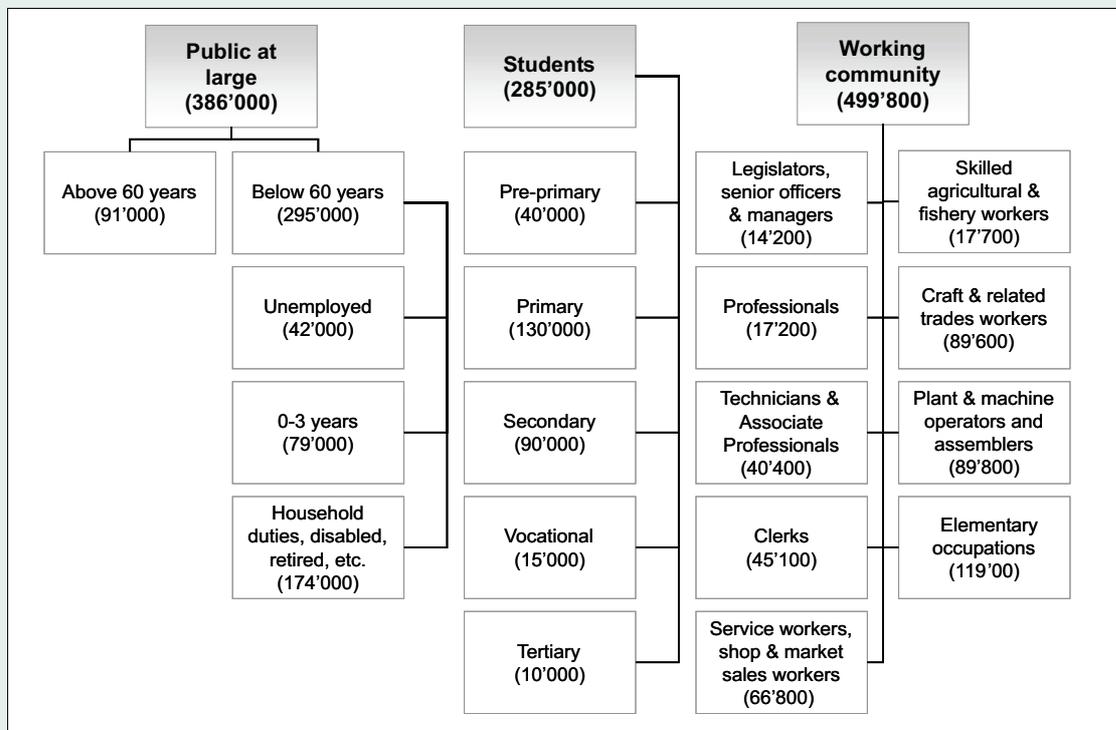
Source: ITU adapted from "Report of the Sub-Committee for Developing a National Strategy for the Promotion of E-Education and E-Training for Students, the Working Community and the Public at Large", 2001.

Resource Centre also has a library with magazines and reports on ICT such as multimedia and networking.

The Gian Nath Computer Scheme, named after a former Minister, was launched in 2000. The goal of the project was to increase IT awareness by setting up ICT facilities in public locations across Mauritius, including 112 community centres, 12 women centres, 52 social welfare centres and ten public centres in Rodrigues. Each location was equipped with two multimedia PCs and free Internet access. However personnel were not assigned to supervise use of the facilities and follow up problems, the main reason why the project was discontinued. The government's ultimate goal is to reduce reliance on public facilities by promoting its "A computer in every home" strategy.

7.6   E-Government

The Government of Mauritius realizes that the historical perception of public service is characterized by queues and slow procedures. It is keen to overcome that stereotype by using ICTs to offer "efficient, effective and citizen-focused public services 24 hours a day, 7 days a week."[14] One

step in that direction beginning in 1996, has been putting all ministries online with web sites containing information about their work, including legal texts, publications, events, services available to the public and contact details. A growing number of government departments provide downloadable forms online, adding to convenience for citizens. Over 100 forms were available in early 2003 including applications for passports and driving licenses and tax and business registration forms.[15] Public administration web sites — including the 26 ministries and over 80 governmental bodies — are linked through the Government of Mauritius web portal (www.gov.mu) (Figure 7.4, left).

Several interactive government services are available mainly targeted at the business community. These include TradeNet, introduced back in 1994. The system allows import and export businesses to submit declarations and other documents electronically to the Customs and Excise Department. Another example is the Contributions Network Project, available since January 2002, allowing companies to file taxes online.

Mauritius is now moving towards a higher level of achieving its vision of

Figure 7.4: Around the clock, 24/7

Government of Mauritius Web Portal (left) and Mauritius e-government scheme (right)

