Antelope Consulting

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DFID Internet Costs Study

Appendix B: Country Case Study: India

Executive Summary

Background

There are more than 1 billion people spread over 3.3 million km^2 in India. 27% of the population is urban and 73% is rural.

Internet penetration stands at 1% with 10 million people connected to the Internet using an estimated 1.4 million distinct Internet accounts. Penetration is expected to exceed 8% by 2005.

There are more than 300 registered ISPs in India with around 100 in operation. The rest have either not commenced operations or have wound up.

Total international Internet bandwidth out of the country is around 1 Gbps. Bandwidth growth is at par with the growth in Internet customer base.

The cost of Personal Computers (PCs) is the single largest deterrent to Internet penetration in the country. An entry-level brand new PC costs about three times the per capita income.

Low telephone penetration (2.6 per 100 inhabitants) is the other factor hindering the growth of the Internet in India.

Internet Televisions and cable Internet access are likely to alleviate the problems of low PC penetration and low teledensity. Satellite TV penetration stands at 40% with more than 400 million people in 70 million households having access to satellite television.

Internet Status

The bulk of "Indian" web sites are not in India. Of the top (by way of turnover) 500 private sector Indian companies, 396 have their sites on servers outside India. Most of the top non-corporate Indian "pure" web sites (web sites that are companies rather than web sites that belong to companies in other areas of business) are also not in India. This gives rise to a lot of international Internet traffic that could be retained within the country by encouraging these companies to have their sites within India as a growing percentage of visitors to these sites are from within India.

Initial target audiences for these sites were people not normally residing in India, so these sites were located outside India. A perception that hosting within India is unavailable, unreliable or uneconomical is primarily

responsible for most of the sites being outside India. Multinational companies (MNC) also tend to have their sites outside India as the head office of the MNC also often handles the “India” sites of these companies.

India has one prominent International Gateway Company that also operates a monopoly international telephony business. It has reasonable bargaining power in the international bandwidth market due to volume of business, equity participation in bandwidth projects and board level positions in these projects. Gateways operated by this company also serve as exchange points for national traffic.

More companies are now setting up international gateways. Indian ISPs will have a wider choice of gateways in the coming months.

There are few or no serious regulatory barriers to setting up an ISP business or establishing a gateway.

The incumbent monopoly ISP was not allowed to operate all over the country in the early part of Internet history in order to allow other ISPs to gain a foothold. There is healthy competition amongst the ISPs and very competitive pricing for Internet access.

Internet Costs

ISP charges to end users have gone down from around US$0.75 per hour in 1995 to US$0.04 per hour at present. There are a number of free ISPs in operation and many unlimited use monthly plans are also available to internet users.

56 kbps, dial-up, unlimited use, monthly plans range from US$2.50 per month to US$4.50 per month depending upon the number of months that the user signs up for. Telco charges are payable over and above these ISP charges.

Most towns have a local Point of Presence (POP) for connection to the Internet. Most national ISPs also publish a single national number for connecting to the Internet at local call rates even from towns where there is no local POP.

Local call charges are the biggest variable cost component for Internet access. Cable Internet and DSL may alleviate this. Permanent connection cable access is available to users at around US$20 per month for a 64 kbps link with no other local call or other charges. Nominal set-up charges of around US$75 are payable for such connections. Cable access charges are also expected to drop drastically with skyrocketing volumes. There is a very real possibility of advent of data-transfer based tariffs

(volume based tariffs as opposed to usage based tariffs) in addition to time based tariffs for cable access.

The country's largest ISP and till recently the monopoly gateway company is creating local caches of frequently visited sites to reduce the need for international bandwidth.

A single or predominant gateway automatically takes care of peering as all national traffic can be routed within the country at the gateway level where all traffic converges anyway. The problem in India is not national traffic going out but the fact that there is hardly any national traffic to speak of.

The Internet is primarily used as a communication medium with e-mail and chat accounting for more than half of the total time spent on the Internet. An average of 17% of the Internet connect time is spent on web surfing, 26% for chat, 20% for file downloads, 31% for e-mail and the balance 6% is divided amongst e-Commerce, idle time and miscellaneous applications. On-line gaming, with negligible share-of-connect-time, is yet to seriously catch on.

