VIETNAM INTERNET CASE STUDY

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INTERNATIONAL TELECOMMUNICATION UNION
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Tim Kelly and Michael Minges wrote this report. Lara Srivastava and Audrey Selian contributed to some sections. Vanessa Gray provided editorial comments and Nathalie Delmas handled formatting and production. The report is based on field research undertaken 14-18 May 2001 as well as reports and articles identified in the bibliography or as footnotes. We would like to thank the Directorate General of Posts and Telecommunications for arranging the meetings. The views expressed are those of the authors and may not necessarily reflect the opinions of the International Telecommunication Union (ITU), its members or the Government of the Socialist Republic of Vietnam. This report is one of a series of Internet Case Studies. Additional information is available on the Internet Case Studies web site <www.itu.int/ITU-D/ict/cs>.

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1. Country background

1.1 Overview

The Socialist Republic of Vietnam, occupying 331'114 square kilometres, borders China to the north, Laos to the west and Cambodia to the southwest. On the east, it is bordered by a 3'260 kilometres long coast line.

Vietnam is marked by two delta regions at either end of the country, the Red River in the north and the Mekong in the south, which are separated by the narrow region of the Central Highlands. Three quarters of Vietnam's territory is composed of mountains and hills.

Administratively, the country consists of 57 provinces and four centrally administered cities (Hanoi, Ho Chi Minh City, Hai Phong, Da Nang). Its capital, Hanoi, lies on the Red River.

1.2 Demography

Vietnam's population was estimated at 76.3 million people in April 1999, the second most populated nation in South East Asia.[1] The latest estimate for 2000 is a population of 77.7 million with annual average growth at 1.7 per cent. Around three quarters (76.5 per cent) of the population resides in rural areas. The largest city is Ho Chi Minh with five million people. Hanoi is home to 2.7 million.

The largest ethnic group are the Viet accounting for 87 per cent of the population.[2] There are 53 other ethnic groups (accounting for around eight million people), the majority of which reside in the mountainous areas. Vietnam's official language is Vietnamese. Chinese, English and French are utilized to a lesser extent; ethnic languages are also part of the linguistic landscape.

1.3 Economy

The shift from a centrally planned economy towards a policy of renovation (*Doi Moi*) was formally adopted at the Sixth Party Congress in December 1986. The top priority of the Doi Moi policy is the economy and the creation of a market-oriented environment. Vietnam has made significant progress over the last decade in this transition, building up investment and maintaining consistent growth. Nonetheless, the role of the state remains influential via use of measures such as five-year plans, price controls, production planning, and access to credit, with the underlying objective to achieve stable economic growth and development.

For the decade after the introduction of Doi Moi, the economy performed impressively. During the period 1986-

Figure 1.1: Map of Vietnam

Source: The World Factbook.

1990, Gross Domestic Product (GDP) grew around four per cent a year and inflation was brought under control. The next five-year period, from 1991-1996 was even more impressive with economic growth averaging an annual rate of over eight per cent. More than US$ 20 billion of foreign direct investment flowed in and the level of GDP contribution by the non-State economic sector grew to 60 per cent.[3] Poverty declined from 58 per cent in 1993 to 37 per cent in 1998.[4]

Economic growth declined to 4.4 per cent in 1998 as a result of the regional financial crisis and the "lack of incisive domestic reforms."[5] It has since risen to 4.8 per cent in 1999 and an estimated 6.8 per cent in 2000. The size of Vietnam's economy was US$ 31.3 billion in 2000 and per capita income was US$ 390. The agricultural sector accounted for 24 per cent of GDP in 2000, industry for 37 per cent and services for 39 per cent.[6]

Vietnam's principal exports are crude oil, garments and textiles, sea products, rubber, footwear, rice, computer components, and coffee. Export value for 2000 was US$ 14.5 billion, with major trade partners being Japan (18 per cent), China (11 per cent), Singapore (7 per cent), Taiwan-China (5 per cent) and Australia (9 per cent). The value of imports was US$ 15.6 billion in 2000, with major imports comprised of machinery and equipment, refined petroleum, textiles, steel, electronic components and fertilizer.

Vietnam is committed to regional global economic integration through its participation in ASEAN and APEC, its WTO accession negotiations and its signing in July 2000 of the US-Vietnam Bilateral Trade Agreement.

1.4 Human development

Vietnam ranks 101st out of 174 countries in the United Nations Development Programme's (UNDP), Human Development Index (HDI), placing the country in the medium human development category just ahead of Indonesia. The HDI attempts to measure achievements in three key

Table 1.1: Human Development Indicators

Vietnam compared to selected Asian, 1999

HDI Rank	Country	Life expectancy at birth (years)	Adult literacy rate (%)	Combined school gross enrolment ratio (%)	GDP Per Capita (PPP US$)
26	Singapore	77.4	92.1	75	20'767
56	Malaysia	72.2	87.0	66	8'209
66	Thailand	69.9	95.3	60	6'132
70	Philippines	69.0	95.1	82	3'805
101	**Vietnam**	**67.8**	**93.1**	**67**	**1'860**
102	Indonesia	65.8	86.3	65	2'857
118	Myanmar	56.0	84.4	55	1'027
121	Cambodia	56.4	68.2	62	1'361
131	Lao PDR	53.1	47.3	58	1'471

Note: GDP per capita is shown in Purchasing Power Parity (PPP).
Source: United Nations Development Programme < http://www.undp.org/hdr2000/english/book/back1.pdf>.

components of human development: education, health and standard of living, and ranks countries based on a composite index of factors such as life expectancy at birth, adult literacy, school enrolment, and GDP per capita. The country has made impressive strides in human development, raising its ranking from 122 to 101 over the last few years. Furthermore Vietnam has a higher HDI ranking that its economic level would suggest. For example compared to other countries with a similar GDP per capita, Vietnam scores higher in literacy. Similarly, Vietnam's life expectancy is similar to countries with much higher per capita income such as Brazil, Turkey, Russia and Thailand.

1.5 Government

Vietnam declared independence from France as the Democratic Republic of Vietnam on 2 September 1945, becoming the first South East Asian nation to do so. In November 1946, its first constitution was adopted. The country was renamed the Socialist Republic of Vietnam following reunification in April 1975.

The National Assembly, which consists of 450 members, is the legislative branch. Members are elected every five years. The National Assembly elects the President and Prime Minister. There are various 'People's Councils' elected at the local level for provinces, cities, towns, districts and communes.

The role of the Communist Party is highlighted in Article 4 of the Constitution. Every five years, the National Congress of the Communist Party meets to discuss and design strategic direction for the nation.

1 General Statistical Office (Vietnam). *Statistical Yearbook 1999*. Statistical Publishing House. Hanoi. 2000.

2 See "Culture: Ethnic Groups" on the web site of the Embassy of Socialist Republic of Vietnam in the United States of America: www.vietnamembassy-usa.org/learn/cul-ethnic.php3.

3 See "Economy" on the Ministry of Foreign Affairs (Vietnam) web site at: www.mofa.gov.vn/English/Home.htm.

4 See Asian Development Bank. "Vietnam Economic Performance." At www.adb.org/Countries/Highlights/VIE.asp.

5 Asian Development Bank. Vietnam Resident Mission. "Economic Update." www.adbvrm.org.vn/Economic_Update.html.

6 The World Bank Group. "Vietnam Data Profile". devdata.worldbank.org/external/dgprofile.asp?rmdk=82695&w=0&L=E.

2. Telecommunication and Mass Media

2.1 Telecommunications Sector

Vietnam is one of the major emerging markets of the ASEAN region. It has shown some of the fastest rates of growth in economic development and consumer demand. One of the underpinnings of this growth has been the expansion in telecommunication networks. Vietnam passed the critical threshold point of one fixed-line per 100 inhabitants (teledensity) during 1994, some two years after Indonesia. But by the end of 2000, by which time it had reached a teledensity of 3.2 it had already overtaken Indonesia. Over the past five years, Vietnam has sustained an average network growth of 26.8 per cent, slightly ahead of China and one of the highest in the region, with particularly rapid expansion in the middle part of the last decade (See Figure 2.1). If current growth rates continue, Vietnam is on target for reaching ten million lines installed in 2006 and a teledensity of 30 within a decade.

While Vietnam's domestic fixed-line network has been leaping ahead, other parts of the telecommunication economy have been doing relatively less well. Although mobile communications was introduced back in 1992, and even though it is one of the first parts of the sector where competition and private sector participation has been allowed, it has been relatively slow to take off. Vietnam has one of the lowest ratios of mobile to fixed-line subscribers of all the countries in the region (see Figure 2.2). At the end of 2000, there were some 789 thousand mobile subscribers compared with more than 2.5 million fixed-line subscribers. However, during 2000 the number of mobile subscribers more than doubled, suggesting that the country is now catching up with trends elsewhere in the world.

Telecommunication services in Vietnam are dominantly state-owned. Viet Nam Posts and Telecommunications Corporation (VNPT) <www.vnpt.com.vn> operates the telecommunication networks and provides services. The Department General of Posts and Telecommunications (DGPT) <www.vnpt.com.vn/DGPT/dgpt_general.html>regulates them. Until recent years, this situation was quite common worldwide, but now Vietnam is in a small minority of ITU Member States that have neither privatized the incumbent operator nor yet fully separated the functions of operator and regulator. For instance, even though the two were formally separated in 1993, both DGPT and VNPT share the same building in Hanoi. Also, DGPT decrees and ordinances are published via the VNPT web site.

2.2 Public Telecommunication Operators

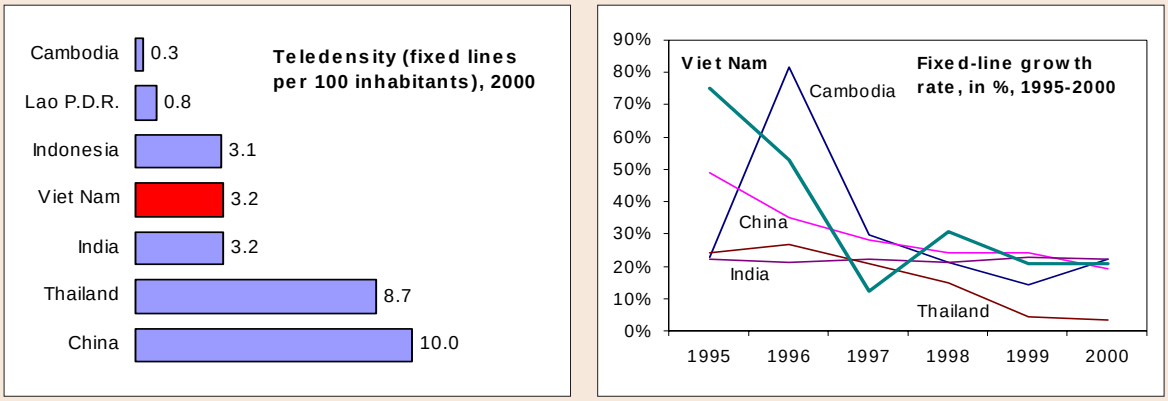
2.2.1 Fixed telephone operators

The **VNPT** is the monopoly telecommunications operator for fixed-line services in Vietnam. It was created in 1990 when regulation and operation were nominally separated. A 1995 government decree (No. 51) outlines VNPT's functions. Although fully state-owned, VNPT functions as a business entity. It has created numerous subsidiaries to carry out virtually every aspect of telecommunications. In addition it has established several *Business Cooperation Contracts* (BCC) with foreign telecommunication companies to jointly provide services (see Table 2.1). The main subsidiaries of relevance here are:

- National HQ in Hanoi (**Hanoi PTT**), a secondary centre in Ho Chi Minh City (**HCMC PTT**) and other offices in each of Vietnam's 61 Provinces;

Figure 2.1: Vietnam's place in the region

Vietnam's teledensity, 2000 and fixed-line growth rate, 1995-2000, in comparison with selected countries in the region



Source: ITU World Telecommunication Indicators Database.

- **VTN** (Vietnam Telecoms National) <www.vtn.com.vn>. Created in 1990, it is responsible for construction, installation and maintenance of the long distance telephone network, and provides a wide range of services;

- **VTI** (Vietnam Telecom International), is the international services provider (see section 2.6);

- **VDC** (Vietnam Data Corporation). Created in 1989, it offers data communications, Internet (both access and connectivity), software applications and value-added services (see chapter three);

- **Vinasat,** which is a project to launch and operate a Vietnamese national satellite. Originally this was to have been achieved within the 1996-2000 National Telecommunications Plan, but this has now been postponed to 2003 at the earliest;

- VNPT is also a major shareholder in both the main mobile operators, **Mobifone** (VMS) and **Vinaphone** (GPC) and in **Saigon Posts and Telecoms** (SPT).

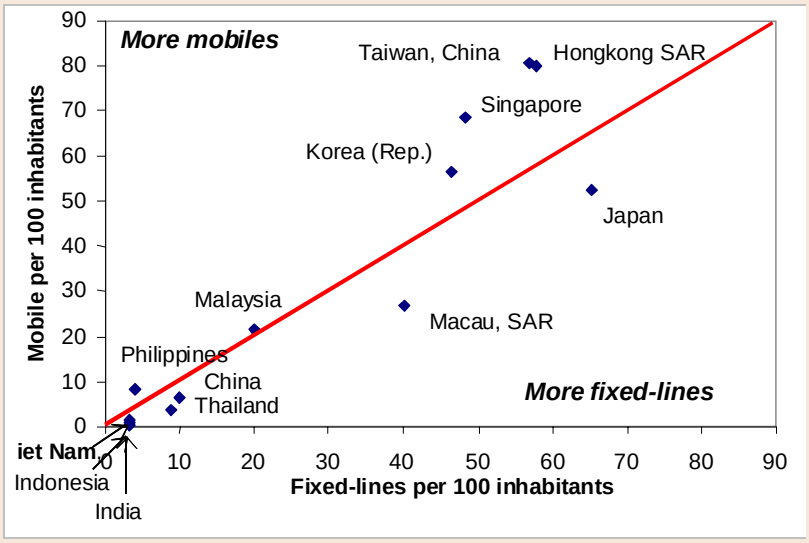
These are described in more detail below.

In 1999, VNPT achieved a turnover of US$ 841 million, which was nine per cent higher than in 1998. It invested some US$ 300 million. In 2000, VNPT set a target of 600'000 new "lines" (both fixed and mobile) to be installed, which it had achieved by October of that year. For 2001, it has set a target of installing just under 900'000 "lines" to achieve a combined mobile/fixed teledensity of five per cent. In the first quarter (to end March) it had already added 237'000 new subscribers.