Source: www.gov.mu and ICTA.
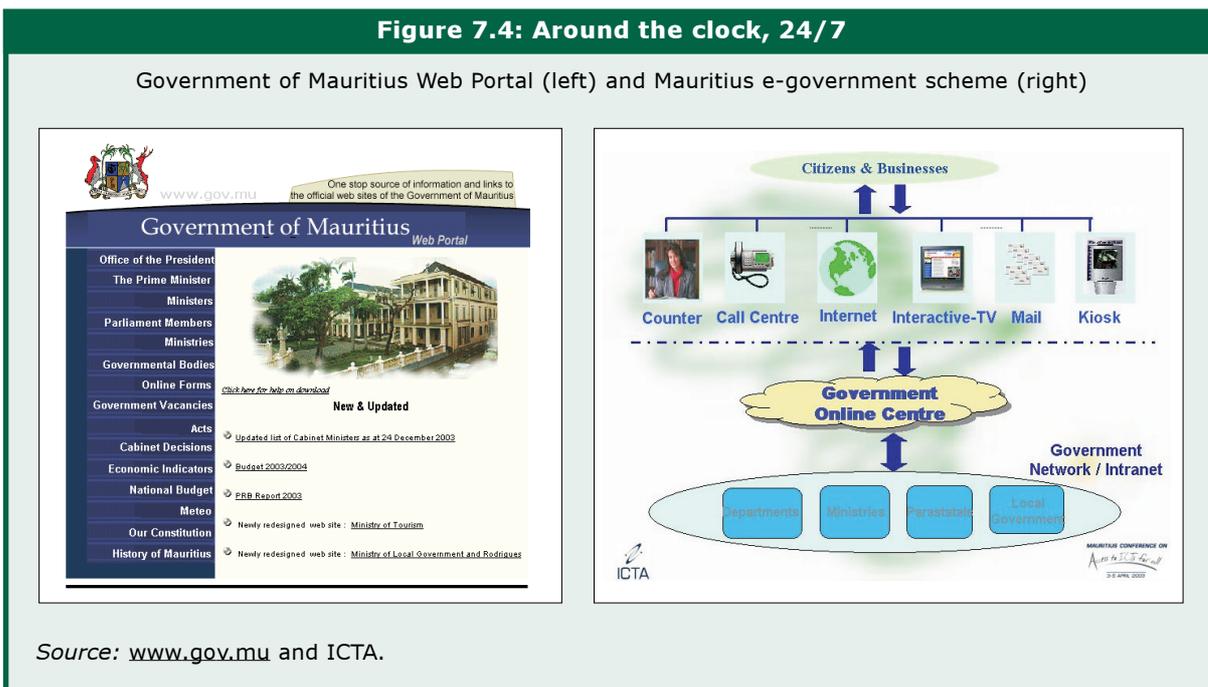
around the clock availability of *all* government services for citizens through several e-government initiatives and projects. This involves making the transition from static web sites to fully integrated transactional services. E-government would be accessible from a variety of access points including traditional counter services, as well as the Internet, kiosks and call centres (Figure 7.4, right).

The E-government Task Force, chaired by the Minister of Information Technology and Telecommunications, has been charged with overseeing implementation of the e-government program. A concept paper lays out the vision, objectives and benefits of e-government and sets the deadline of 2005 for having all government services online. Key players to implement the programme are the Central Informatics Bureau and Central Information Systems Division working with a Chief Information Officer in each ministry.

The e-government programme consists of a number of projects of which three main ones are currently being implemented: Government Online Centre (GOC), Government Intranet System and E-Government: Online Delivery Services (Box 7.2). The heart of the system is the GOC. The total budget for implementing GOC is Rs 40 million for the next two years. A tender for Phase I was launched in January 2003. This phase will develop an E-Centre and Government Portal. Phase II of the project will focus on disaster recovery and Phase III will be a Government Call Centre to handle queries.

Box 7.2: Major E-Government projects

Government Online Centre

The Government Online Centre (GOC) will be the focal point through which citizens and businesses will interact electronically with the government. It will provide Internet connectivity as well as email facilities for the entire civil service. It will also be a central repository for some applications and databases for ministries and departments. A Government Portal — part of the GOC — will provide a window to Government Online Services to the public and businesses.

Government Intranet System

Mauritius is proceeding to set up a "joined-up government" through which public sector institutions will communicate and collaborate more effectively — the Government Intranet System (GINS). The essence of the GINS is the development of a well-integrated and extensive information infrastructure, based on advanced information technology to link all government agencies. The GINS will provide a common and highly secure platform for information sharing between the government agencies through the Government Online Centre (GOC).

Electronic Service Delivery

Popular applications have been identified for the implementation of online delivery of government services. The following are a few of the services being considered: Application for Scholarships, Application for Driving Licence, Application for Vacancies in the Civil Service, Application for Lump Sum (National Savings Fund) & Application for Work Permit. These services will be deployed once the Government Online Centre is operational. Other services will be implemented at a later stage.

1   "Apart from infrastructure development, which is well underway, we need to focus on three other critical factors for transforming Mauritius into a CyberIsland. These are human resource development, telecoms connectivity and access to computers at home." http://www.cdacindia.com/html/pdf/pmspeech.pdf. [Accessed 21 July 2004].

2   For example a National Seminar on Information Technology was held in December 1993 and a joint National Computer Board - World Bank report entitled *Information Technology and the Competitive Edge* was issued in June 1995. See http://www4.worldbank.org/afr/poverty/pdf/docnav/02375.pdf. [Accessed 21 July 2004]. A National Information Technology Strategy Plan was issued in 1997. See http://ncb.intnet.mu/ncb/nitsp/. [Accessed 21 July 2004].

3   "Government is giving top priority to the development of the ICT sector to make it the fifth pillar of the economy."

4   For more information on the Cyber City project see the Business Parks of Mauritius Limited web site at http://e-cybercity.mu. [Accessed 21 July 2004].

5   This is derived from adding "Office, accounting and computing machinery", "Radio, television and communication equipment and apparatus" and "Telecommunications services; information retrieval and supply services" from the Products section of Mauritius' 1997 Supply and Use Tables, SOURCE?.

6   "Report on Demand in IT Sector (2001-2005)." http://economicdevelopment.gov.mu/it.htm. [Accessed 21 July 2004].