Current connectivity to the Internet is 52% dial-up, 21% leased lines, 20% ISDN, 4% DSL, the balance using wireless, cable and other means. There is a relatively high proportion of leased line and ISDN connectivity due to the use of cyber cafés that connect to the ISPs using leased lines and ISDN.

The average ISP is losing money. Things will change if the average Internet usage jumps from the current level of 52 minutes per dial-up user per day to around 103 minutes per day or if the internet access charges are increased by around 30% from the current levels without any significant change in the quantum of internet usage.

Average Internet usage per account is 52 minutes a day, spread over a little under 3 sessions per day, giving an average of 19 minutes per session of Internet usage.

The average effective cost of Internet access to the dial-up user is INR 38.32 (US$ 0.82. 1 US$ = 47 INR) per hour. The user actually pays INR 31.88 (US$ 0.69. 1 US$ = 47 INR) per hour but in this one hour of Internet access, he loses 11 minutes due to network inefficiencies and this pushes up the effective cost per hour.

Projections

Estimates for next year's method of connecting to the Internet by existing Internet users are: 40% dial-up, 17% leased lines, 15% DSL, 10% wireless, 9% cable, 9% ISDN. Around 10 million new Internet users are expected to be generated as a result of availability of cable Internet connectivity, making cable the preferred means of Internet connectivity in the country, with an expected 55% of all Internet users connecting using cable within a year and more than 70% by 2005.

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Tables

1 Background

1.1 India – Vital Statistics[1]

Total Population: 1000 million people

00 – 04 years:	10.7%
05 – 14 years:	23.6%
15 – 19 years:	10.8%
20 – 24 years:	8.9%
25 – 34 years:	15.5%
35 – 45 years:	12.0%
45 – 54 years:	8.5%
55 – 59 years:	3.1%
60 and above:	7.0%

Table 1: Age Distribution of Population (2001)

Average Life Expectancy at birth: 63 years

Post Graduates	
Arts	3,341,300
Science:	695,500
Commerce:	728,500
Graduates	
Arts:	7,663,100
Science:	3,479,300
Commerce:	4,037,800
Medicine:	359,700
Dentistry:	20,700
Agricultural Sciences:	216,500
Veterinary Sciences:	42,700
Engineers	
Degree Holders:	798,400
Diploma Holders:	1,255,500
Nursing Personnel	473,100

Table 2: Manpower Availability (No. of people, year 2000):

These are the people more likely to be on the internet right now and in the near future. In our opinion, the total Internet market size is not 1000 million but these 23 million people who have studied largely in English or at least studied English if Internet access in regional languages is not developed soon. Enough work is in progress to indicate that language will

not be a barrier – most prominent Indian web sites like Rediff have regional language functionality.

Per Capita Income: Indian Rupees (INR) 15,370/- (US$ 327. 1 US$ = 47 INR)

Food & Beverages:	53.3 %
Clothing & footwear:	5.2 %
Housing Rent, Fuel & Power:	10.2 %
Transport & Communications:	13.7 %
Others	17.6 %

Table 3: Private Consumption Expenditure (at current prices)

With bulk of the household income going into essentials of life, Internet access would have to be an essential of life for it to find takers.

Low Income (< INR 22,500 per annum)	59.3 million households
Lower Middle (INR 22,501 – 45,000 per annum)	72.2 million households
Middle (INR 45,001 – 70,000 per annum)	23.5 million households
Upper Middle (INR 70,001 – 96,000 per annum)	13.6 million households
High Income (> INR 96,000 per annum)	12.1 million households

Table 4: Household Income Distribution (Total 180.7 million households) (1 US$ = 47 INR)

Since India is not a country where individuals have goods and gadgets – households own these assets - income distribution of households is very significant.

Railways: (Important because the railway network is likely to be used for data traffic and long distance telephony within India)

- Railway Route: 62,800 km
- Electrified tracks: 14,600 km

Electricity Generation: 517.5 billion kWh

Total Exports: INR 1629 billion (US$ 34.66 billion. 1 US$ = 47 INR)

Total Imports: INR 2046 billion (US$ 43.53 billion)

Total No. of Telephone Connections: 22.47 million (1998-99)

Estimated 26 million in March 2001 (general industry estimate).