Like China, Vietnam has followed a policy of allowing different government ministries to offer telecommunication services, as a form of competition with the incumbent operator. The Defence Ministry has entered the market through Military Electronic Telecommunications Company (**Vietel**), which gained a number of licenses to provide different telecommunication services in 1998. It currently has more than 300 employees in three locations in Hanoi, an office in HCMC and a presence in ten provinces. It had

Figure 2.2: Ratio between fixed and mobile lines

For selected Asian economies, 2000



Source: ITU World Telecommunication Indicators Database.

previously been operating as a department of the Defence Ministry, mainly serving government clients, for instance in the provision of private networks. Vietel now has a general posts and telecommunications license and is theoretically allowed to operate radio paging, mobile cellular and postal services including parcel post and money transfers. However, because of limited resources, it has not yet entered all these different markets.

Vietel's main telecommunication success to date has been in IP Telephony (see Box 2.1) where it has been running an experimental service between Hanoi and HCMC.

A third operator is **Saigon Posts and Telecoms** (SPT), which is based in HCMC. Previously part of VNPT, SPT was established in 1995 with some eleven state-owned shareholders, including VNPT (18 per cent). It became a joint-stock company in 1998 when some 13 per cent of its shares were sold to individuals, companies and staff. Like Vietel, SPT has a general license that could, theoretically, permit it to offer a full range of services. At present SPT has five main operations:

- Manufacturing (e.g., radio-pagers, in conjunction with a Belgian company);
- Services, including telecommunication services such as the SaigonNet ISP. SPT has a license for other services not yet being offered (e.g., mobile cellular). It is also preparing to offer trunk radio services in conjunction with Champion, a US company, and an HF radio service in conjunction with PineOak. SPT has a land line license for HCMC;
- Postal services (e.g., parcels and money remittances) nationwide within Vietnam;
- Import/export activities (e.g., imports of high-tech goods, components);
- Construction.

Box 2.1: IP Telephony in Vietnam

In many aspects of its telecommunication policy, Vietnam has followed the lead set by China. One example of this is in IP Telephony where China has already established itself as one of the world's major markets since liberalizing the service in 1998 (see the ITU IP Telephony Case study commissioned for the 2001 World Telecommunication Policy Forum[7]).

Vietel was granted a Voice over Internet Protocol (VoIP) license in February 2000 and started service in October. The equipment vendor is Lucent, which provides equipment and some training. For the moment Vietel's service is characterised as a commercial trial system. There are two points of presence (PoPs), linking Hanoi and HCMC. The service uses VNPT leased lines. Vietel charges a price of 1'818 Dong (12 US cents) per minute (peak and off-peak are the same) including VAT at 10%. The regular VNPT price for the Hanoi-HCMC route is 4'000 Dong (28 US cents) for the first minute and 3'700 Dong (25 US cents) for subsequent minutes. Vietel's price is therefore less than half the regular PSTN price. Vietel argues that its price is based on cost but ultimately it has to be approved by DGPT. The level of price reduction is benchmarked against the Chinese case.

Results have exceeded expectations and every month more than 60'000 subscribers use it, equivalent to around 40 per cent of the market. The system is postpaid and customers select to use IP Telephony by dialling an access code (1780) before the subscriber number. Although it is still officially a trial, any telephone subscriber can use it.

In October 2000, capacity on the system was 8 Mbit/s (4xE1 circuits). Some customers could not use the network because of capacity limitations. Traffic was 1.7 million minutes per month initially after launch (October to March). In March, capacity was expanded to 16 Mbit/s. Traffic increased by about eight to ten per cent per month.

VoIP is not seen as replacing the PSTN. Although the quality is good, there are other problems, such as subscribers' unwillingness to dial the extra numbers and a delay of between 10-16 seconds in obtaining a dial tone (because SS7 is not being used).

In the future, Vietel's strategy will be to build up a packet-based network, like China's new operators. Vietel's ability to compete however is constrained by VNPT's leased line prices. Until July 2001, the price was around US$ 20'000 per month for each E1 line. In addition, some 30 per cent of Vietel's revenue goes to VNPT (or 600 Dong per minute), plus a three per cent commission for billing. Vietel would like to launch a prepaid card (like in China). This would, for instance, allow public call offices to offer lower price calls to their users and it would enable Vietel to save on the commission currently being levied for billing and bad debts. At present, mobile users can't use VoIP and mobile is not part of the trial. Also, there is no advertising of the service at the moment. Vietel's own plans include introducing prepaid service, selling services to mobile users, offering international calls via VoIP and expanding to cover more cities.

The situation changed on 1 July 2001 when the DGPT announced it was liberalizing VoIP services, and also announced lower leased line prices at the same time. It will award two additional licenses (to VNPT and SPT as well as Vietel) and may, before the end of 2001, allow the provision of international services by VoIP. The DGPT has said that it will continue to review the situation every six months to ensure what it calls "a healthy competitive environment for all enterprises".

Internet service and import/export are SPT's biggest money earners, with Internet service raising some eleven billion Dong (US$ 0.75 million) out of a total of 43 billion Dong (US$ 2.9 million) in 2000. SPT has some 300 staff, including in postal services. There are a total of ten offices throughout Vietnam including the HQ in HCMC. The majority of customers are in HCMC but SPT opened an office in Hanoi at the end of 2000.

2.2.2 Mobile cellular operators

Vietnam currently has a duopoly for GSM-based digital mobile communications, which is shared between **Vinaphone** (Vietnam Telephone Service) and **Mobifone** (Vietnam Mobile Service). There is also an older analogue system, **SMTC** (Saigon Mobile Telephone Company), running AMPS. VNPT owns all operators and counts their subscribers as part of its own network. Mobifone is operated under a BCC revenue-sharing and technology sharing arrangement between VNPT and international mobile operator Millicom.[8] Mobifone has more customers in the private sector and among individuals, whereas Vinaphone serves the government customers. Although the two are theoretically in competition, the fact that they both

have VNPT as owner, and that their rates are identical, means that in practice it is more a battle for resources within VNPT than for customers. Indeed there is a suggestion that Mobifone can only grow as fast as Vinaphone as it would be regarded as inappropriate if the company with foreign investors did better than the locally-owned one.

As of December 2000, there were some 788'559 mobile subscribers in Vietnam of which Vinafone had 54 per cent, Mobifone 45 per cent and SMTC one per cent (see Figure 2.3). In addition to the three operators listed above, a number of other players, notably Vietel and SPT, claim to have mobile licenses but are not yet active in the market.

Just under 70 per cent of mobile subscribers in Vietnam are on prepaid schemes. Roaming services are offered with around 50 countries worldwide.

2.3 Regulation and policy-making

2.3.1 Policy development

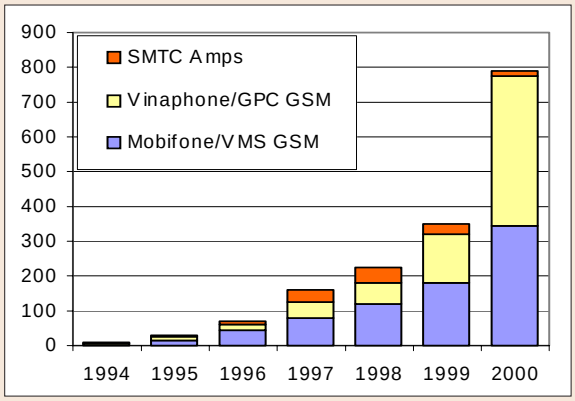
The Department General of Posts and Telecommunications (DGPT) is responsible for telecommunication policy and regulation. Although not a ministry, the DGPT is a ministerial-level organization (there is no Ministry of Communications). DGPT's roots trace back to 1990 when regulation and operation were nominally separated in the country and DGPT was an organizational unit within the sector ministry. In 1993, the Ministry responsible for telecommunications was abolished and DGPT assumed supervision of the industry. The Secretary-General of DGPT reports directly to the Prime Minister.

DGPT's functions are outlined in a 1995 government decree (No. 12). A new Telecommunications Act is currently being drafted. Up to now, government decrees govern the telecommunications sector. In the draft Act, policy and regulatory aspects would be separated. A ministry, or so-called Telecom Bureau—similiar to the Chinese model—would be established. The draft is to be submitted to the government by end of 2001. Then, in 2002, the government would submit the draft Act to the National Assembly.

Besides defining the regulatory framework the new Act is expected to

Figure 2.3: Mobilephone development in Vietnam

Growth in number of subscribers, 1994-2000, in thousands, and mobile tariffs, in Dong (including ten per cent sales tax)



	Local	Neighbouring	Long-distance
Postpaid peak	1'800	3'200	4'600
Prepaid peak	3'500	6'000	8'000
Prepaid off peak	2'450	4'200	5'600
International calls	Local plus international		
Maximum installation fee			900'000
Postpaid subscription charge			200'000
Cost of Prepaid SIM card			150'000
Price of an SMS message			500
Average cost of handset			3'000'000

Note: Tariffs are set by Decision No.293/2000/QD-TCBD dated April 3, 2000 of the Secretary General of DGPT. Effective from May 1, 2000.
Source: ITU World Telecommunication Indicators Database, VNPT.

introduce a measure of liberalization and to clarify the roles of the different players already licensed. The outlines of the plan for future liberalization are evident from the terms of the US-Vietnam bilateral trade agreement (July 2000) and cemented by President Clinton's visit to Vietnam in November 2000. The trade agreement is meant to prepare the way for Vietnam to enter the World Trade Organization (WTO) and is comparable to the bilateral agreement reached with China. The main elements relevant to telecommunications and the Internet are:

- Vietnam's agreement to implement the WTO regulatory reference paper;
- By 2001, two year's after US ratification (expected in 2001), existing BCC contracts involving US companies should become joint ventures (JV) (i.e., permitting foreign ownership);
- By 2005, JVs should be able to enter the mobile and satellite services market;
- By 2007, the market for basic voice telephony should be liberalized.

It should be noted however that all of these commitments are contingent upon ratification of the bilateral trade agreement and, until Vietnam's accession to the WTO, they offer privileges only to US firms. Nevertheless, the agreement indicates a commitment to progressive market liberalization.

2.3.2 Privatization

It would be accurate to say that privatization is not currently on the policy agenda in Vietnam. Instead, the new draft Telecommunications Act foresees the "equitization" of VNPT. There is some "experimentation" with private ownership. For instance, Saigon Posts and Telecom is a joint-stock company. Until 1998, it was fully state-owned (there are some eleven different state owners with VNPT holding 18 per cent) but in that year some 13 per cent of the company was sold to individuals, companies and staff. However, private investment is the exception rather than the rule and foreign ownership in telecommunications is not currently permitted.

Instead, the Vietnamese government has tried to pioneer a different concept, which is termed Business Co-operation Contracts (BCCs). Under a BCC, a foreign company provides financing and services as well as training, in partnership with VNPT. The foreign partner shares revenue with VNPT over the life of the BCC (typically 15 years). BCCs have been established for fixed lines, international gateways and mobile cellular (see Table 2.1). The nominal value of the BCCs exceeds US$ 1 billion but it should be noted that funds committed are generally much higher than funds actually disbursed (see Box Figure 2.2). Foreign investors such as Telstra (see Box 2.2) seem to have been discouraged by the poor financial climate in the late 1990s as well as the unwillingness of the Vietnamese governments to convert the BCCs into joint venture agreements by permitting a degree of foreign ownership. This may change in the future, under the terms of the US-Vietnam trade agreement (see above). The most successful BCC is probably that of the second mobile operator, Mobifone (VMS), which is a BCC between VNPT and international mobile operator Millicom/Comvik.

2.3.3 Licensing

The process of licensing is almost entirely carried out by government decrees, in the absence of a formal telecommunications Act. SPT, for instance, has some nine separate licenses, of which five were delivered by the DGPT, and one each from the HCMC Department of Planning and Investment, the Ministry of Trade, the Ministry of Culture and Information and the HCMC Department of Construction. SPT itself, which was formerly part of VNPT, was actually

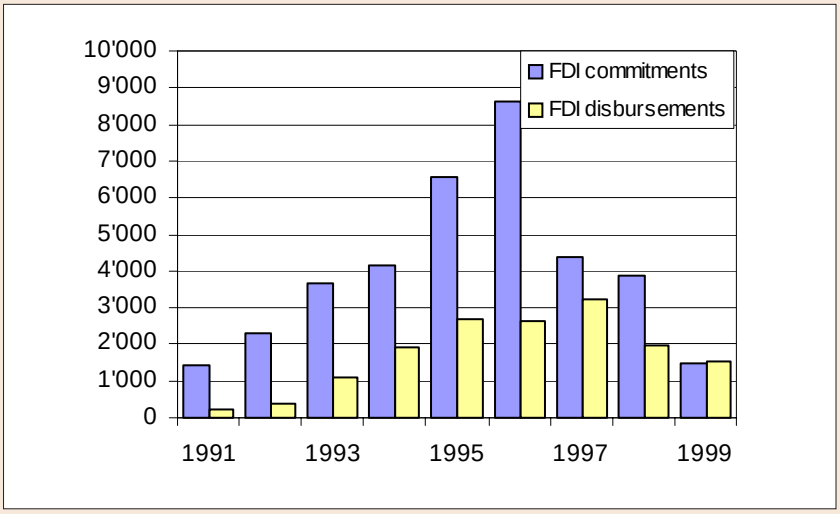
Box 2.2: Telstra investing in Vietnam

The incumbent Australian operator, Telstra, has been one of the major investors in Vietnam, having been one of the first to take up the option of a BCC contract, as far back as 1988. The first contract committed OTC (the former international operators arm, later integrated into Telstra) to invest US$ 237 million over twelve years. The initial involvement included the provision of a satellite earth station in HCMC followed by an INTELSAT station in Hanoi. Subsequently Telstra helped install earth stations in other provinces and provided 45 VSATs (Very Small Aperture Terminals). In 1990, OTC won the contract to handle the development and management of Vietnam's international services network, and later it extended this project to cover investment also in the domestic long-distance network. Part of the investment involved participation in the TVH (Thailand-Vietnam-Hongkong) undersea cable.

Relations between VNPT and its foreign partners received a set-back in 1996 when earlier plans to establish joint-ventures were reversed and instead the BCC contracts were offered. These were not perceived as being so beneficial to foreign investors and were indeed seen an highly risky, given the financial situation in the wider Asia region. Subsequently FDI declined (see Box Figure 2.2). Investment has picked up more recently, and Telstra was among the first foreign investors to return with an Internet Service Agreement with VDC in September 1998. Since the thawing of US-Vietnamese relations following President Clinton's November 2000 visit, Telstra will now face new competitors vying for VNPT's favour.