7   Adult population refers to Mauritians 15 years and older.

8   Ministry of Finance and Economic Development. 11 June 2001. *Budget Speech 2001/2002*. Available at: http://ncb.intnet.mu/mof/budget/. [Accessed 21 July 2004].

9   Ministry of Education and Scientific Research. *Interim Report of the Inter-Ministerial Task Force on E-Education and E-Training*. Available at: http://ncb.intnet.mu/education/cont_rep.htm. [Accessed 21 July 2004].

10 Data for tertiary enrolment come from the Central Statistics Office. *Digest of Educational Statistics 2002*. "Total number of students enrolled in Tertiary Education, both locally and overseas, by field of study — 2001." Available at: http://ncb.intnet.mu/cso/report/natacc/edu02/tab514.htm. [Accessed 21 July 2004]. In Mauritius, the age group for secondary school is 12 to 19 years. The gross tertiary enrolment ratio was calculated by dividing the number of students enrolled in tertiary education by the population aged 20 to 24 years.

11 The 2000 data is from the Ministry of Education and Scientific Research. *Report of the Sub-Committee to Take Stock of the Existing State of E-Education and E-Training in Mauritius*. Available at: http://ncb.intnet.mu/education/irrept02.htm. [Accessed 21 July 2004].

12 The range in forecast IT employment is based on two scenarios. One assumes a certain growth in ICT sector value-added while another assumes a certain growth in ICT turnover. See Ministry of Education and Scientific Research. *Report of the Sub-Committee on Demand for Information Technology Manpower (2001-2006)*. Available at: http://ministry-education.gov.mu/irrept01.htm. [Accessed 21 July 2004]. At the same time the Chief Executive of Business Parks Mauritius Ltd. stated that the number of IT professionals required for by the year 2008 would be 15'000. Akilesh Roopun. March 2003. *Quinze mille professionnels pour les TIC en 2008*.

13 Ministry of Education and Scientific Research. *Report of the Sub-Committee to Take Stock of the Existing State of E-Education and E-Training in Mauritius*. Available at http://ministry-education.gov.mu/irrept02.htm. [Accessed 21 July 2004].

14 E-Government Task Force. *E-Government Concept Paper*. Available at: http://ncb.intnet.mu/mitt/ministry/ICT/cpaper.htm. [Accessed 21 July 2004].

15 See "Government of Mauritius On line Application Forms" web page at: http://www.gov.mu/forms.htm. [Accessed 21 July 2004].

8.   Conclusions

8.1   Small is beautiful?

One of the aims of this study is to examine the specific problems small island developing states face in adopting ICT. An often cited problem, isolation, is being overcome by Mauritius in several ways. The decision to connect to the SAFE submarine fibre optic cable system has provided the island a lifeline to the global information society. In the words of the former Prime Minister: "*Our physical isolation will no longer hold us back from complete interaction with our major markets beyond geographical and time barriers*."[1] Thus, a key factor for helping small island states overcome isolation is ample connectivity to global communication networks.

Another way in which isolation can be turned to an advantage is by exploiting the increased concern about security in the post-September 11 2001 world. Isolation can now be equated with safety since it implies being far away from terrorism. Properly marketed, this can help attract ICT businesses and Mauritian authorities cite this as a selling point.

Another concern of island nations is small size. On the one hand, this can be an advantage. The relatively small size of the main island of Mauritius (1'864 square kilometres and where 97 per cent of the population reside) has made it easy to install infrastructure. Mauritius has a high level of telecommunication access with over 80 per cent of households possessing a telephone and virtually universal mobile cellular coverage. There is no infrastructure barrier to every Mauritian having access to telephone service.

Another advantage of a small country is that people know each other and that there is a relatively close relationship between the government and citizens. Government actions are closely followed and easily criticized. This 'quality control' mechanism helps reduce corruption and makes the government more efficient.

A related concern of SIDS is undersized markets. Many island states have relatively small population sizes that result in higher costs (due to lack of economy of scale) that may be a disincentive to investment. This has often been used as an argument for the maintenance of a monopoly for the provision of telecommunication services. In the case of Mauritius, it has had limited experience with competition. There have been two competing mobile cellular providers since 1996, but the results have been mixed. Mauritius was late to achieve the mobile transition (where there are more mobile than fixed telephone subscribers) and has been late to adopt newer mobile data technologies. This has more to do with social and regulatory aspects (as well as the highly developed fixed network) than small market size. Mauritius has now fully thrown open the door to market liberalization and received more than a dozen applications for new licenses, suggesting that market restriction rather than market size inhibits investment.

Another aim of the case study was to see how developing nations are adapting to becoming information societies. For example, is the term information society of more concern to rich, developed nations that are highly wired and where access to ICT is ubiquitous or does it also have relevance in developing nations? In the case of Mauritius, the desire to grasp ICT for economic and social development is enunciated at the highest level of the government. It has been backed by US$ 100 million in funding to build a Cyber City and

develop e-education and e-government. Public access and use of ICT is growing. This suggests that the information society is not entirely the prerogative of rich, developed nations.

8.2 Where does Mauritius stand?

One drawback of a relatively small population (151st in the world) is that Mauritius is often ignored in most e-readiness indexes prepared by different organizations. This makes it difficult to assess where it stands. One it is included in is the Network Readiness Index (NRI) compiled by the World Economic Forum.[2] Mauritius is ranked 56 out of 82 nations in the NRI. This is a drop from its previous year ranking, which was 51. In terms of the composites that make up the index, Mauritius fares well in its business and economic environment and general infrastructure, but less so in ICT Policy, e-commerce and e-government.