Mumbai (Bombay)	2,012,000
Delhi (includes New Delhi)	1,642,000
Calcutta	853,000
Chennai (Madras)	625,000
Rest of India	17,338,000

Table 5: Distribution of telephone connections

Total No. of Telephone Calls: 146.6 billion

International Incoming to Outgoing calls ratio: 3.74 (99-00) [3.44 (98-99).] (Source: VSNL)

No. of international telephone circuits: 19,722 (Mar 2000) 17,922 (Mar99). (Source: VSNL)

About 85,000 km of optical cable has been laid down in India. Of this, 76,000 km belong to the Department of Telecom (Government of India), 3,000 km belong to various railways, gas companies, etc. and 6,000 km belong to various private companies. The last has just been laid down and quite a bit of it is still not in active operation. There are plans for another 15,000 km of optical cable by private companies in India.

Radio Sets:	121
TV Sets:	69
Motor Vehicles:	7
Telephone Lines:	22.5
Mobile Phones:	1.0
Fax Machines:	0.2
Personal Computers:	2.7
Internet Hosts:	0.02

Table 6: Penetration Levels (per 1000 people: 1999)

2 Telecom Status

2.1 Basic Telephony (Fixed Line Services)

For the purpose of basic or fixed line telephony service (POTS), India is divided into 20 telecom circles. Mumbai (Bombay), Delhi (includes New Delhi), Kolkata (Calcutta) and Chennai (Madras) are one circle each and the other 16 circles are geographically contiguous areas of the country.

Fixed line service in the entire country was, until recently within the purview of DoT (Department of Telecommunications, Government of India) and MTNL (Mahanagar Telephone Nigam Ltd. – Mahanagar means metropolis, Nigam means corporation). The Government of India also largely owns MTNL, although it is a company listed on the Indian stock exchanges and shares are also held by other entities.

Fixed line services were privatised some time back with one more operator permitted in each area, subject to payment of a hefty licence fee. In 1999 this restriction on the number of players was removed and the licence fees paid by the earlier bidders for the circles were to be adjusted against future payables to the Government.

Service providers now work on a revenue sharing arrangement with the Government of India.

All such payments by the service providers to the government, be it licence fees, entry fees or share of revenues are recommended by the Telecom Regulatory Authority of India (TRAI).

These measures are expected to aid the penetration of telephony into interior and rural India. Current levels of teledensity (2.3 per 100 people) make the cost of service provision too high and vice versa. Private investment into this sector and the ensuing marketing efforts of the new players in the field are expected to yield positive results.

Domestic long distance services as well as international long distance services, for a long while monopolies of government-owned companies, are also being opened up to competition.

2.2 Cellular Services

Regulation governing cellular services is similar to that governing the provision of fixed line services. The difference is that there was no

incumbent government owned or controlled operator in this sector and hence two private operators were permitted to start operations from the outset.

Here also, the restriction on number of players has been removed and even the government-owned basic telephony service providers have been permitted to enter this field. TRAI plays an important role here, although there are disputes with DoT in a number of places.

Cellular phones in India are fast catching up with fixed line phones in India in terms of number of subscribers.

2.3 Wireless in Local Loop (WiLL)

Fixed or basic telephony service providers are permitted to offer limited mobility via WiLL technology. There are additional fees to be paid to the government for spectrum allocation. In addition to the TRAI, the Wireless Planning Commission (WPC, Ministry of Communications, Government of India) also comes into the picture here as the frequency spectrum is involved in the provision of WiLL services.

2.4 Radio Paging Services

Radio Paging Services are governed by rules similar to those that govern the basic and cellular services. The only difference here is that service providers were allowed to interconnect with other service providers in other areas of operation (other telecom circles) right from the onset of services while this issue is still being resolved in the case of basic telecom services.

Radio paging arrived in India a little before cellular services and the pager has always been considered the poor man's cell phone. Cellular services started in India too soon after radio paging and radio paging failed to have a significant impact on the market. This matter was made worse by the drastic reductions in the cost of cellular handsets as also by reductions in the usage charges of cellular services.

2.5 Global Mobile Personal Communication Services (GMPCS)

Iridium and ICO Global were permitted to start these services in India but the financial woes of the worldwide industry have taken their toll on the Indian operations and services never started commercially. Almost worldwide coverage of cellular services and interconnectivity between cellular networks (which facilitate worldwide roaming service) are bound to be the major factors contributing to the demise of GMPCS.

If GMPCS services had started, the service providers would have been permitted to offer all kinds of voice and data services using practically any type of equipment approved by ITU.