Box Figure 2.2: The Foreign Direct Investment Rollercoaster

FDI commitments and disbursements in Vietnam, 1991-1999, in US$ million



Source: Vietnam Ministry of Planning and Investment.

established by a Prime Minister's Decision and operates under a license from the People's Committee of HCMC.

SPT's case is not unusual and this myriad of overlapping federal, regional and local licenses is confusing and may explain why companies are sometimes slow to exploit the full potential of their license, as additional ones may be necessary before services can be offered. The licensing procedure, which can take up to a year, also introduces delays and can be off-putting for foreign investors.

2.3.4 Universal service

Around 85 per cent of the 11'000 villages in Vietnam have a

Table 2.1: Business Co-operation Contracts (BCC) for telecommunication networks and services in Vietnam

Company	Date	# lines	Value (US$ million)	Note
Japanese consortium (NTT, Nissho Iwai, and Sumitomo)	Nov. 1997	240'000	US$ 208 plus US$14 service contract.	Northern part of Hanoi
France Telecom	Nov. 1997	540'000	US$ 492.5	15 year contract for HCMC region
Cable and Wireless (US)	Nov. 1997	250'000	US$ 207	
Telstra (Australia)	Several contracts, beginning in 1988	n.a.	US$ 237 in 1988 subsequently increased	See Box 2.2
Comvik (Sweden)	1993	n.a.	n.a.	GSM mobile

Note: For manufacturing, VNPT has joint ventures with Corning (fibre-optic cable), Alcatel, NEC Fujitsu and LG.
Source: DGPT, ITU.

telephone line. The aim is to raise this to 100 per cent by 2005.

As of year-end 1996, the last date for which data is available, Vietnam had just under 1'000 public payphones. Though this figure has undoubtedly gone up, there is considerable doubt as to whether these payphones are being used. Although they are generally in prominent positions on street corners in Hanoi and HCMC, it is rare to see one in use. This may be due to the difficulty of purchasing phonecards, or it may be because mobilephones are more popular.

Public call offices, or teleshops, which are abundant in other Asian cities, are also difficult to find in Hanoi and HCMC. This may be because of the difficulties in gaining a license to resell telephone services, especially international calls, or to offer privately owned payphone services. Mobilephone shops belonging to Vinaphone or Mobifone are abundant, but it is not possible to make calls from these shops, only to purchase handsets or prepaid cards.

The mobilephone licenses state that "nationwide" coverage should be provided but there are no specific obligations for geographic coverage.

For Internet access, the goal is to reach the world average for developing countries by the year 2010.

2.4 Tariffs

The DGPT effectively regulates tariffs in Vietnam and is involved not only in approving tariffs but, in many cases, in proposing them. Until recently, Vietnam had the characteristics of a country that had not started to rebalance its tariff structure. By the standards of neighbouring countries, international calls are among the highest in the world (see section 2.6) while monthly residential costs (at just under US$ two per month) are relatively cheap. Local call charges were relatively expensive until 1998 but have since been progressively reduced in price and now stand at 400 Dong (2.7 US cents) for a three minute call, including tax. This creates problems of sustainability of growth

Table 2.2: Main telecommunication indicators for Vietnam, 1991-2000

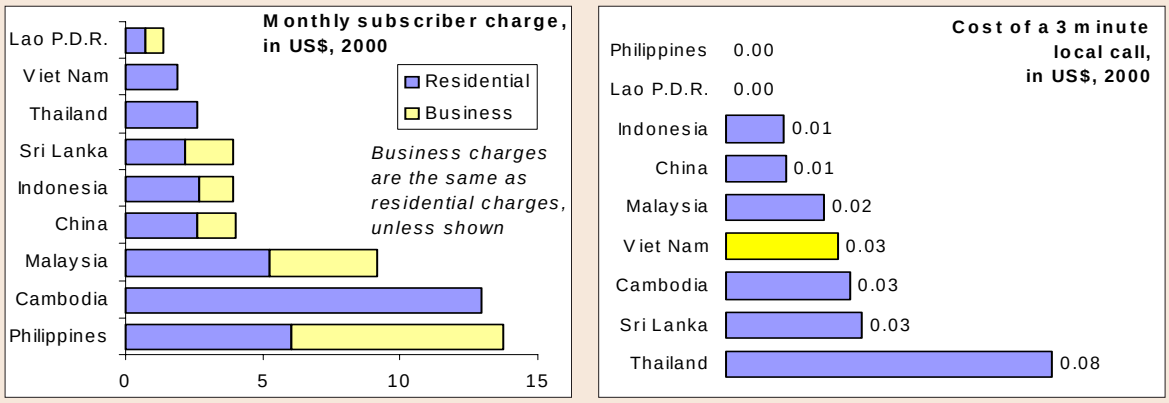
Year Ending 31.12

	Unit	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
DEMOGRAPHY, ECONOMY											
Population 1)	10x3	67'770	69'410	70'980	72'510	73'790	75'181	76'548	77'562	78'705	79'832
Households 2)	10x3	13'500	14'000	14'300	14'600	14'850	15'195	15'500	15'700	15'900	16'100
Gross domestic product 3)	10x9	76'707	110'535	136'571	178'534	228'891	272'037	313'624	361'016	399'942	444'139
Average annual exchange rate per US$ 4)		10'037	11'202	10'641	10'966	11'038	11'033	11'683	13'268	13'943	14'168
Consumer price index (1995 = 100) 5)		...	...	...	...	100.0	105.7	109.1	117.0	121.8	119.7
TELEPHONE NETWORK											
Main telephone lines in operation 6)	10x3	137	153	260	442	775	1'186	1'333	1'744	2'106	2'543
Main telephone lines per 100 inhabitants		0.20	0.22	0.37	0.61	1.05	1.58	1.74	2.25	2.68	3.19
Residential main lines per 100 inhabitants		...	0.1	0.5	1.1	2.6	3.9	...	...	...	...
% digital main lines	%	20.0	39.0	78.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
% residential main lines	%	...	10.0	30.0	35.0	50.0	50.0	...	...	...	...
Public payphones		...	50	200	500	850	950	...	...	...	...
MOBILE SERVICES											
Cellular mobile telephone subscribers		—	800	4'060	12'500	23'500	68'910	160'457	222'700	328'671	788'559
- Digital cellular subscribers		—	—	—	4'000	10'000	12'500	151'511	213'700	257'568	780'673
Cellular subscribers per 100 inhabitants		—	—	0.01	0.02	0.03	0.09	0.21	0.29	0.42	0.99
Radio paging subscribers		—	100	13'800	40'000	55'000	...	32'300	40'765	45'935	48'145
OTHER SERVICES											
Estimated facsimile machines 7)		1'200	2'100	4'060	13'200	14'900	19'800	23'500	27'900	31'000	...
Telex subscribers		...	950	830	801	738	643	570	530	490	...
TRAFFIC											
- National trunk telephone (mins) 8)	10x6	...	119	234	350	500	750	1'003	1'232	1'359	...
- Int'l outgoing telephone (mins) 9)	10x6	...	8	20	30	39	52	55	50	47	...
- Int'l incoming telephone (mins) 10)	10x6	...	30	72	120	200	250	279	320	337	...
- Int'l bothway telephone (mins)	10x6	...	38	92	150	239	302	334	370	383	...
STAFF											
Full-time telecommunication staff 11)		...	20'000	20'000	30'000	58'000	75'000	79'600	...	...	...
TARIFFS											
Telephone connection charge 12)	10x3	...	...	3'500	3'000	2'700	2'700	1'800	1'800	1'800	1'636
Telephone monthly charge 13)		...	...	100'000	90'000	68'000	68'000	68'000	68'000	61'818	27'000
3-minute local call (peak rate) 14)		...	...	1'200	1'200	1'200	1'200	1'200	1'200	1'091	360
Cellular connection charge 15)	10x3	—	2'200	2'200	2'200	2'200	2'200	...	...	1'363	1'090
Cellular monthly subscription 16)	10x3	—	330	330	330	330	330	...	...	227	182
Cellular - 3-min. local call (peak rate) 17)		—	2'200	2'200	2'200	2'200	2'200	...	...	4'908	4'908
Cellular - 3-min. local call (off-peak)		—	2'200	2'200	2'200	2'200	2'200	...	...	3'436	3'436
REVENUE AND EXPENSE											
Total telecom services revenue 18)	10x9	382	746	1'512	2'567	5'019	6'978	6'934	8'838	8'974	15'294
- Telephone service revenue	10x9	...	629	1'118	...	...	...	4'613	5'226	5'407	...
- Mobile communication revenue	10x9	—	...	...	...	...	...	899	1'270	1'670	...
CAPITAL EXPENDITURE											
Annual telecom. investment	10x9	...	989	...	...	...	...	4'000	4'500	4'500	...
BROADCASTING											
Television receivers 19)	10x3	2'800	3'000	3'200	3'300	12'000	13'500	14'000	14'250	14'500	14'750
Television equipped households 20)	10x3	...	...	5'000	6'000	10'000	11'500	11'700	11'850	12'000	12'500
Home satellite antennae	10x3	...	...	...	...	1.20	2.50	...	...	...	...
INFORMATION TECHNOLOGY											
Personal Computers 21)	10x3	...	10	20	50	100	250	350	500	600	700
Internet hosts 22)		—	—	—	—	—	5	—	34	126	179
Estimated Internet users		...	...	...	...	...	100	3'000	10'000	100'000	200'000

Source: ITU Statistical Yearbook, Vietnam Post & Telecommunications Corp. (VNPT).
(1) Source: UN. (2) ITU estimate. (3) Source: IMF. (4) Source: IMF. (5) Source: IMF. (6) 1991: Estimate. (7) Estimate. (8) 1994-1996: Estimate. (9) 1993-94: Estimates. (10) 1993-97: Estimates. (11) 1993: Estimate. (12) Not including tax. (13) Not including tax. (14) From 2000: Rate up to the 200th minute. (15) Not including tax. (16) Not including tax. (17) Not including tax. (18) Until 1991 including post. (19) Source: Unesco, ITU estimate. (20) TV homes (sets). (21) Source: ITU estimates, USITA. (22) Source: Internet Software Consortium.

Figure 2.4: Comparative tariffs

Among selected Asian economies, in US$, 2000



Note: In the right chart, there are no local call charges in the Philippines. In Thailand, the local charge is flate rate.
Source: ITU World Telecommunication Indicators Database.

in that most subscribers (who make no international calls) would not generate sufficient revenue to repay the initial investment costs incurred by VNPT. On the other hand, low per minute call tariffs are obviously good for encouraging Internet use.

2.4.1 Interconnection

Given that VNPT has an effective monopoly over most forms of telecommunication, and owns a major stake in "competitors" like Vietel and SPT, the arrangements for interconnection mainly take the form of cost allocation and revenue-sharing arrangements. The two main interconnection arrangements at present are:

- Between Vietel and VNPT for IP Telephony (see Box 2.1);
- Between mobile operators, where a 50/50 revenue-sharing agreement is used (effectively sender-keeps-all);
- Between the mobile operators and the fixed-line network (all part of VNPT).

This latter arrangement takes the form of a revenue-sharing agreement. Between the mobile operators and VNT (domestic network), revenue-sharing is on a 61/39 per cent basis, with mobile operators gaining 61 per cent for outgoing traffic and 39 per cent for incoming traffic. This is based on a DGPT decision and has not been reviewed or changed since mobile services started. Between the mobile operators and VTI, the revenue-sharing agreement is 2/98 per cent for the International Direct Dial (IDD) revenue (the mobile operators keep the airtime charge). However, this two per cent of revenue does not cover the costs of billing for the service and bad debts on international calls have to be covered by the mobile operator. Indeed, the two per cent revenue is less even than the five per cent commission given to card resellers. This is seen as an area where reform is overdue.

2.5 Network

Vietnam's domestic telecommunication network is run by VTN, a subsidiary of VNPT. Previously VTN had a narrowband, copper and microwave based network. Since the "open door" policy of the late 1990s, VTN has been investing heavily in the network. The current network is composed of a microwave (140 Mbit/s) and optical fibre (34 Mbit/s to 2.5 Gbit/s) backbone. Equipment suppliers include Siemens, Nortel, Alcatel and Fujitsu. For

switching technologies, Ericsson technology is mainly used. The mobile operators are also obliged to use VTN's backbone network.

In the future, the plan is to move towards an IP over ATM backbone with three ATM nodes to be implemented initially and then later extended to other cities. VTN will move Internet traffic onto this new network. In the longer term, there is a plan to install a 10-20 Gbit/s undersea fibre cable system along the coast using DWDM technology.

Until recently, only VTN was authorized to provide long-distance infrastructure. Vietel and SPT recently entered the market (see Section 2.2.1), with Vietel in particular using an IP-based network to carry IP telephony. The railway ministry is also planning to offer a data network but has to work with VTN. Also, the electricity ministry has a fibre optic network but this is for internal use only at present.

2.6 International traffic

Vietnam Telecom International (VTI), a subsidiary of VNPT, is responsible for Vietnam's international voice and fax traffic and also provides international IP capacity to VDC.

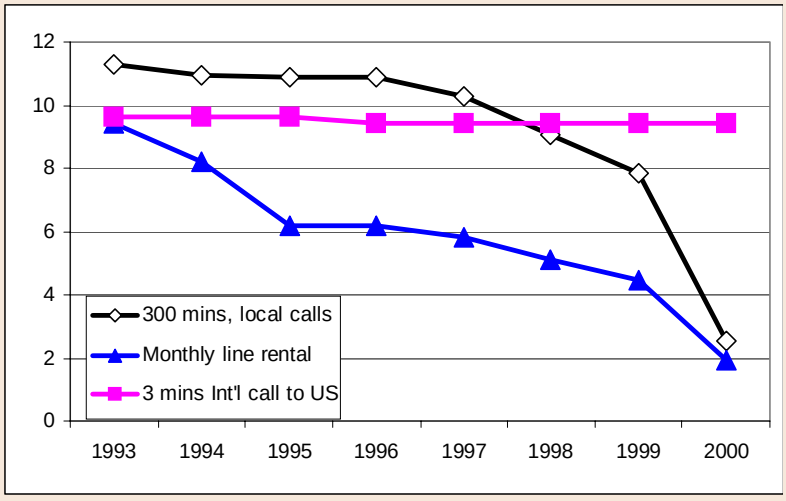
The SeaMeWe 3 and TVN (Thailand-Vietnam-Hongkong) cables provide the main links to the rest of the world. VTI has seven satellite earth stations, including one at its main site in Hanoi but these no longer appear to be used to carry substantial volumes of international traffic. VTI is carrying out a cost-benefit study to analyse whether it might be worth using these earth stations for Internet services (Intelsat is charging VTI around US$ 9'800 per month per one Mbit/s link) in order to benefit from the greater flexibility of deployment of satellite links. However, VTI has considerable spare capacity available on the undersea cables.