In order to overcome the limitations of existing ICT indices in terms of scope and coverage, the ITU created the Digital Access Index (DAI) in 2003.[3] It is based on five components that determine how well an economy provides access to ICT: infrastructure, pricing, education, quality and usage. Economies are classified into one of four access groups: high, upper, middle and low. Mauritius ranks 62nd out of 178 countries in the DAI with an overall value of 0.5 (out of a maximum of 1.0). Although it ranked second in Africa (after Seychelles), Mauritius just makes it into the upper category.[4] Its strongest asset is affordability, with a value close to the average for both the upper and high groups (Figure 8.1, left). However it lags in all the other categories. It is instructive to compare Mauritius to peer countries from other regions such as the United Arab Emirates, Chile and Malaysia that have similar aspirations of developing an ICT export sector. Again Mauritius does well in terms of affordability and its level of infrastructure is equivalent to two of the three peer countries. It falls behind in the other categories, particularly usage (Figure 8.1, right). Boosting the level of Internet users, which is tied into education, will be a challenge.

The ITU has also been using the Mosaic framework to assess e-readiness in nations. Advantages

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Figure 8.1: Mauritius and the DAI

Mauritius compared to group averages and selected countries in the Digital Access Index, 2002

Source: ITU.
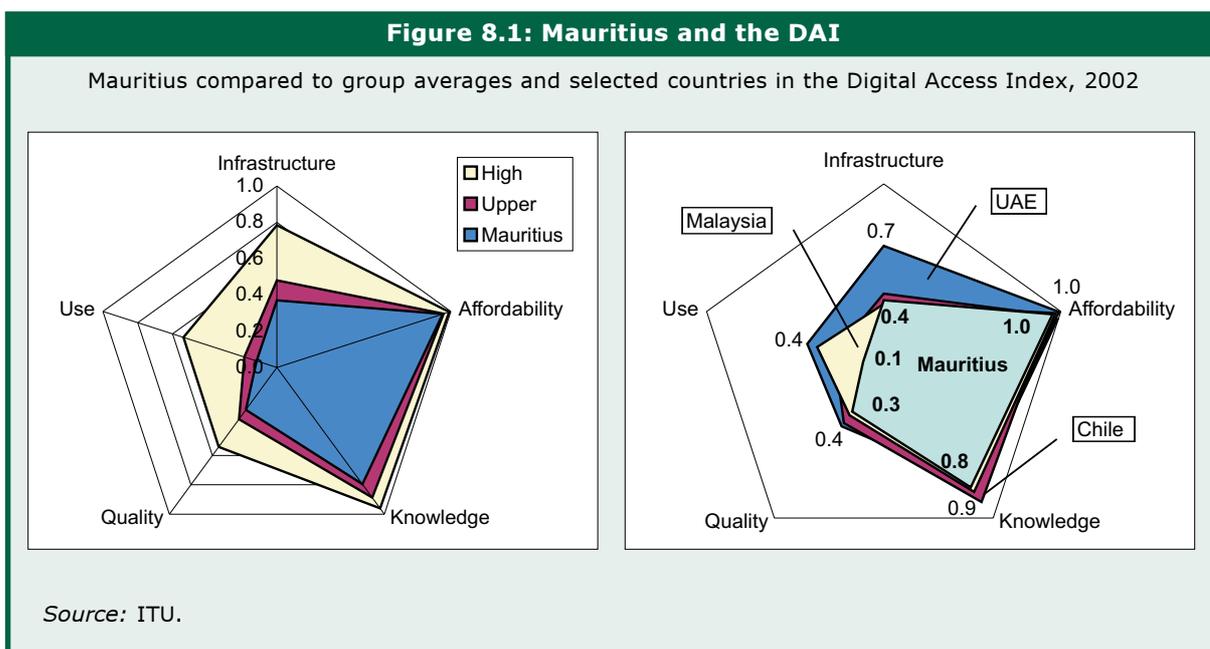
of this framework include its application to many countries, detailed analysis and comprehensive assessment by looking at a number of different factors. The framework was applied to Mauritius (Box 8.1). Mauritius ranks fifth out of the 18 economies that have been thus far analyzed and has improved from an earlier assessment using the same framework. One of the features of the Mosaic framework is that it allows a quick visual assessment of where a country is strong and where it is weak (Box Figure 8.1, left). In the case of Mauritius, it is strong in terms of access and infrastructure but weaker in terms of organization (market structure) and the sophistication of applications.

To summarize, Mauritius' strength is its infrastructure and affordability while its weaknesses are market structure and usage and sophistication of ICT. The government is moving to address these issues. There has been a recent emphasis on education aimed at increasing secondary and tertiary school enrolment. There is also an e-government project that aims to deliver all public services online. The liberalization of the ICT sector since 1 January 2003 addresses market limitations. It is crucial for these initiatives to be carried forward for Mauritius to minimize its weaknesses and threats in order to seize the opportunities offered by ICT (Table 8.2).

Table 8.2: Mauritius SWOT
Strengths. Weaknesses, Opportunities and Threats

Strengths	**Weaknesses**
Language (bi-lingual in French and English)	Low secondary and tertiary school enrolment
Kinship with India	Shortage of ICT professionals
Telecom infrastructure	ICT regulatory inexperience
Widespread access to basic telecom	Geographic isolation & small size
Current government commitment to ICT	
Fibre-optic bandwidth	
Good governance	
Stability & security	
Geographic isolation & small size	
Opportunities	**Threats**
Leverage fibre-optic bandwidth capacity to develop offshore ICT industry	Telecom liberalization stalls
Leverage ties with India to benefit from India's offshore software development expertise	Future governments not as committed to ICT
Leverage language skills particularly for French-speaking markets	Other competitors in offshore software industry
Leverage geographical proximity and trade links with Africa to export ICT services	

Source: ITU.