For voice services, VTI has 384 Mbit/s of capacity split between some 6'000 separate circuits (compared with just eight international lines in the 1980s!). Voice demand continues to grow by around 15 per cent per year.

Vietnam has some of the world's highest prices for international outgoing traffic, which is priced in US

Figure 2.5: Tariff rebalancing (or the lack of it) in Vietnam

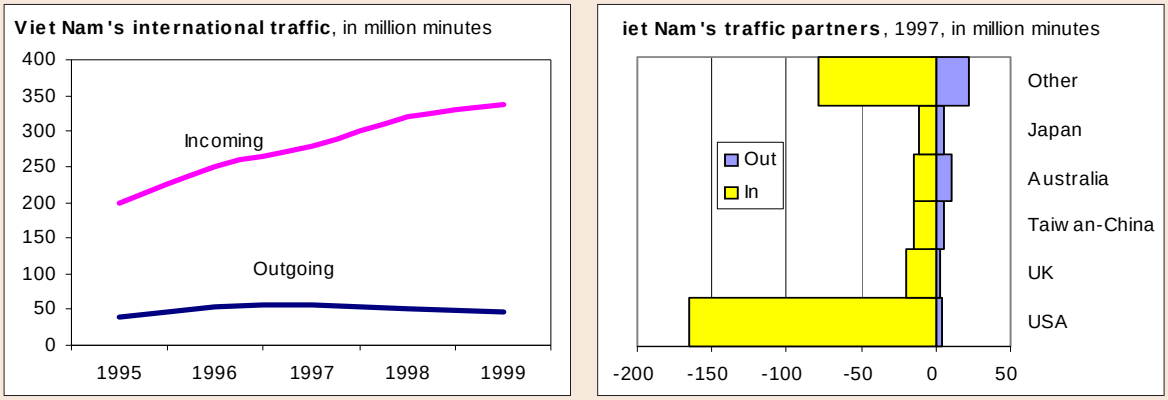
Trends in price of selected services, in US$, 1993-2000



Source: ITU World Telecommunication Indicators Database.

Figure 2.6: Vietnam's international traffic

By incoming and outgoing, 1994-97, and by main partner, 1997, in million minutes



Source: ITU/TeleGeography Inc. Direction of Traffic Database.

dollars, effectively putting it out of reach of ordinary people. Unlike other countries in the world, there has been no reduction in international tariffs and virtually no rebalancing (see Figure 2.5). A peak rate three minute call to the United States costs over US$ nine and more than US$ ten to Europe. As a consequence, Vietnam also has one of the highest ratios between international outgoing traffic (46 million minutes in 1999, and in decline since 1996) and incoming traffic (337 million minutes). For the United States, which is by far Vietnam's largest traffic partner, the ratio of outgoing to incoming is as high as 40:1 (see Figure 2.6).

One of the reasons for the traffic imbalance is because Vietnam maintains a high net margin between the retail price of a call and the settlement rate. Vietnam's settlement rate with the United States, for instance, was 0.9 SDR (62.5 US cents) per minute, as of 1 July 2001. Vietnam is not on target to comply with either the FCC benchmarks (23 US cents by year end 2001 for a low income country) nor the ITU indicative target rate (35 US cents by year end 2001 for a country with teledensity between 1 and 5).

2.7 Mass Media

The media in Vietnam is state-owned. Policy and regulatory aspects are under the responsibility of the Ministry of Culture and Information <www.cinet.vnn.vn>. Despite the lack of plurality, media usage is increasing as reflected by a rise in advertising expenditures. Ad spending on broadcasting, print and outdoor (billboard), only allowed since 1990, rose from US$ 20 million in 1993 to US$ 166 million in 1999. Of particular interest is the effort the state broadcasting authorities place on reaching the large number of overseas Vietnamese. These include shortwave radio broadcasts as well as satellite television. The leading ISP, VDC, also has a news-based web portal primarily aimed at overseas Vietnamese.

2.7.1 Print

According to government statistics, in 1996 there were some 562 press publications including 295 at the national level and 218 at the provincial level. Of these, there are some 150 newspapers, 58 at the national level and 92 in the provinces. According to UNESCO, there were ten dailies in 1996 with a combined circulation of just 300'000 copies per

day. This translates into a relatively low figure of just four newspaper readers per 1'000 population, considering Vietnam's relatively high literacy rate. However an increase in new publications suggests that circulation has risen since these statistics were compiled. The major newspapers in Vietnam are *Nhan Dan* (The People's Daily) <www.nhandan.org.vn>, *Saigon Giai Phong* (Saigon Liberation) and *Lao Dong* (Labour). English newspapers and publications include the *Saigon Times Daily* <www.saigon-news.com>, *Vietnam News* <vietnamnews.vnagency.com.vn>, *Vietnam Economic Times*, and *Vietnam Investment Review*.

The Vietnam News Agency is the official government press organ. It has offices in all provinces as well as serveral overseas. It has a web site <www.vnagency.com.vn> where information is available in Vietnamese as well as English, French and Spanish. The web site was launched in August 1998.

2.7.2 Radio

There are three major radio stations and one national broadcaster, Voice of Vietnam (VOV). VOV is the official network of the Vietnamese Government. It broadcasts on AM, FM and shortwave. National broadcasts are in Vietnamese as well as ethnic tongues including H'mong, Khmer, Ede, GiaLai and Bana. Overseas broadcasts are in twelve languages including Vietnamese for expatriates.

VOV has 61 provincial radio stations primarily using AM while Hanoi and HCMC also have FM stations. According to UNESCO, there were some 8.2 million radio sets in use in 1997 translating into a density of 107 sets per 1'000 inhabitants.

2.7.3 Television

State-owned Vietnam Television (VTV) has monopoly on over-the-air television. It has three nationwide channels (VTV1, VTV2, VTV3) as well as a local channel in each province. In addition there is a satellite channel, VTV4, aimed at overseas Vietnamese and carried by Thaicom 3 (Thailand), Viasat 1 (Malaysia) and Telstar 5 (United States).

According to VTV, there are approximately ten million TV households meaning that around 80 per cent of Vietnamese homes have a television set. The density is even higher in urban areas. According to one statistic, 96 per cent of urban households have TVs and watch an average of three hours per day. Household TV penetration is estimated at 92 per cent in HCMC and 96 per cent in Hanoi.

Multi-channel television is available through satellite reception or VTV's MMDS wireless cable service. The use of a satellite dish requires permission from the Ministry of Culture and is primarily intended for hotels. Supposedly it is difficult for locals to get permission. Nonetheless small satellite dishes are openly sold. According to AC Nielsen, there were some 20'000 satellite dishes in the four largest cities in 1999. VTV's MMDS service, launched in 1994, has 10'000 subscribers in Hanoi and HCMC. In Hanoi, nine channels are available for US$ five/month while in HCMC it costs between US$ 13-30 depending on how many channels are selected. VTV censors political, sexual and violent content. According to VTV,

there is not much demand for multi-channel TV because programming is not in Vietnamese. They have plans to launch a coaxial cable service and a Direct-To-Home (D-T-H) satellite service as well as more extensive dubbing and subtitling of foreign programs.

VTV launched a web site in September 2000<www.vtv.org.vn>. The main demand for this comes from overseas Vietnamese. The site provides program schedules, news as well as delayed video streaming. Streaming capability is limited because of speed. VTV leases a 64 kbit/s line and plans to upgrade it to 128 kbit/s. Cost is an issue as they are paying VND 33 million per month (around US$ 2'250) just for bandwidth.

Over 50 per cent of VTV's revenue comes from the government with the rest coming from a variety of sources. VTV carries advertising but this is controversial since viewers complain. By law, advertising cannot exceed five per cent of programming time. According to the Press Law (1983, amended last year), private TV stations are not allowed. Programming is in Vietnamese with some news programs in English and French. Provincial channels also provide broadcasting in local languages. There is no license fee system in Vietnam.

WebTV is being developed by VDC, with a target date for introduction of year-end 2001[9] but VTV is not involved. There is currently no data broadcasting in the country.

[7] See: http://www.itu.int/wtpf/casestudies/index.html.

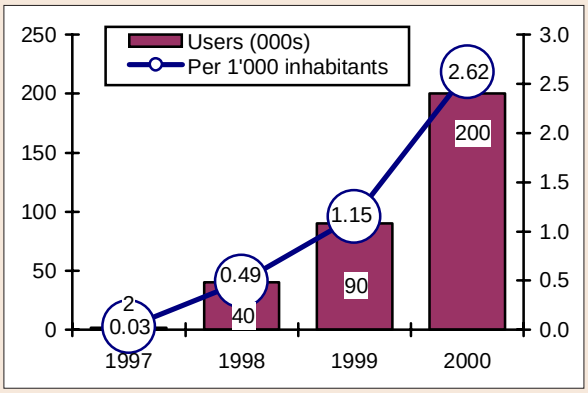
[8] Millicom, which is based in Luxembourg, has a 90 per cent shareholding in the Swedish company Comvik. The local company is called Comvik International Vietnam (CIV).

[9] See: http://db.vnpt.com.vn/news/view.asp?ID=240.

3. Internet

Vietnam is a relative newcomer to the Internet, obtaining its first permanent international connection in December 1997. This late start is partly explained by government hesitation. The Internet is perceived as a powerful tool for research and economic development.[10] It is also perceived as a potential threat by opening up access to a variety of views and opinions that are not always consistent with the Vietnamese government. In order to guard against the latter, the state has exerted strong control over Internet development. Although the Internet has grown at an impressive rate—the number of subscribers more than doubling each year since its inception—this may soon reach a plateau, with most of those that can afford access at commercial rates having it. In order to promote future growth, create sustainability and enhance the sophistication of Internet usage in the country, the government will have to reconcile the contradiction between strong regulatory control and the benefits of a more free and competitive market.

Figure 3:1: Vietnam on the Net



Note: Users estimated on the basis of two users per subscriber.
Source: ITU adapted from VNPT data.

3.1 History

Although Vietnam only permanently connected to the Internet in November 1997, it had been involved in various networking activities for more than five years before. This helped to build up the expertise needed to successfully launch Internet services in the country. In 1991, the exchange of e-mail with a German university was explored but this proved unfeasible due to poor connections and high costs. In 1992, Hanoi's Institute of Information Technology (IOIT) established a dial-up telephone connection with the Australian National University to exchange e-mail. This pioneering service grew into Vietnam's first national computing network:

"This was how the online venture, which began with nine telephone lines, ending up at the Australian National University (ANU), was growing into the first Vietnamese internal network. The new network was called VARENet (Vietnam Academic Research and Educational Network), reflecting its intention to facilitate the exchange of academic communication and research. In its early days, batches of e-mails were sent five times a day from ANU to Hanoi, where they were sorted by members of IOIT. At times, they were hand delivered (via motorbike) around the city. The calls were initiated in Australia and hence the transmission costs were only

about one third the cost if initiated in Vietnam. Users were charged for the service, and transmission fees were refunded to the ANU."[11]

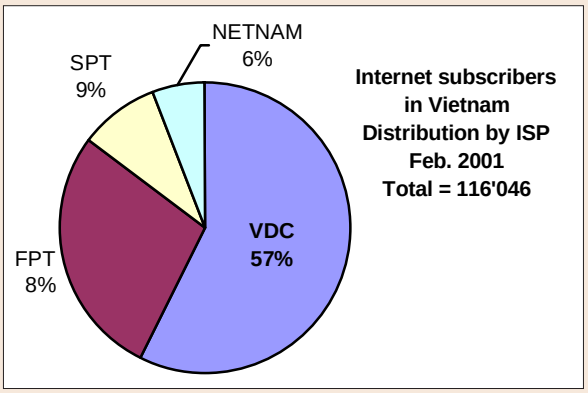
By 1996, around 300 scientific, academic and research organizations were connected to the IOIT.

Parallel to this, another IOIT related organization known as NetNam was launched with assistance from Canada's International Development Research Center (IDRC) through its Pan Asia Networking (PAN) project. While VARENet provided basic connectivity to research and academic institutions, NetNam sought to address the needs of the NGO community in Vietnam. NetNam also used a UUCP connection to ANU in Australia to provide Internet mail to its predominantly NGO, academic and research clients. It also had a local bulletin-board service (BBS) that contained a number of file libraries and locally-oriented material. In 1996, NetNam hosted a few hundred accounts, including 60 of the 75 foreign NGO's operating in the country, or more than 800 users.

While Vietnam was probably ready to have a full time international connection to the Internet in 1996, this was delayed by the government due to a lack of suitable rules and regulations. A flurry of decrees and resolutions were issued in 1997 outlining how the Internet was to be used and controlled prior to its actual implementation. Finally in November 1997, the government gave its seal of approval and the first ISPs began providing commercial access service.

Vietnam had just over 100'000 dial-up Internet subscribers at the end of the year 2000. This translates into a penetration level of just over one subscriber per 1'000 inhabitants. Official statistics for the number of users do not exist. Most estimates are based on multiplying the number of subscribers by a factor of no more than two. This seems reasonable considering that usage in business and education is relatively low—there were only some 200 leased Internet lines in May 2001. Although there are a growing number of cybercafés, these are in the main cities and appear to be primarily utilized by expatriates and tourists. Added to this would be the 40'000 some users of the 1268 and 1269 services (see below). It is estimated that, by the end of 2000, there were around 200'000 users. This figure is equivalent to a penetration rate of around 0.25 per cent or one Internet user per 389 Vietnamese.

Figure 3.2: Internet market



Source: VNPT.

3.2 Market structure: A Quartet

Vietnam had four operational ISPs in May 2001. The four all have long time data communication experience and their ISP operations essentially were an outgrowth of that.

The largest ISP is **Vietnam Data-communications Company** (VDC) <www.vdc.com.vn> with some 66'500 subscribers in February 2001, accounting for almost 60 per cent of the market. VDC was established by VNPT in 1989 to provide data communication services. VDC serves as the sole Internet Access Provider (IAP) as owner of the only international Internet gateway. VDC also hosts web sites (i.e., it is an ICP: Internet Content Provider).