Box 8.1: State of the Internet in Mauritius

The ITU has been using a framework to analyze the development of the Internet in different nations. Developed by the Mosaic group, the framework consists of values for six different elements that have an impact on Internet take-up. Values range from 0 to 4; the higher the value, the better.

Pervasiveness measures the overall access rate to the Internet. Mauritius is rated *pervasive*, 4, as the estimated penetration rate is 15 per cent of the population (above the 1 in 10 to reach the pervasive level).

Dispersion measures the geographical spread of Internet access. Here too Mauritius is rated 4, *nationwide*, with Internet access available throughout the island.

Absorption measures the extent to which different sectors of the economy are using the Internet. Mauritius is rated 3, *common*, with between 50 – 90 per cent of organizations in the academic, government, business and health sectors having Internet access.

Infrastructure measures the extent and speeds of backbone and local access networks. Mauritius is rated 2.5, between *expanded* and *broad*. Mauritius has a well-developed telephone network and recently connected to the SAFE fibre-optic cable for international connectivity. However, the predominant method of access to the Internet is still via low-speed, dial-up.

Organization measures market conditions. Mauritius is rated 2, *controlled*. There are only a few ISPs and they mostly rely on Mauritius Telecom for connectivity. Though the government has recently liberalized the telecommunication industry, it is still too early to say what impact that will have on a creating a dynamic and competitive ICT sector.

Sophistication measures how usage ranges from conventional to highly sophisticated. Mauritius is rated 2, *conventional*. According to surveys, the most popular applications in Mauritius are surfing and e-mail. The usage of more advanced applications such as media streaming, e-commerce transactions and government interaction are still developing.

The ITU has carried out evaluations for 18 economies since January 2000. One way of comparing economies is to sum the individual scores. The highest ranked economy thus far is Hong Kong, China with an overall score of 22.5 (out of a possible maximum of 24). Mauritius ranks fifth with a score of 17.5. One benefit of the Mosaic framework is that it highlights which areas a country need to improve to enhance its Internet diffusion. In the case of Mauritius, this would be organizational and sophistication, areas where it is below or just above the averages of the 18 countries evaluated. In the case of organizational, Mauritius has recently opened up its telecommunication market and it is too early to gauge the impact. In the case of sophistication, there is a need to further develop and get people to use applications that go beyond the trivial such as online financial, shopping and government transactions. Mauritius has made impressive progress in Internet diffusion over the last five years. A September 1998 Mosaic rating gave Mauritius an overall score of only eight.

Box Figure 8.1: State of Internet in Mauritius
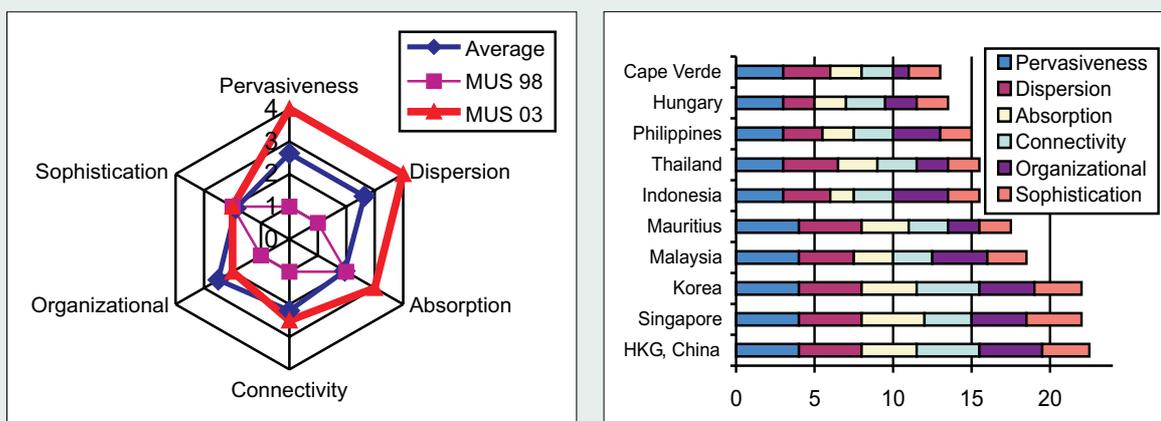
Note: The higher the value, the better (0=lowest, 4=highest).
Source: ITU.

8.3   Recommendations

There are no major problems in most areas of the Mauritian ICT landscape. The government has recognized the country's weaknesses and taken steps to address them. For example, market liberalization has been on-going for several years and though there have been delays, it is on the right track. The government is also moving to boost educational levels, increase ICT training and raise awareness.

- *Enhanced coordination and planning*. Though the Mauritian government has been promoting the use of ICTs since the late 1980s, the first strategic plan was developed in 1997 covering a five-year period. This plan is no longer mentioned and seems to be abandoned. Emphasis is now placed on three projects emanating from the former Prime Minister: cyber city, e-education and e-government. These projects have not been elaborated in an integrated plan and a strategic overall plan for the ICT sector is lacking. The consequences are that the ICT push may be prone to uncertainty depending on changes in government. This will make it difficult to predict the long-range evolution of the sector, assess the impact of government policies and could discourage investment. A new ICT sector strategy and plan, incorporating the recent projects as well as other initiatives is needed.