The second largest ISP is the **Corporation for Financing and Promoting Technology** (FPT)

<www.fpt.com.vn>. It was founded in HCMC in 1988 to carry out software development and computer training. It later expanded into systems development and integration and became the distributor for a number of international computer companies. It was awarded its ISP license in 1997.

Saigon Postel Corporation (SPT) <www.saigonpostel.com.vn> is a joint stock company created in 1995. It provides Internet services through its SaigonNet subsidiary. SPT is 87 per cent state-owned (by eleven government organizations including VNPT), and 13 per cent by individuals, companies and staff. Total staff is around 300, including postal services. There are nine other offices throughout Vietnam in addition to the headquarters in HCMC. The majority of SPT's customers are in HCMC but it opened a Point of Presence (POP) in Hanoi in 2000 and is aiming to build up its activities there. SPT also operates a string of over 100 cybercafés in HCMC (see Box 3.1).

The Institute of Information Technology created **NetNam** <www.netnam.vn> in 1994. With assistance from Canada's IDRC, it started an e-mail and local Bulletin Board Service primarily used by development agencies, expatriates and professional Vietnamese. It was later awarded an ISP license. It operates in Hanoi and HCMC, offering both an Intranet (access to Vietnamese sites) as well as full Internet services.

3.3 International connectivity and peering

VDC is the sole Internet Exchange Access Provider (IXP) and thus has a monopoly on delivering international Internet connections. The actual gateway is managed by VNPT's subsidiary for international traffic, Vietnam Telecom International (VTI). Overseas Internet bandwidth in May 2001 was 34 Mbps (up from 24 Mbps in December 2000). Despite the fact that most Internet traffic is incoming—indeed VDC estimates the incoming to outgoing traffic ratio at 5:1—Vietnam is one of the few countries in the world with symmetrical international bandwidth (i.e., incoming capacity equal to outgoing). Connectivity is with five countries, all through undersea fiber optic links (see Table 3.1).

Table 3.1: Internet connections

Vietnam's International Internet bandwidth by route, May 2001

ISP / Location	Mbps
Hongkong Telecom (Hongkong SAR)	16
KDD (Japan)	2
Sprint (USA)	6
Singtel (Singapore)	8
Telstra (Australia)	2

Source: VTI.

International access prices are considered high but have been coming down. They amount to around 20 per cent of VDC's overall operating costs. Vietnam does not have to pay for both half circuits to countries with whom it peers. Typical half circuit costs are around US$ 10'000 per month for one E1 (1.5 Mbps).

National peering between ISPs has not been necessary because there is only a single IXP (i.e., VDC). Since all ISPs connect to VDC's international gateway, their traffic is automatically exchanged and national traffic stays within the country.

3.3.1 Broadband

Broadband options are currently limited to leased high-speed circuits ranging in speed from 64 kbps to 2.048 Mbps. Prices are high, which explains why there are only around 200 leased line subscribers. A 64 kbps leased line costs VND 21'480'000

(US$ 1'442) per month while a 2 Mbps line costs VND 257'760'000 (US$ 17'304) per month. VDC has an ADSL pilot. It is expected that there will be 100 users by the end of 2001 and perhaps 1000 by the end of 2002. There is no cable television in Vietnam so cable modem access is not a short-term option. According to VDC's five-year development plan, it is targeting 100'000 broadband users by 2005.[12]

3.4 Regulation

Numerous decrees and ordinances guide use of the Internet in Vietnam. They regulate practically everything ranging from who qualifies for an ISP license to tariffs. One of the most important is Decree 55 of 2001, which regulates the use of the Internet in the country.

3.5 Licensing

An inter-ministerial circular issued in May 1997 outlines the procedure for the granting of Internet provision licenses.[13] There are three types of Internet licenses: Internet Service Provider (ISP), Internet Exchange Provider (IXP) (provision of international Internet gateway) and Internet Content Provider (hosting of content). The first two licenses are granted by the DGPT whereas the Ministry of Culture and Information licenses the latter. As of May 2001, there were five licensed ISPs: VDC, FPT, NetNam, SPT and Vietel of which the first four were operational. Current regulations stipulate that IXPs must be state-owned. ISPs pay a one-time licensing fee of VND 15 million (around US$ 1'000) for a five-year license. Three—VDC, SPT and Viatel—are theoretically allowed to provide their own infrastructure. However the situation is unclear and to date, only VDC has an IXP license.

3.6 Tariffs

Internet tariffs are established by the DGPT.[14] Dial-up Internet access consists of an ISP charge and local telephone charges (see Table 3.2). VDC, VNPT's Internet subsidiary, offers nationwide dial-up access from most of Vietnam's 61 provinces for the price of a local call using three four digit numbers: 1260, 1268 and 1269. The first requires prior registration, payment of a monthly subscription charge and provides full access to the Internet. The latter two do not require prior registration but can only be used from the user's own telephone line. In addition, the latter two do not have subscription charges but are tariffed according to the amount of time spent online. The 1268 access code only provides access to Vietnamese sites.

ISPs can establish different pricing packages but they must equal the prices established by the DGPT. The one exception is for the second off-peak tariff (midnight, 7am Mon.-Fri. and 7pm Sat.-Sun). This can be reduced by up

Table 3.2: Internet Dial-up Tariffs, July 2001

	VND	US$
Connection	Set by ISP	
Monthly subscription	27'273	$1.83
Per minute:		
7am-7pm (Mon.-Fri.)	210	$0.014
7pm-12pm (daily) 7am-7pm (Sat.-Sun.)	150	$0.010
Midnite-7am (daily) 7pm-7am (Sat.-Sun.)	130	$0.009
Telephone usage charge (per minute):		
Up to 200 minutes	120	$0.008
201-1000 minutes	80	$0.005
After 1001 minutes	40	$0.003

Note: Not including ten per cent tax. Converted to US$ at rate of 30 June 2001.
Source: VNPT.

to VND 30 (US 0.2 cents). In order to distinguish service, ISPs can offer other incentives to customers.

3.7 Universal access

Vietnam has an Internet penetration level of just 0.25 Internet users per 100 inhabitants (end 2000). Usage is heavily skewed to urban areas, particularly Hanoi and HCMC. For example these two cities accounted for 86 per cent of all subscribers and all of the leased line accounts even though they only make up ten per cent of the Vietnamese population. Current Internet pricing is unaffordable for most Vietnamese; 30 hours of monthly use would be roughly equivalent to the country's per capita GDP.

Despite these grim statistics, there are few government policies to encourage public Internet access. There is currently no provision for providing discounts to public facilities such as educational institutions, let alone Internet cafés. On the other hand a fifty per cent Internet access discount is available for software development centres in order to promote that industry. Government plans call for Internet density in Vietnam to be the same as the world average by 2010 but without more concrete projects for supporting public access, it is unclear how this target can be met.

There is a government plan to provide free access to villages through post offices and cultural establishments. Around 20 communes currently receive free Internet access, via dial-up, but this is still a pilot.[15]

3.8 Content

An Internet Content Provider (ICP) license is required in order to host a web site in Vietnam. The ICP license is granted by the Ministry of Culture and Information. Web hosting tariffs are established by the DGPT. Company web sites do not need a license, but they must be hosted by an ICP. There were around 15 ICPs at May 2001 including all the ISPs as well as several media organizations such as newspapers (e.g., <www.laodong.com.vn>).

Access to foreign content is controlled via a firewall. Sites that are considered offensive or contrary to the government's perspective are blocked. The Ministry of Interior decides which sites are to be blocked and VDC implements the filtering on the gateway. Sometimes users complain about lack of access to particular sites, but more often they complain about the slower speeds caused by the filtering software.

3.9 Domain name

The Ministry of Science, Technology and the Environment and IOIT registered the .vn domain name in April 1994. Today the .vn domain

Box 3.1: SPT Cybercafés

Saigon Postel (SPT) is one of the leaders driving public Internet access. It has over 100 Internet agencies in HCMC. They are branded as "SaigonNet" cafés. They can set their own prices (around VND 300-400 per minute). SaigonNet cafés tend to use dial-up rather than leased lines because leased line prices as so high. They can also connect to more than one ISP if there is a failure. A typical cybernet has one or two technicians plus students so salaries are low

keeping overhead down. Most SaigonNet cafés would have an average of ten PCs although some have more than 20. Usage is mainly e-mail and chat. Offline games are also popular. In the past, mainly foreigners used them. But now more Vietnamese are visiting cybercafés. Students use them for their research. SPT is trying to promote fidelity by offering a "multilink service" whereby a SaigonNet café takes a number of lines connected permanently to their PBX.

name is administered by the DGPT and managed by the Vietnam Internet Network Information Center (VNNIC). More than 2'000 domain names have been registered. Second level domain names corresponding to those widely used in other countries are generally used (e.g., ac (academic), edu (educational), gov (government), org (other organizations) or com (commercial)). The registration fee is VND 450'000 (US$ 31.76) and the annual fee is VND 480'000 (US$ 33.88). All web sites located in Vietnam must use the .vn domain. Use of generic Top Level Domains (gTLD) (e.g., www.site.com or www.site.edu) is not allowed but may be permitted in the future. At present, only web sites hosted outside Vietnam can use gTLDs.

3.10 VoIP (See Box 2.1)

The provision of Voice Over Internet Protocol (VoIP) requires a license from DGPT. In May 2001, VIETEL had the only VoIP license (granted in February 2000) and has been running a trial since October 2000 for domestic long distance between Hanoi and Ho Chi Minh City. The price, decided by the DGPT, is VND 1'818 (US 13 cents) per minute (exclusive of VAT) compared to the PSTN price of VND 4'000 (US 12 cents) per minute. Around 60'000 users were using the service in May 2001, quite an accomplishment considering that there is no prepaid service and marketing is limited. Users dial a special prefix—1780—to get access to the service. Ironically, even though it is a competitor, VIETEL leases equipment from VNPT for the service. VNPT also does the billing. VIETEL pays 33 per cent of revenues to VNPT for interconnection and billing. While the quality is acceptable, users have to dial a longer number and put up with delays in getting a dial tone. VIETEL estimates that it has captured around 40 per cent of the market based on minutes. It is rumored that the DGPT will offer additional VoIP licenses.

International VoIP is easy to control in Vietnam since there is only one Internet gateway controlled by the incumbent telephone operator, VNPT. It blocks access to Internet Telephony sites such as Dialpad and Net2Phone. There have been a number of applications for international VoIP licenses. In June 2001, the DGPT published tariffs for international VoIP as a preparation for the eventual granting of licenses for the service. The rate is set at a uniform US$ 1.30/minute to any destination. Though still steep for an Internet Telephony call, the tariff is significantly cheaper than existing international charges over the PSTN. For example a one-minute IDD call to the USA during peak hours cost US$ 2.51. It is expected that international VoIP licenses will be awarded soon.

3.11 Quality of Service

ISPs must register for a quality certificate from the DGPT. They must abide by certain quality of service parameters and provide quarterly reports.

3.12 Mobile Internet

Mobile Internet has considerable potential as there are more than one million mobile users and an estimated 20'000 Wireless Application Protocol (WAP) handsets on the market. WAP was launched by both GSM operators in May 2001. Subscribers have to pay a connection fee (VND 15'000; US$ 1.06). The usage charge is VND 900 (US 6 cents) per minute (including VAT). Of this, VND 100 goes to VDC (including VAT). Applications include basic information, news, sport, weather, and exchange rates. Subscribers can also use it for e-mail. Currently there are three Vietnamese WAP sites (VDC, VMS and Vinaphone).

[10] "If this is correct, then the direction of Vietnam's recent dramatic reform in the direction and learning purposes of the primary school curriculum coupled with widespread, low cost access to ICT (including the internet) is exactly what is required. Not only should it represent the fastest and surest combination of factors to Vietnam becoming quite early in this century a knowledge-based economy, it should also serve to stimulate the rapid economic growth that the country seeks." MPI, UNIDO, UNDP. Report on a Science, Technology and Industry Strategy for Vietnam. May 2000.

[11] Dang Hoang-Giang. "Internet in Vietnam: From a Laborious Birth into an Uncertain Future." www.interasia.org/vietnam/dang-hoang-giang.html

[12] "VNPT five-year plan upbeat on Internet growth potential." VNS, Feb. 20, 2001. http://db.vnpt.com.vn/News/view.asp?ID=212

[13] See "Inter-Ministerial Circular No.08-TTLT of May 24,1997 guiding the granting of permits for hooking up, providing and using the Internet in Vietnam." Available at: <www.vnpt.com.vn/Vnpt/Legals/Bulletins/VBInternet/Thongtu/Circular08-1997TTLT.htm>

[14] See Decision No.519/2001/QD-TCBD dated June 28, 2001 of the Secretary General of DGPT. Available at www.vnpt.com.vn/Vnpt/Services/TelecomServices/Internet_PSTN.htm

[15] "Free Internet access for nine more village post office and cultural places." VNPT Web site. April 17, 2001. http://db.vnpt.com.vn/News/view.asp?ID=278.

4. National absorption

4.1 Government

Although the government sector plays an important role in economic life in Vietnam, it has generally been slower to adopt the Internet than businesses or individuals. Although most of the major ministries have web sites, the majority are slow to load and contain a limited amount of information.

The Ministry of Science, Technology and the Environment (<www.moste.gov.vn>) was one of the first government entities to go online, even before the formal liberalization of the Internet in 1997, through a dial-up connection to Australia. However, as so often happens with pioneers, its site has failed to keep up with developments.

One of the more useful government sites is the one maintained by the Vietnam Tourist Office (<www.vietnamtourism.com>), which provides links to hotels, tour operators, and some limited online booking facilities. It has language support in English and French, but most of the content comprises links to other sites.

Perhaps the most impressive site is the one for the National Assembly (<www.na.gov.vn>). This basic but skillfully presented site has information about the history of the National Assembly and of Vietnam, as well as the full text of the national constitution. It has information and brief biographies of each of the Deputies but unfortunately no e-mail addresses or other links that would allow for interactive communication or feedback.

Among other government sites, the better organized and more informative ones tend to be those with links to overseas development assistance programmes, such as the German-funded assistance programme for small and medium-sized enterprises (<www.smelink.com.vn>) or the Japanese-funded National Transport Development Strategy (<www. vitranss.org>). Table 4.1 gived an overview of the main government web sites.

Within government, computer use is limited but growing. For instance, although the DGPT does not yet have a functioning web site, most staff members have access to a PC and there is an internal LAN with dial-up links to regional offices. Similarly, the Ministry of Health has around 100 LANs linking some 5'000 computers in total, but this is considerably fewer than the number of professional staff working in the health sector.