  A number of agencies are involved in ICT issues including the Prime Minister's office, MITT, NCB, ICTA, BPML and IBA. It does not appear that coordination mechanisms are optimised. This results in a duplication of efforts and uncertainty about the direction of the industry. It is not always clear what repercussions the decisions in one agency will have on another. For example, there is a plan to put Internet access in Post Offices as a way of enhancing universal access. But there does not appear to be a clear link about how this will tie into universal access policy (e.g., will Mauritius Post be reimbursed? Will the government subsidize Internet access at Post Offices? Will the Post Office be required to get an ISP license?). Another example relates to convergence. Some laws and institutions reflect the fusion of telecommunications and computing such as the ICT Act and the existence of the Information and Communications Technology Authority and the Ministry of Information Technology and Telecommunication. However broadcasting has a separate regulatory authority that licenses television services. This can cause regulatory and administrative complications since cable television systems can also offer telephony and Internet access. It appears that a consolidation of tasks including possibly the creation of a "super" ICT agency might be helpful. At a minimum, the agencies above should meet on a formal and regular basis.

- *Wireless and broadband push*. There has been a delay in the adoption of key wireless technologies such as high speed mobile, Wireless Local Area Networks (WLAN or Wi-Fi) and fixed wireless as well as high-speed broadband Internet access. Part of this is due to regulatory uncertainty and part to perception about market readiness. In regards to WLAN, this market should be liberalized and the frequency deregulated as has been done in many other nations around the world.[1] A strategy for third generation mobile services needs to be developed quickly. The development of alternate broadband technologies (e.g., cable modem, high-speed wireless) to MT's ADSL service needs to be encouraged to boost broadband penetration and drive Internet experimentation and development and use of innovative applications.

- *Test bed*. There is currently a mismatch between Mauritius' aspiration to become a cyber island and adoption of new technologies. Part of this is due to the advanced state of the fixed line network as well as the island's small size. One area where Mauritius could leverage its small but relatively sophisticated developing country market is as a test bed for new technologies. This could include broadband access technologies such as ADSL and cable modem as well as wireless technologies such as 2.5/3G, fixed wireless and Wi-Fi. A precedent has already been set with an offer to establish a third generation CDMA2000 1x mobile network. Mauritius provides an ideal venue to test new products in a bi-lingual and developing country environment with tropical weather conditions. The government could encourage this by waiving licensing conditions and import restrictions for products to be tested. The large numbers of tourists that visit Mauritius are also a potential test-bed for emerging mobile roaming applications such multimedia messaging.

- *Statistics*. Mauritius has a variety of data available for its ICT sector. The NCB commissions surveys on household and business use and the CSO is increasingly adding questions about ICT use in its surveys. MT has also been forthcoming about furnishing data relating to its networks. However, Mauritius needs to enhance its current statistical coverage of the ICT sector in order to improve analysis and planning. There are shortcomings in the existing surveys and there is a lack of official data for several key indicators (e.g., size of ICT sector, e-commerce activity). There are also inconsistencies between NCB and CSO data relating to the number of households with PCs.

  The CSO is to be commended for carrying out the first survey on individual Internet use in 2002, the first in Africa. However this needs to be expanded to include data on gender and other socio-economic aspects of users. It is recommended that the NCB work with the CSO to create a stand-alone ICT household and individual survey based on international models (e.g., Eurostat). This should also be extended to cover businesses use of ICT, where again international models exist. Although the CSO has indicated that a business survey will be conducted beginning in August 2003, results would not be available until late 2004. This schedule needs to be accelerated.

  The role of ICTA in the data collection process also needs review. According to the ICT Act, ICTA is empowered to collect information and is charged with producing an annual report:

  - "*... commission expert evaluations, conduct studies, collect data related to the information and communication industry*; "

  - "*The Authority shall furnish to the Minister — an annual report on the development of the information and communication industry in the country, as may be prescribed*;"

  This would be in line with other regulatory agencies around the world, many of which collect, aggregate and disseminate statistics for their ICT sector. This is all the more pressing given that the telecom sector has been liberalized and there will be many more operators. ICTA should collect operator data and disseminate the information on its web site at least quarterly.

- *Universal service and access*. Government efforts to increase the level of PC ownership, for example through the *Computer in Every Home* campaign, are important. Initiatives to promote

PCs and Internet access in homes should be increased. As this is likely to take some time, it is unlikely that the majority of homes will have a computer and Internet access in the near future and the lack of public access points will limit the potential number of new Internet users. Alternative access points should be provided, including by the private sector. Different initiatives for providing public Internet access should be coordinated to avoid duplication. The Universal Service Fund should be utilized to increase access to ICT from both households and public locations.

At the same time, Mauritius has reached a level of economic development where there should be near universal availability of telephones in the home. Effective policies need to be designed to get telephones in the twenty per cent of homes that still lack them. This also should be carried out through the Universal Service Fund.

Finally, universal service and access progress should be tracked on a regular basis. The availability of ICT in homes should be measured on an annual basis and targets should be established for this (rather than overall teledensity or penetration figures per population).

- *Marketing linkages to French-speaking nations and Africa.* Mauritius sees one of its market niches in the area of ICT service exports as an interlocutor to the francophone world and Africa. This is supported by its French heritage and widespread use of the language and its geographical, political and trade ties to Africa. These advantages should be more strongly exploited through marketing campaigns and accelerated business links to francophone and African companies. It may be useful to create an entity

whose task is focussed on this activity.

- *Awareness.* The government is pursuing a number of strategies to raise ICT awareness and take-up. This includes the mandate of NCB to promote an ICT culture and initiatives such as the *IT Coach*, the Computer Proficiency Programme and loan subsidies for the purchase of personal computers. An increasing number of government forms are also being placed online with the goal of having all government services available online by 2005. Nonetheless Internet penetration stood at just ten per cent of the population in 2002. This will need to be dramatically increased to achieve the government's dream of converting Mauritius to a Cyber Island. ICT awareness needs to be boosted in imaginative ways. Surveys continue to show that many people are unaware of the benefits of ICT. One way of increasing ICT visibility would be for the government to rapidly launch an interactive service and to encourage the private sector to do the same that compels people to use computers and the Internet. For example, this could be an online driving license application system where users enter and submit the form online and receive their license in the mail, without ever having to wait in a line. This should be backed by a large publicity campaign emphasizing how much easier it is to do things online rather than in person.

- *Benchmarking.* Mauritius is geographically in Africa and there is a tendency to benchmark the nation's ICT development to other African countries. Inevitably, Mauritius ranks high. Instead a set of peer countries should be selected that are more realistic comparators to measure Mauritius' aspirations for developing into a cyber island. These would include other upper-income nations from different regions that also aspire

to a high level of ICT development such as Chile, Malaysia and the United Arab Emirates. Regular reports should be produced comparing Mauritius' progress to these nations.

[1] Speech by The Right Honourable Sir Anerood Jugnauth, Prime Minister on the occasion of the inauguration of the SAT-3/WASC/SAFE Cable System in Mauritius. 6 June 2002.

[2] World Economic Forum. *Global Information Technology Report 2002-2003 - Readiness for the Networked World*. http://www.weforum.org/pdf/Global_Competitiveness_Reports/Reports/GITR_2002_2003/GITR_Rankings.pdf. [Accessed 21 July 2004].

[3] See the Digital Access Index web page at http://www.itu.int/ITU-D/ict/dai/index.html. [Accessed 21 July 2004].

[4] A Mauritian newspaper covered the country's Digital Access Index score noting it could do better. See Hilbert, Patrick. "Tic : Maurice deuxième en Afrique australe. » *L'Express*. 26 November 2004. Available at http://www.lexpress.mu/display_article_sup.php?news_id=8543#. [Accessed 21 July 2004].

[5] The ITU Radiocommunication sector notes: "What is often meant by the term "unregulated frequencies" is the frequency bands for industrial, scientific and medical (ISM) applications." This includes the 2.4 GHz frequency used for WLAN. See http://www.itu.int/ITU-R/terrestrial/pub-reg/faq/#g013. [Accessed 21 July 2004].

Annex 1: Acronyms and abbreviations

ADSL	Asynchronous Digital Subscriber Line
ATM	Asynchronous Transfer Mode; Automatic Teller Machine
BMI	Bit Minute Index
BMPL	Business Parks of Mauritius Limited
CcTLD	Country-code top-level Domain
CIO	Chief Information Officer
CSCP	Civil Service Computerization Programme
CSO	Central Statistics Office
EGMP	E-government Master Plan
EPZ	Export Processing Zone
FDI	Foreign Direct Investment
Gbps	Giga bits per second
GDP	Gross Domestic Product
GHz	Giga Hertz
GINS	Government Intranet System
GOC	Government Online Centre
GPRS	General Packet Radio Services
IANA	Internet Assigned Numbers Authority
IBA	Independent Broadcasting Authority
ICANN	Internet Corporation for Assigned Names and Numbers
ICT	Information and Communication Technologies
ICTA	Information and Communication Technologies Authority
IP	Internet Protocol
ISDN	Integrated Services Digital Network
ISP	Internet Service Provider
IT	Information Technology
ITU	International Telecommunication Union
MBC	Mauritius Broadcast Corporation
MCA	Mauritius College of the Air
MDG	Millennium Development Goals
MES	Mauritius Examinations Syndicate
MESR	Minister of Education and Scientific Research
MIH	Mauritius Institute of Health
MITT	Ministry of Information Technology and Telecommunications
MOH	Ministry of Health and Quality of Life
MT	Mauritius Telecom
MTA	Mauritius Telecommunications Authority

MTS	Mauritius Telecommunication Services
NCB	National Computer Board
NHIS	National Health Information Systems
OECD	Organisation for Economic Co-operation and Development
OTS	Overseas Telecommunication Services
PC	Personal Computer
Rs.	Rupee. The national currency. The 2002 annual average rate of Rs. 29.96 per one United States dollar is used to make conversions in the report.
SAFE	South Africa-Far East fibre optic submarine cable
SAT3/WASC	South Atlantic Telephone–West African Submarine Cable
SITP	School Information Technology Project
SITRAC	State Informatics Training Centre Limited
SWOT	Strengths-Weaknesses-Opportunities-Threats
TEC	Tertiary Education Commission
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific, and Cultural Organization
UoM	University of Mauritius
VoIP	Voice over Internet Protocol
VSAT	Very Small Aperture Terminal
WAP	Wireless Application Protocol
WAN	Wide Area Network
WiFi	Wireless Fidelity
WLANs	Wireless Local Area Networks
WSIS	World Summit on the Information Society
US$	United States dollar

Annex 2: Schedule of Meetings

Organization	Date
Ministry of Information Technology and Telecommunications	Mon 7th April
Central Statistical Office	Mon 7th April
National Computer Board	Tues 8th April
Emtel (unconfirmed)	Tues 8th April
Business Parks Mauritius Ltd	Wed 9th April
Information and Communications Technology Authority	Wed 9th April
Mauritius Post Limited	Wed 9th April
Mauritius Telecom	Thurs 10th April
Cell Plus	Thurs 10th April
Telecom Plus	Thurs 10th April
Community Internet Access Centre/Cybercafe	Thurs 10th April
Tertiary Education Commission	Fri 11th April
Ministry of Education & Scientific Research	Fri 11th April