Within government, there is no single ministry with responsibility for IT, and therefore no real coordination of e-government initiatives. An IT project office was established in 1993 and a national IT project was defined in 1995 but in 2000 this was cancelled and the responsibilities were split between the Prime Minister's office and the Ministry of Science, Technology and the Environment.

The longer-term goal is to create a single government network, for instance to facilitate e-mail communication. One of the peculiarities of the current situation in Vietnam is that many government officials and business people have multiple e-mail accounts that are used for different purposes. Because it is not feasible to check so many accounts on a regular basis, this means that e-mail is less useful than it could be.

4.2 Education

Although the Internet is considered very important for teaching and learning in Vietnam, the actual level of Internet use

Table 4.1: Government on the Web in Vietnam

Ministry	Website URL
Ministry of Culture and Information	www.cinet.vnn.vn
National Assembly (English and Vietnamese)	www.na.gov.vn
Ministry of Agriculture and rural development (some English)	www.mard.gov.vn
Ministry of Education and Training	www.moet.edu.vn
Ministry of Health	www.moh.gov.vn
Ministry of Foreign Affairs (English and Vietnamese)	www.mofa.gov.vn
Ministry of Planning and Investment (English and Vietnamese)	Sites hosted by Netnam at: www.netnam.vn/mpi_ferd and by UNIDO at: www.smelink.com.vn
Ministry of Science, Technology and the Environment	www.moste.gov.vn
Ministry of Transport, National transport development strategy study, funded by Japan (English)	www.vitranss.org
Ministry of Trade	www.mot.gov.vn
Ministry of Trade, Vietnam Trade network (English and Vietnamese)	www.vitranet.com.vn
Vietnam National Tourist Agency (English, French and Vietnamese)	www.vietnamtourism.com

Source: ITU, UNDP (http://www.undp.org.vn/undp/partner/links/vnmin.htm).

in the education sector is limited. In primary and high schools, usage is low but all universities have an Internet connection and their own web site. Many professors have private Internet accounts and use e-mail. Perhaps 3-4 per cent out of the total number of 120'000 Internet accounts in Vietnam are used by the academic sector. That would amount to around 5'000 accounts out of a total potential user base of 22 million students.

Because connections are slow—typically just a 64 kbit/s dial-up line, though a few universities have leased line connections—using the Internet is often frustrating. One of the reasons for the slow connections is cost. Until July 2001, a 64 kbit/s dial-up account cost US$ 2'500 per month. Since July, that price has come down to US$ 800 per month, but still remains a luxury. In principle, the education sector should benefit from a discount on connectivity prices. In practice, this is not the case. Quality of service is low and costs are high. A few hours use would cost several hundred thousand Dong, which is beyond the reach of most students.

Many of the first users of the Internet came from the education sector. For instance, the Ministry of Science and Technology was one of the first users, with a dial-up account to Australia before the use of the Internet became "official" in late 1997. The Ministry of Education and Training has a web site at www.moet.edu.vn. There is a plan to link the Ministry with Edunet, the

international not-for-profit educational network (see for instance www.edunet.ca), and a grant from the Japanese Overseas Development Agency has been requested for this purpose. The idea is to connect all universities to the Ministry and to Edunet but this project is still at the planning stage.

In Vietnam there are 22'200 primary schools, 1'760 secondary schools and 123 institutes of higher learning. Primary school is mandatory but not secondary school. Adult literacy rates stand at just over 90 per cent. This represents a major improvement since the 1950s when as few as one in five of the adult population could read or write.

Most secondary schools would have at least one PC. Relatively few primary schools have PCs but some private schools in big cities have better facilities. One example is the Hanoi Amsterdam High School, one of the best schools in Hanoi. Out of a sample "Maths-gifted class" that graduated in 1991, some 16 out of the 26 students are known to have e-mail addresses. Many are working in the IT sector, or in government institutions of one form or another, including universities.[16] Another example is the ChuVanAn secondary school, which has an active alumni section.[17] As ever, things are further ahead in HCMC than elsewhere and the local government there has recently announced a project to introduce computers at all levels in schools.

At the university level, the situation is much brighter. There are an estimated one million university students, all of whom receive compulsory courses in basic IT use. There are some 50'000 IT specialists in universities and training colleges and around 5'000 computer graduates each year. However, this falls substantially short of the requirement for computer literate employees in the workforce. The situation is exacerbated by the brain drain. Of the 26 students in the 1991 Hanoi-Amsterdam maths class, at least five currently work outside Vietnam and a further five work in foreign-owned companies in Vietnam.

One problem is the lack of Vietnamese language software for use in educational applications. This effectively restricts the likely user population for the Internet to the ten per cent or so of Vietnamese who speak some English. There has been some development of distance learning, for instance at the Hanoi University of Technology (www.hut.edu.vn), but again cost is a limiting factor.

4.3 Health

In 1995, the Prime Minister's Office formulated a five-year Master Plan geared towards increasing the use of information technology (IT) in the health sector. In the same year, the Ministry of Health set up a nationwide Steering Committee for IT Development. However, this programme was discontinued owing to a shortage of funds.

Four of Vietnam's universities contain medical schools. In addition, there are 30 accredited research institutes, and 15 provincial medical schools. Collectively, these institutions have access to 5'000 PCs, more than 100 local area networks (LANs) and eight wide area networks (WANs). As many as 300 professionals work in the field of IT. Some are specialized in the subject and other doctors and pharmacists hold supplementary qualifications. Some 100 Internet accounts, all dial-up, exist in the health sector, four belonging to the Ministry's headquarters in Hanoi. In 1997, the Ministry set up a web site containing official health information, such as health legislation, access to services and health policy. At the same time, the Ministry set up a medical Intranet connecting 30 hospitals and institutes. The initial target date in the Master Plan for connecting all district hospitals was 2000. Once again owing to financial constraints, the unofficial target is now 2005.

In 1999, Vietnam had 11' 229 medical service units around the country. WANs are used by hospitals to send their periodical reports to the Ministry

of Health <www.moh.gov.vn> electronically. Some hospitals use LANs to facilitate the management and processing of patient records. However, the prevalence of non-standard systems and applications across hospitals prevents a consistent exchange of information.

Telemedicine projects have suffered from shortages of staff and equipment. Results have been unsatisfactory so far as the first pilot transmission suffered from poor quality of service. In 2000, the Ministry of Health applied to the European Commission for the funding of a Telemedicine project, the outcome of which is still uncertain.

National health insurance, which is mandatory in Vietnam, covers more than ten million people. Claims are processed electronically. Some of the obstacles to the wider use of the Internet in the health sector include the slow speed, the high cost, and the limited IT training. But the main obstacle according to the Ministry of Health is the lack of a legal framework for electronic signatures.

While the first priority of the Ministry of Health is the treatment of patients, the IT Committee is also considering the following issues:

- funding options for the high-cost leased line access
- the official status of electronic documents
- standardization of hospital software

Even though some 1'000 PCs are in use in the pharmaceutical industry, individual pharmacies typically do not have their own web sites or Internet access. Moreover, as in many other countries, pharmaceutical companies need to comply with regulations on sales and advertising through lengthy and complex procedures. In an effort to address this, the Vietnamese government is currently working with the Canadian International Development Agency (CIDA) on a project to devise an IT-based approval procedure for pharmaceuticals.

4.4 e-commerce

The Prime Minister has assigned responsibility for e-commerce to the Ministry of Trade (MoT) <www.mot.gov.vn> and DGPT, although the former has taken a coordinating role. This mandate, which is vague, was given three years ago. The MoT has invited experts and specialists from different ministries and organizations to provide input into the nation's e-commerce policy development.

In 1998, the MoT launched an awareness campaign about e-commerce and organized seminars for government officials to discuss the topic. It held a three-week training course in Hanoi for officials from all over the country as part of a Canadian International Development Agency IT project. An e-commerce guide has been prepared and is available on VDC's web site.

Since 1999, there has been a government-funded project to develop a policy paper on e-commerce. The topic has been divided into twelve subjects (infrastructure, legal, impact on culture, security, consumer protection, e-payment, etc.) and the relevant ministries were assigned to look into each subject. The report, covering 2001-2005, was submitted to the government in July 2001.[18]

A major obstacle to e-commerce is the lack of information and official guidance from government on what is allowed and not allowed. There is also a shortage of funds and expertise to look into e-commerce. The government is not stopping anyone from entering the market but they are concerned about how to protect Small and Medium Enterprises (SMEs). There is also a lack of e-payment mechanisms. A major barrier for Business to Consumer (B2C) e-commerce in Vietnam is the limited availability of credit cards. The use of credit cards has just recently started, in co-operation with foreign banks. Though credit cards are available, few people have them. Additionally they are primarily used domestically as there are restrictions on overseas use.

The government is working on a legal framework for e-commerce, including electronic signatures and certification authorities but this is unlikely to become a law in the near future. These issues are more likely to be dealt with through a decree or ordinance. Vietnam may sign the Berne Convention on copyright protection in the near future. This is one of the requirements of the US/Vietnam trade agreement.

Security concerns, relating to hacking and computer crime, have increased. For instance, a Ministry of Trade official recently lost some one million Dong because his Internet account was hacked and his password stolen. In the short term there will be an ordinance on encryption which will help security.

State-owned banks have been slow to develop consumer electronic services such as ATMs or online banking. Instead this is being driven by foreign banks that have been allowed to operate in Vietnam for a number of years. Australia's ANZ was one of the first to set up offices in Vietnam and has two branches in Hanoi and Ho Chi Minh City. ANZ offers credit cards and ATMs but thus far no online banking. Another foreign bank, HSBC, has plans to introduce on-line banking.

There is scarce market research on e-commerce or business adoption of Information and Communication Technology in Vietnam. For example, there have been no government studies on computer use in companies.[19] One reason is a lack of funding. There are no known estimates regarding the size of the e-commerce market.

A major bottleneck for facilitating electronic trade is the number of documents and licenses required to do business. Though this may not be remedied in the short-run, more transparency can be introduced by putting required forms and procedures online. Vietnam is encouraging government departments to go online and make forms such as customs papers available electronically. Supposedly every ministry has a web site, although some are only available over the government's intranet.

Despite the barriers, the MoT is taking a number of steps to promote e-commerce. For example it is developing web sites to promote trade. There is also a project to put customs online. The MoT is also interested in following legal frameworks for e-commerce, particularly the United Nations Commission on International Trade Law (UNICTRAL) model.[20]

The majority of Vietnam's some 30'000 private firms are SMEs. For the most part, they are not very computer literate. The country is working with regional organizations such as APEC and ASEAN to strengthen its SMEs. These regional agreements tend to create some pressure to build up e-commerce capabilities.[21] The Vietnamese Chamber of Industry and Commerce <www.vcci.com.vn > has also been active in building up IT capability in SMEs and sponsored a workshop in May 2001 on Internet-based information.[22]

It is expected that state-run companies should take the lead in the introduction of e-commerce.[23] The MoT is particularly optimistic about sectors such as tourism, agriculture and the garment industry. For instance, the Vien Tien company, which sells paper products and clothes, is using its web site to advertise its products and to take orders but not yet to do financial transactions. There are also high hopes that Vietnam's large expatriate community will use their expertise to build up e-commerce applications. The fact that they tend to be well-off and have Internet connections suggests that expatriates provide an ideal market for Business-to-Consumer transactions.

Some initiatives or potential applications include:

- NutTrade.com, a US company, is helping Vietnamese companies to sell cashew nuts. There is a verbal agreement to develop the scheme nationwide;

- The rice industry is another potential e-commerce user as this market is now fully opened;[24]

- Flower sales are another possibility, for instance for expatriate Vietnamese sending flowers to relatives living in Vietnam. Flower production is famous in the mountainous Dalat region in the south, near HCM City. It is doing well in attracting foreign investment.

Portal sites are not particularly well developed, though ISP home pages and newspapers attract a lot of attention. One successful company is VASC (value-added services company) <www.vasc.com.vn> which is a kind of Vietnamese version of Yahoo. Another portal is VITRANET <www.vinakey.com.vn>, partially supported by the ITU's Electronic Commerce for Developing Countries project. It provides trade news, legal documents and other business-related news on its web site.

Overall, the Ministry of Trade is confident that e-commerce will take off in Vietnam but it is difficult to see the way ahead. For example the Ministry has plans to have e-procurement and trade management go online by 2005. Unfortunately this timetable is too conservative and in the meantime the country is missing out on many benefits of e-commerce. Vietnam has a long way to go to improve its e-commerce physical and legal infrastructure and improve its low e-readiness ranking.[25]

Box 4.1: Vietnam's Software Parks

Software development has been identified as one of the four key areas in Vietnam's Information Technology (IT) Master Plan (along with infrastructure, hardware development and human resources).[26] The logic is compelling. Computer programming is basically brainpower and thus requires relatively little investment. Funds that are needed could come from local private companies as well as foreign ones. A software development industry would also build up Vietnamese expertise in computing, helping to make Information and Communication Technology sustainable and driving the country into a knowledge-based economy. The government feels Vietnam has a number of advantages:

"The development of our country's software industry would benefit from the following fundamental advantages: … Vietnamese people are capable of quickly absorbing this technology; there are in the overseas Vietnamese community many experts, who are experienced in the software industry and wish to establish cooperation and make investment in Vietnam."[27]

The strategy the government is adopting is to promote software development sites around the country rather than one specific zone. The Ministry of Science, Technology and Environment has been charged with spearheading software development. A number of incentives are provided to companies locating at the sites such as tax breaks, low rent, etc.[28] So far, a few so-called "Software Parks" have been established in Ho Chi Minh City and Hanoi.

One of the first was Saigon Software Park (SSP) <www.saigonsoft.com.vn>. The word "park" is a misnomer since SSP is actually located in a new six-story building albeit in a relatively quiet residential district of HCMC. It opened for business in July 2000 with 30 companies. SSP has around two dozen management staff and over 600 people are working there. This includes established companies as well as new ones. Most are Vietnamese but there are also a few foreign ones. SSP is fully occupied and has been looking for another building close by. SSP has a two Mbps Internet connection for which it pays VND 200 million a month. This price is discounted 50 per cent as part of a government policy to promote software development. Nonetheless SSP's main cost is the Internet connection. SSP Internet connection goes straight to the international Internet gateway so it must provide its own firewall that blocks sites specified by the Ministry of Interior (Internet Telephony sites are excluded). Companies in SSP typically do one portion of software coding in Vietnam; this is usually part of a larger project. Accounting, management, and education applications are among those being developed for the local market. Softwares that have been developed include a job market application and an electronic catalogue for a business.

One strategy for funding software parks is to attract overseas funding as well as development assistance. For example the US Trade and Development Agency recently approved a US$ 400'000 grant to fund a feasibility study for Quang Trung Software Park. The Japanese government is also planning to provide assistance for a US$ 100 million software park in Hanoi.

Government plans call for creating a US$ 500 million software market and 50'000 IT professionals including 25'000 computer programmers (also fluent in English) by 2005. How realistic is the Vietnamese government's plan? The value of the market seems optimistic considering that the software market in Vietnam is currently estimated at only US$ ten million per year. Also software piracy in the country is rife with Vietnam cited as one the worst offenders in the world.[29] This may deter potential investors in software development.

Vietnam's main advantage appears to be labour costs with the average programmer earning about US$ 200/month. SSP has a training and education centre to instruct software engineers on following international standards. It is also working with the University of Ho Chi Minh City to train software engineers. SSP also hosts the first Cisco Networking Academy in Vietnam.[30] Nonetheless Vietnam currently only churns out around 2'000 graduates in IT a year and it will need to accelerate this if it is to meet its target. The country is also working with overseas partners to develop training programs. India appears to be a model for the Vietnamese with several agreements made with that country for human resource development.[31]

Right now, the major selling point of software "Made in Vietnam" would appear to be lower labour costs. However there are a number of other countries that offer equally low labour costs as well as other advantages. For example, one of the best known is India which has the added pluses of having been in the business a long time, a core of highly trained and English speaking professionals and extensive worldwide connections. Another potential problem is that government support for software development risks creating an island of IT activity insulated from the rest of the country.

[16] See: http://www.jaist.ac.jp/~thang/toan-ha-8891.html.

[17] See: http://64.177.74.100/cgi-bin/UltraBoard/UltraBoard.cgi .

[18] The improvement of telecommunication infrastructure and reduction of Internet access prices were identified as top priorities. See "Telecommunications infrastructure first priority in e-commerce development in Vietnam in 2001-2005." VNPT Web site, July 12, 2001. http://db.vnpt.com.vn/News/view.asp?ID=620.

[19] According to one survey of 93 private firms in May 2000, 33 per cent were connected to the Internet. None had created a web site or considered the Internet a particularly useful tool. See ebusinessforum. http://www.ebusinessforum.com/index.asp?layout=rich_story&doc_id=913&country_id=&title=Vietnam%3A+Key+issues&channelid=6&categoryid=21

[20] According to UNICTRAL "The Model Law, adopted in 1996, is intended to facilitate the use of modern means of communications and storage of information, such as electronic data interchange (EDI), electronic mail and telecopy, with or without the use of such support as the Internet. It is based on the establishment of a functional equivalent for paper-based concepts such as "writing", "signature" and "original". By providing standards by which the legal value of electronic messages can be assessed, the Model Law should play a significant role in enhancing the use of paperless communication. In addition to general norms, the Model Law also contains rules for electronic commerce in specific areas, such as carriage of goods. With a view to assisting executive branches of Governments, legislative bodies and courts in enacting and interpreting the Model Law, the Commission has produced a Guide to Enactment of the UNCITRAL Model Law on Electronic Commerce." See http://www.uncitral.org/english/texts/electcom/ecommerceindex.htm.

[21] For example under the terms of the e-ASEAN Framework Agreement which Vietnam signed, a high-speed Internet connection will connect ASEAN countries to provide online products and services.

[22] See "Workshop on Internet-based Information and Services for SMEs: SMEs want more and better Vietnamese web sites." http://www.smenet.com.vn/index-e.htm.

[23] There are some 5'300 State-Owned-Enterprises accounting for around 40 per cent of GDP. See US Department of State. "FY 2001 Country Commercial Guide: Vietnam." July 2000.

[24] The Internet could help rice farmers obtain better prices. See Anya Schiffrin. "Of rice and Men." http://www.thestandard.com/article/0,1902,21402,00.html.

[25] For example, Vietnam was ranked 58th out of 60 economies in one e-readiness survey. See http://www.ebusinessforum.com/index.asp?layout=rich_story&doc_id=367.

[26] See Prime Ministerial Decision No.81/2001/QD-TT on IT promotion for the country's industrialisation and modernization.

[27] Resolution NO.07/2000/ND-CP of June 5, 2000 on the building and development of software industry in the 2000-2005 period. www.vnpt.com.vn/Vnpt/Legals/Bulletins/CPTTg/Nghi_Quyet/Resolution07_June2000.htm.

[28] "First northern hi-tech park prepares to open its door." VNPT Web site. 31/7/2001. db.vnpt.com.vn/News/view.asp?ID=703.

[29] According to the US Software and Information Industry Association, Vietnam's software piracy rate is 98 per cent. See www.siia.net/sharedcontent/press/2000/5-24-00.html.

[30] "Saigon Center of Techniques and Technology to Award Cisco Networking Academy Scholarships to Top Le Hong Phong Students." *Press Release*. 5 April 2001. http://www.cisco.com/warp/public/146/asia_pr/april01/1.html.

[31] "VN, India set up IT center." (VNS, April 26, 2001) http://db.vnpt.com.vn/News/view.asp?ID=322. FPT and India's Aptech have a one year program leading to certification of software programmers. Students can enroll at one of three centers (Hanoi, HCMC and Danang). The programme costs between US$ 700-850 per year. The centers enroll around 800 students. See "Aptech, FPT to introduce new training program." The Saigon Times Daily. 17 May 2001.

5. Conclusions

5.1 State of the Internet in Vietnam

The Mosaic Group <www.agsd.com/gdi97/gdi97.html>, has developed a framework for characterizing the state of the Internet in a nation. They consider six dimensions, each of which has five ordinal values ranging from zero (non-existent) to four (highly developed). The dimensions are as follow:

- **pervasiveness:** a measure based on users per capita and the degree to which non-technicians are using the Internet.
- **geographic dispersion**: a measure of the concentration of the Internet within a nation, from none or a single city to nationwide availability.
- **sectoral absorption**: a measure of the degree of utilization of the Internet in the education, commercial, health care and public sectors.
- **connectivity infrastructure**: a measure based on international and intra-national backbone bandwidth, exchange points, and last-mile access methods.
- **organizational infrastructure**: a measure based on the state of the ISP industry and market conditions.
- **sophistication of use**: a measure characterizing usage from conventional to highly sophisticated and driving innovation.

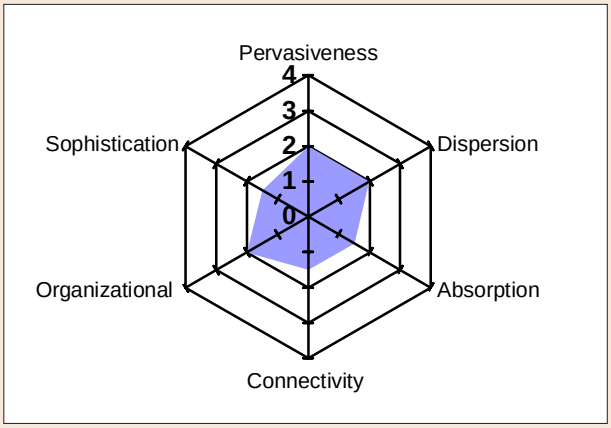
Vietnamese values for these dimensions are shown below.

Pervasiveness is rated at level 2, *Established*. At December 2000, there were just over 100'000 subscribers translating into an estimated 200'000 Internet users in the country or 0.25 per cent of the population.

Geographic Dispersion is rated at level 2, *Moderately dispersed.* Internet

Figure 5.1: State of Internet in Vietnam

Dimension	Value
Pervasiveness	2
Geographic Dispersion	2
Sectoral Absorption	1.5
Connectivity Infrastructure	1.5
Organizational Infrastructure	2
Sophistication of Use	1.5
TOTAL	**10.5**



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

access is theoretically available from all provincial capitals for the price of a local call. However there are very few fixed telephone lines outside of the capital.

Sectoral Absorption is rated at level 1.5, between *Rare* and *Moderate.* This ranking is a function of the type of connectivity in education, government, health care and business. One major factor affecting this dimension is the high cost of leased lines. Few primary or secondary schools have Internet connections though all universities do. Some government ministries are on the web although there is no central portal. In addition, other ministries are on the government intranet and therefore not accessible to the general public. Few provincial governments have web sites. The Ministry of Health has its own web site. Usage in the business sector is minimal.

The **Connectivity Infrastructure** is at level 1.5, between *Thin* and *Expanded*. International connectivity is 34 Mbps bothways. There are POPs in the large cities as well as a nationwide Internet backbone. There is a domestic Internet exchange by default since there is only one international gateway provider to which all ISPs connect. Few leased lines are in place and there is no ADSL or cable modem for broadband local access.

The **Organizational Infrastructure** is at level 2, *Controlled*. There are four operational ISPs of which only one is allowed to provide an international gateway. Entry into the ISP market is not possible at this time although it appears that may be changed soon.

Sophistication of Use is at level 1.5, between *Minimal* and *Conventional*. The most popular applications among most users appear to be e-mail, chat and information retrieval. However there are a growing number of local language web sites.

5.2 Recommendations

In Vietnam, the government has attempted to reconcile the essentially free-market character of the Internet with a national system based on state control. Despite a late start, (the Internet was first permitted in Vietnam on November 19,1997), the dramatic growth that has marked the Internet in other countries is apparent now also in Vietnam. During 2000, the number of dial-up Internet subscribers grew from just 42'000 to over 100'000, a growth rate of almost 150 per cent. In the first four months of the year, approximately 10'000 subscribers have been added each month.

The big question is what happens next? A series of market reforms are proposed, which would see a degree of liberalization and an extension of the current system whereby different ministries and provincial governments are effectively in competition with each other. Already, in some areas that are seen as critical to national development and trade promotion, such as building a software industry, there has been a degree of relaxation of government control. A trial of Voice over Internet Protocol (VoIP) is being conducted between the two largest cities and could be extended to international traffic, where Vietnam has some of the highest prices in the world.

It seems clear that the Vietnamese government is at a turning point. Should it persist with a model of state control or should it move in the direction of a free market model? The Internet, a potent symbol of civil liberties, lies at the heart of this dilemma. Can a socialist model of government be reconciled with a user-driven Internet? Equally, can the Internet continue to grow without a new measure of economic liberalization? The following recommendations to help promote the diffusion of the Internet are offered for discussion, on the basis of lessons learned in other countries.

1. Licensing and adjustments to market structure

1.1 Internet access provider

There appears to be a conflict of interest in the situation of VDC, which is the monopoly national and international backbone Internet

Access Provider (IAP), using lines leased from VTI, as well as the country's largest Internet Services Provider (ISP). This puts VDC in a strong position relative to other ISPs since it is both their competitor and their main supplier. There does not appear to be any structural separation between the two sides of the business (e.g., accounting separation). When considering opening up the market to more ISPs, the Internet bandwidth market should also be opened to alternative suppliers, for instance by allowing direct connections between VTI and other ISPs. If VDC is to continue as both an IAP and the leading ISP, then there should be full managerial and accounting separation between the two halves of the operation.

1.2 Internet service providers

The current number of licensed ISPs (five, of which only four have launched services) is inadequate now that the market in Vietnam is maturing. As a first step, additional ISPs should be licensed. At a later stage, the ISP market should be liberalized and the licensing requirement for ISPs should be simplified.

1.3 Cybercafés

The licensing procedure for cybercafés should be liberalized.

1.4 Internet Content Providers

The government should consider phasing out the current system of Internet Content Provider licenses to encourage more production of local content. Instead, a system a self-regulation of content, perhaps backed up by a set of agreed guidelines and an industry watchdog, should be introduced.

1.5 Separation of regulatory, policy-making and operational functions

The degree of separation between the regulator and policy-maker (DGPT) and the national operator (VNPT) should be clarified.

1.6 Transparency of process

When considering changes in policy, the DGPT should involve all interested parties, including users and private sector representatives, in a formal consultation process. The inputs to these consultation processes and the resulting policy changes should, as far as possible, be made available over a DGPT web site, which is independent from that of VNPT.

2. Private sector participation

The government should encourage private sector participation, foreign investment and employee ownership in Internet companies, especially among Internet Service and Content Providers. The experience of partial private ownership in Saigon Posts & Telecommunications has been successful and this should be extended. It may be worthwhile to consider reducing or removing caps on the percentage of equity that can be owned by any single organization or individual. These steps would help attract investment into the Internet sector.

3. Cybercafés

The growth and development of cybercafés has had a very positive effect in spreading awareness of, and access to, the Internet in Vietnam. Policies that specifically support the development of cybercafés could include:

3.1 Official endorsement of cybercafés and clarification of their legal status.

3.2 Recognition by government of particularly successful or innovative cybercafés, for instance through some sort of awards scheme which honours excellence and best practice.

3.3 Official support for franchising schemes that will enable entrepreneurs to establish cybercafés. Such support could include, for instance, training, loans, starter kits and rental subsidies during early phases of development.

3.4 Special recognition and support for entrepreneurs wishing to establish Internet access points

in rural areas. This might include tax concessions, reduced access pricing such as exists for Software Development Parks, etc.

3.5 Creating a professional association of cybercafés.

3.6 Creation of a range of different types of cybercafés, for instance in universities, government departments, libraries, health centres and other office buildings as well as in public places.

3.7 Using the network of post offices to extend Internet access into smaller towns and rural areas, thereby exploiting the synergies between the postal and telecommunications operations in the current organizational structure.

4. Public awareness and training

The Internet is now reaching a phase where it could begin to expand rapidly among the general population. In order to achieve this, it will be necessary to raise general public awareness of the Internet and its potential benefits. Measures to raise awareness and to promote access could include:

4.1 Extending the offer of subsidised Internet access prices, currently available only in the software development parks, to universities and schools and other community access locations. In the past, this has been offered on a case-by-case basis. Evidence suggests that high prices, especially for leased line access, are a significant obstacle to broadening the take-up of Internet.

4.2 Developing short (e.g., one week), standardized, government-approved training programmes for Internet skills, such as web site development and awareness of the Internet. At the same time, informal training and sharing of expertise among cybercafé entrepreneurs and between cybercafé users should also be encouraged.

4.3 Promoting e-government initiatives (i.e., putting certain government administrative services and information on the Web). This could include, for instance, selecting one or two high-profile applications, such as processing of school registrations or the system of application for licenses, and making these available online.