Annex 3: ICT statistics

Year Ending 31.12

	Note	Unit	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
DEMOGRAPHY, ECONOMY												
Population	1	10x3	1'113	1'122	1'134	1'148	1'160	1'175	1'187	1'200	1'210	1'221
Households	2	10x3	259	264	271	277	283	290	296	300	302	305
Gross domestic product	3	10x6	63'043	69'082	77'310	86'428	99'890	107'444	119'529	131'895	142'127	
Gross Fixed Capital Formation	3	10x6	19'350	16'750	20'125	23'430	23'082	29'676	28'069	30'280	30'575	
Average annual exchange rate per US$	3			17.96	17.39	17.95	21.06	23.99	25.19	26.25	29.13	29.96	
Consumer price index	3			94	100	107	114	122	130	135	143	...	
Telecom equipment imports	4	10x6	17	25	38	21	19	43	36	21	46	
TELEPHONE NETWORK												
Main telephone lines			129'443	148'185	183'861	222'747	245'367	257'099	280'885	306'773	327'225	348'235
Main tele. lines p. 100 inhab			11.6	13.2	16.2	19.4	21.1	21.9	23.7	25.6	27.0	28.5
% households with a tele.	5		34.1	40.4	50.4	54.8	59.5	64.6	70.2	76.3	80.4	
% digital main lines		%	100	100	100	100	100	100	100	100	100	
% residential main lines		%	68	72	82	80	80	80	80	80.5	80	
Public payphones			428	859	1'346	1'900	2'401	2'803	2'925	2'981	2920	
Waiting list			43'838	46'640	35'888	23'214	24'970	29'052	18'914	9'916	13'518	
MOBILE SERVICES												
Cellular mobile telephone subscribers			5'706	11'735	20'843	42'515	60'448	102'119	180'000	272'416	348'137	462'400
- Digital cellular subscribers			-	-	5'563	16'167	26'162	43'412	150'000	200'000	348'137	462'400
Cellular subscribers p. 100 inhab.			0.5	1.0	1.8	3.7	5.2	8.7	15.2	22.7	28.8	37.9
Radio paging			...	8'000	6'000	7'500	1'367	1'287	989	882	...	
OTHER SERVICES												
ISDN			9	29	56	146	242	557	927	1'412	2'601	
ISDN B channel equivalents			18	114	280	1'216	2'108	4'194	6'278	8'116	12'034	
TELEPHONE TRAFFIC (minutes)												
Local		10x6	...	...	...	...	...	...	1'513	1'510	1'544	
Internet dial-up		10x6							99			
Fixed to mobile		10x6									79	
International outgoing		10x6	19	20	22	25	28	31	35	36	37	
International incoming		10x6	23	26	29	35	39	47	51	56	63	
- Int'l bothway telephone		10x6	42	46	51	60	66	79	86	92	...	
- Total national telephone		10x6	266	333	418	527	602	631	...	...	...	
Outgoing mobile		10x6										
SMS messages		10x6										
STAFF												
Full-time telecommunication	6		1'465	1'673	1'729	1'801	1'839	1'770	1'838	1'859	1'811	
QUALITY OF SERVICE												
Faults per 100 main lines per year	7	%	104.8	97.5	74.9	55.0	64.0	45.8	56.4	56.8	41.5	
TARIFFS												
Residential telephone connection			2'000	2'000	2'000	2'000	2'000	2'000	1'000	1'000	1000	
Business telephone connection			3'000	3'000	3'000	3'000	3'000	3'000	2'000	2'000	2000	
Residential telephone monthly subscription			60	60	60	60	60	60	60	60	75	
Business telephone monthly subscription			100	100	100	100	100	100	100	100	210	
3-minute local call (peak rate)			1	1	1	1	1	1	1	1	1.3	
Cellular connection	8		...	...	500	500	500	500	500	500	...	
Cellular monthly subscription	8		...	...	300	125	125	125	125	125	125	125
Cellular - 3-min. local call	8		...	...	3	3	3	3	3	3	3	3
Cellular - 3-min. local call (off-peak)	13		...	...	3	3	3	3	3	3	3	3
REVENUE AND EXPENSE												
Total telecom services		10x6	1'618	1'813	2'052	2'406	2'882	3'061	3'800	4'200	...	
- Telephone service		10x6	1'110	1'654	1'473	1'986	2'125	2'553	2'877	2'971	...	
- Mobile communication		10x6		...	...	...	...	284	485	720	1'019	...
CAPITAL EXPENDITURE												
Annual telecom investment	9	10x6	602	885	1'376	816	1'034	1'249	1'430	1'932	1'762	
BROADCASTING												
Households with radio	10	10x3	238	241	244	244	253	259	260	270	280	
Households with television	10	10x3	206	217	229	241	250	259	268	278	280	
Home satellite dishes		10x3	...	...	...	...	...	...	8	10	13	
INFORMATION TECHNOLOGY												
Personal computers	11		20'000	36'000	60'000	90'000	100'000	110'000	120'000	130'000	180'000	
Internet	17		—	—	122	201	575	823	3'275	3'126	3'462	
% of households with PC	12					4.3	5.7	7.6	10.0	13.3	18.0	
Internet users	13		...	...	2'100	5'500	30'000	55'000	87'000	106'000	125'000	150'000
% of households with Internet	12									5.7	9.2	12.6	