4.4 Extending adult education programmes and IT "re-training" for professionals (e.g., health care workers and lawyers).

5. Invest in the new generation

In order to encourage Internet take-up among students in primary and secondary schools, a formal programme should be developed to extend the level of access to computers and computer skills. Measures could include "kids' computer clubs" to encourage students to explore the Internet and to develop research projects. At least in urban areas, some element of computer training (e.g., keyboard and mouse skills) should be a compulsory element of the secondary school curriculum. An essential first step is to increase the number of PCs in school classrooms. Where appropriate, the support of international and bi-lateral assistance organizations could be solicited.

At the university level, steps to encourage university use of Internet could include:

- Provision of subsidised leased line access for universities and other higher educational establishments;
- Creation of a high-speed national academic network to link all national universities and research institutes together and to establish links with foreign universities;
- The programme currently in place for compulsory IT training in universities should be extended;

- Further development of computer science courses in universities to increase the number of computer-literate students who graduate each year;

- Establishment of formal links and co-operation between academic institutions and IT businesses, to help reverse the brain drain.

6. Pricing issues

The rebalancing of prices, towards regional norms, is an urgent priority. Currently Vietnam has some of the world's most expensive prices for domestic and international leased lines. This is inevitably passed on in terms of higher prices for local ISPs and therefore customers' Internet access prices are also among the highest in the region, mainly due to the telephone charge element. Steps to rebalance tariffs could include:

- Allowing ISPs, and other operators to set their own tariffs. In the short term, an upper limit on prices could be set by DGPT. It should not be necessary to set lower limits for prices;

- Introducing some degree of competition in services provision, for instance by allowing resale of services and by permitting voice over IP (VoIP) services to develop further (see below);

- Systematic benchmarking of telecommunications and Internet prices against regional and national averages;

- In the critical area of leased line prices, a target of reaching regional average prices within three years should be considered;

- Consider waiving or reducing the dial-up telephone charge for Internet access.

7. VoIP

The Voice over IP trial being conducted between Hanoi and Ho Chi Minh City is proving to be a success, gaining some 40 per cent of the traffic on this route within a few months of operation and with only minimal advertising. In line with the policy on VoIP in China, the experiment should now be operationalised and the provision of VoIP should be permitted also for international traffic. In this context, the endorsement of IP Telephony by participants in the ITU's recent World Telecommunication Policy Forum should be noted (see www.itu.int/wtpf).

8. Content issues

While clearly of great significance for Vietnamese society, the operation of a national firewall has the effect of slowing Internet communication, and exacerbating problems of congestion. A better policy might be to direct efforts towards developing more local content, especially in the Vietnamese language. This could be achieved through programmes such as school competitions for content development and e-government initiatives. In any case, the perceived need for content control should be dealt with in a way that does not exclude ISPs from eventually having their own international gateways.

9. 3G mobile

The take-up of mobile in Vietnam, which is now around the one million user mark, suggests a high level of latent demand for communication services. SMS messaging is also proving very popular. It is likely that demand for 3G mobile Internet services will also be high. For that reason, Vietnam should consider an early licensing policy for 3G mobile services to allow operators the time to prepare their networks. Mobile operators should be granted ISP licenses and permitted to offer Internet access via wireless means. Vietnam should follow closely 3G developments in other countries, and select an IMT-2000 standard, which will allow it to compete at the international level.

10. E-commerce

The development of a viable local e-commerce capability will require close co-operation between several different

arms of government, the banking sector, the ISPs, merchants and others. It will also require wider use of credit cards and clarification of the status of electronic signatures. Given the high percentage of the economy that is in state hands, it is logical that the government should take a leading role in making available its own products and services via the Web.

11. Conduct more market research

Given the high level of statistical data gathering that is conducted within the country, for instance for agricultural products, it would be worthwhile for government agencies and ISPs to carry out more market research in the Internet arena to ascertain user demand and market trends more precisely. One indicator that would be useful to monitor is the percentage of dial-up minutes that go to Internet users rather than voice callers. Another would be a more scientific survey on the number of Internet users in the country. The DGPT might consider working with the Central Statistics Office to include questions on ICT equipment availability and use in annual household surveys.

Annex 1: List of meetings

No.	DATE	TIME	Appointment with
1	14/05/01	09:00 am	Department General of Post and Telecommunications (DGPT) (Telecom Policy Department and Science Technology and International Cooperation Department)
2	14/05/01	10:30 pm	Vietnam Television
3	14/05/01	02:00 pm	Ministry of Health
4	14/05/01	03:00 pm	Ministry of Education
5	15/05/01	11:00 am	Ministry of Trade
6	15/05/01	02:00 pm	Vietnam Post and Telecommunication Corporation (VNPT)
7	15/05/01	15:30 pm	Vietnam Data Communication Company (VDC)
8	15/05/01	08:00 am	Vietnam Telecom International Company (VTI)
9	15/05/01	09:00 am	Vietnam Telecom National Company (VTN)
10	16/05/01	09:00 am	VIETEL – Ministry of Defense (ISP)
11	16/05/01	10: 30 am	Ministry of Science, Technology and Environnement (FPT)-(ISP)
12	16/05/01	13:30 pm	Vietnam Mobile Services Company (VMS)

Annex 2: Acronyms and abbreviations

AMPS	Advanced Mobile Phone Service/System
ANU	Australian National University
APEC	Asia-Pacific Economic Cooperation
ASEAN	Association Of South East Asian Nations
ATM	Asynchronous Transfer Mode
B2C	Business to Consumer
BBS	Bulletin-board service
BCC	Business Cooperation Contract
CIDA	Canadian International Development Agency
CcTLD	Country code top-level domain
DGPT	Vietnam Department General of Posts and Telecommunications
DWDM	Dense Wavelength Division Multiplexing
FCC	Federal Communications Commission
FDI	Foreign Direct Investment
FPT	Corporation for Financing and Promoting Technology
GDP/GNP	Gross Domestic Product/Gross National Product
GSM	Global System for Mobile Communication
HCMC	Ho Chi Minh City
HDI	Human Development Index
HQ	Headquarter
IAP	Internet Access Provider
IXP	Internet Exchange Provider
ICP	Internet Content Provider
ICT	Information and Communication Technology
IDRC	Canadian International Development Research Centre
IDD	International Direct Dialing
IOIT	Institute of Information Technology
IP	Internet Protocol
ISP	Internet Service Provider
IT	Information Technology
JV	Joint Venture
LAN	Local Area Network
LDC	Least Developed Country
MoT	Ministry of Trade
NGO	Non-governmental organization
PAN	Pan Asia Networking
POP	Point of Presence

PSTN	Public Switched Telephone Network
SDR	Special Drawing Right
SPT	Saigon Posts and Telecommunications (Saigon Postel Corporation)
SKA	Sender Keeps All
SME	Small and Medium Enterprises
SMS	Short Messaging Service
SMTC	Saigon Mobile Telephone Company
UNDP	United Nations Development Programme
UNICTRAL	United Nations Commission on International Trade Law
UUCP	UNIX-to-UNIX Copy Program
VARENet	Vietnam Academic Research and Educational Network
VASC	Value-added services company
VDC	Vietnam Datacommunication Company
Vietel	Military Electronic Telecommunications Company
VMS	Vietnam Mobile Service (Mobifone)
VND	Vietnam Dong
VNNIC	Vietnam Internet Network Information Center
VNPT	Vietnam Posts and Telecommunications Corporation
VOV	Voice of Vietnam
VTI	Vietnam Telecom International
VTN	Vietnam Telecoms National
VTV	Vietnam Television
VoIP	Voice over Internet Protocol
WHO	World Health Organization
WIPO	World Intellectual Property Organization
WLL	Wireless Local Loop
WTO	World Trade Organization

Annex 3: Useful links

Organization	Website
Main government-related ICT organizations/providers	
Vietnam Posts and Telecommunications Corporation	www.vnpt.com.vn
Vietnam Department General of Posts and Telecommunications	www.vnpt.com.vn/DGPT/dgpt_general.html
Vietnam Telecoms National	www.vtn.com.vn
Vietnam Datacommunication Company	www.vdc.com.vn
Mobifone (VMS)	www.mobifone.com.vn
Vinaphone (GPC)	www.gpc.vnn.vn
Saigon Posts and Telecommunications	www.saigonpostel.com.vn
Main ICT providers	
Corporation for Financing and Promoting Technology (FPT)	www.fpt.com.vn
NetNam	www.netnam.vn
Mass media	
Ministry of Culture and Information	www.cinet.vnn.vn
Vietnam News Agency	www.vnagency.com.vn
Nhan Dan (The People's Daily)	www.nhandan.org.vn
Saigon Times Daily	www.saigon-news.com
Vietnam News	www.vietnamnews.vnagency.com.vn
Academic	
Ministry of Science, Technology and the Environment	www.moste.gov.vn
Ministry of Education and Training	www.moet.edu.vn
Hanoi University of Technology	www.hut.edu.vn
Health	
Ministry of Health	www.moh.gov.vn
Electronic commerce	
Ministry of Trade	www.mot.gov.vn
Vietnamese Chamber of Industry and Commerce	www.vcci.com.vn
Vietnam Trade Network	www.vitranet.com.vn
Portals	
Value-added services company	www.vasc.com.vn
VITRANET	www.vinakey.com.nv
Other	
Vietnam National Tourist Agency	www.vietnamtourism.com
National Assembly	www.na.gov.vn
National Transport Development Strategy	www.vitranss.org
Ministry of Agriculture and rural development	www.mard.gov.vn
Ministry of Foreign Affairs	www.mofa.gov.vn
Value-added services company	www.vasc.com.vn
Saigon Software Park	www.saigonsoft.com.vn

Annex 4: Framework dimensions

Table 1: Pervasiveness of the Internet	
Level 0	*Non-existent*: The Internet does not exist in a viable form in this country. No computers with international IP connections are located within the country. There may be some Internet users in the country; however, they obtain a connection via an international telephone call to a foreign ISP.
Level 1	*Embryonic*: The ratio of users per capita is on the order of magnitude of less than one in a thousand (less than 0.1%).
Level 2	*Established*: The ratio of Internet users per capita is on the order of magnitude of at least one in a thousand (0.1% or greater).
Level 3	*Common*: The ratio of Internet users per capita is on the order of magnitude of at least one in a hundred (1% or greater).
Level 4	*Pervasive*: The Internet is pervasive. The ratio of Internet users per capita is on the order of magnitude of at least one in 10 (10% or greater).

Table 2: Geographic Dispersion of the Internet	
Level 0	*Non-existent*. The Internet does not exist in a viable form in this country. No computers with international IP connections are located within the country. A country may be using UUCP connections for email and USEnet.
Level 1	*Single location*: Internet points-of-presence are confined to one major population centre.
Level 2	*Moderately dispersed*: Internet points-of-presence are located in at least half of the first-tier political subdivisions of the country.
Level 3	*Highly dispersed*: Internet points-of-presence are located in at least three-quarters of the first-tier political subdivisions of the country.
Level 4	*Nationwide*: Internet points-of-presence are located in all first-tier political sub-divisions of the country. Rural dial-up access is publicly and commonly available and leased line connectivity is available.

Table 3a: Sectoral Use of the Internet			
Sector	**Rare**	**Moderate**	**Common**
Academic - primary and secondary schools, universities	>0-10% have leased-line Internet connectivity	10-90% have leased-line Internet connectivity	>90% have leased-line Internet connectivity
Commercial-businesses with > 100 employees	>0-10% have Internet servers	10-90% have Internet servers	>90% have Internet servers
Health-hospitals and clinics	>0-10% have leased-line Internet connectivity	10-90% have leased-line Internet connectivity	>90% have leased-line Internet connectivity
Public-top and second tier government entities	>0-10% have Internet servers	10-90% have Internet servers	>90% have Internet servers

Table 3b: The Sectoral Absorption of the Internet		
Sectoral point total	**Absorption dimension rating**	
0	Level 0	*Non-existent*
1-4	Level 1	*Rare*
5-7	Level 2	*Moderate*
8-9	Level 3	*Common*
10-12	Level 4	*Widely used*

Table 4: Connectivity Infrastructure of the Internet					
		Domestic backbone	**International Links**	**Internet Exchanges**	**Access Methods**
Level 0	*Non-existent*	None	None	None	None
Level 1	*Thin*	≤ 2 Mbps	? 128 Kbps	None	Modem
Level 2	*Expanded*	>2 – 200 Mbps	>128 kbps -- 45 Mbps	1	Modem 64 Kbps leased lines
Level 3	*Broad*	>200 Mbps -- 100 Gbps	>45 Mbps -- 10 Gbps	More than 1; Bilateral or Open	Modem > 64 Kbps leased lines
Level 4	*Immense*	> 100 Gbps	> 10 Gbps	Many; Both Bilateral and Open	< 90% modem > 64 Kbps leased lines

Table 5: The Organizational Infrastructure of the Internet	
Level 0	*None*: The Internet is not present in this country.
Level 1	*Single*: A single ISP has a monopoly in the Internet service provision market. This ISP is generally owned or significantly controlled by the government.
Level 2	*Controlled*: There are only a few ISPs because the market is closely controlled through high barriers to entry. All ISPs connect to the international Internet through a monopoly telecommunications service provider. The provision of domestic infrastructure is also a monopoly.
Level 3	*Competitive*: The Internet market is competitive and there are many ISPs due to low barriers to market entry. The provision of international links is a monopoly, but the provision of domestic infrastructure is open to competition, or vice versa.
Level 4	*Robust*: There is a rich service provision infrastructure. There are many ISPs and low barriers to market entry. International links and domestic infrastructure are open to competition. There are collaborative organizations and arrangements such as public exchanges, industry associations, and emergency response teams.

Table 6: The Sophistication of Use of the Internet	
Level 0	*None*: The Internet is not used, except by a very small fraction of the population that logs into foreign services.
Level 1	*Minimal*: The small user community struggles to employ the Internet in conventional, mainstream applications.
Level 2	*Conventional*: The user community changes established practices somewhat in response to or in order to accommodate the technology, but few established processes are changed dramatically. The Internet is used as a substitute or straight-forward enhancement for an existing process (e.g. e-mail vs. post). This is the first level at which we can say that the Internet has "taken hold" in a country.
Level 3	*Transforming*: The user community's use of the Internet results in new applications, or significant changes in existing processes and practices, although these innovations may not necessarily stretch the boundaries of the technology's capabilities. One strong indicator of business process re-engineeering to take advantage of the Internet, is that a significant number (over 5%) of Web sites, both government and business, are interactive.
Level 4	*Innovating*: The user community is discriminating and highly demanding. The user community is regularly applying, or seeking to apply the Internet in innovative ways that push the capabilities of the technology. The user community plays a significant role in driving the state-of-the-art and has a mutually beneficial and synergistic relationship with developers.