2.6 Satellite Transmissions (VSAT Services)

VSAT service provision has been privatised recently and operators are allowed to use any transponders for the provision of services, subject to approval from the Department of Space, Government of India.

Data can be uplinked or downlinked using any international gateway, not necessarily that of VSNL.

Provision of VSAT services is also governed by a licence, with the licence fee comprising an entry fee and a revenue share arrangement with the Government of India, along lines similar to the arrangements envisaged for the provision of basic and cellular telephony services.

2.7 Cable Services

This is perhaps one of the most important sectors of the Indian telecom industry.

Cable service providers are governed by the Cable Networks Regulation Act. Under the act, the cable service providers are allowed to provide the last mile to the customer as well as switching services within their areas of operation and also to interconnect with each other.

The only hitch so far is that they were authorised to provide largely one-way entertainment-related media services. This is not the case any more as they are now allowed to provide Internet access as well as VoIP.

This is a very significant thing as they are the only people in the country who are allowed to provide VoIP services.

In future we see the emergence of the cable service providers as providers of entertainment, education, telecommunication and Internet services all over the country. The cable network may actually be an alternative to the PSTN network in the near future.

2.8 Interconnection between service providers

In the light of proliferation of technologies & communication media and the phenomenon of convergence of technologies, there is bound to be a lot of interaction between various service providers, not just within a given (technological or communication) area of operation but also across

media. Guidelines have been laid down for facilitating such interconnection between service providers. These are:

- Charges levied for interconnection should be based on the cost of providing the interconnection between the service providers;
- Charges levied for such interconnection services should be non-discriminatory and should not be bundled together with charges for other services;
- Charges for interconnection circuits and Internet port charges would be as laid down by the Telecommunication Tariff Order, 1999.

2.9 Regional Differences

India is broken up into around 20 circles for the sake of telephony and communication services. There are a lot of differences in these circles as far as market dynamics are concerned.

The western region of the country comprising Mumbai (and rest of Maharashtra), Gujarat and a few other states are very prosperous and awareness levels of people are quite high. Disposable incomes are higher than elsewhere in the country and so are the communication needs as these are the more industrialised and productive areas of the country. Gujarat (one of the 28 states of India) alone contributes 31% of the GDP of India.

The state domestic product for Gujarat has been growing at the rate of 9% for the last 7 years while the rate of growth for Maharashtra (the state within which Mumbai lies) is 8% compared to an All India growth of 6.9%.

In 1998-99 Maharashtra and Gujarat together accounted for more than INR 350,000 million (US$ 7.5 billion. 1 US$ = 47 INR) of industrial financial aid as compared to a national total of around INR 850,000 million (US$ 18 billion). Maharashtra and Gujarat together also accounted for more than 20% of the total industrial investments made in India during the previous financial year.

These differences are also manifested in the take up for all kinds of telecommunication services. The penetration of fixed line phones, cell phones, Internet connections and so on in the western region of India by far exceed the national averages. In some cases the total of the western region exceed the totals of the rest of the regions put together.

3 Internet Status

3.1 Legal & Regulatory Framework

There are no restrictions on who can serve as an ISP.

Any Indian company is allowed to set up its own international gateway to carry Internet traffic. Only one international gateway is in operation right now with 2 more expected to commence operations soon.

ISPs are allowed to interconnect with each other for national and international traffic. The Department of Telecommunications (DoT, Government of India) has recently raised a demand of INR 1.5 million (US$ 32,000) as license fees for interconnection but this has not been ratified as a law and is not likely to be ratified either.

ISPs have to interconnect to each other or to the gateway using links provided by one of the approved service providers. There are enough of such service providers to ensure that the rates charged for these links are not excessive.

Internet telephony is not permitted by law. Web sites that allow VoIP are generally “banned” – access to these sites from anywhere within India is cut off.

3.2 Industry Structure

There are more than 300 licensed ISPs in the country with not enough business for all of them. Only around 100 ISPs have commenced operations and the number of ISPs in operation is likely to go down as a result of market consolidation.

An estimated INR 10,000 crores (US$ 2.12 billion. 1 US$ = INR 47, 1 crore = 10 million) of investment planned for an estimated 4 million subscriptions at INR 25,000 (US$ 532) per subscriber.

Currently, there are around 1.4 million Internet accounts that give Internet access to more than 10 million individuals within India. The number of users per account is so high because a large percentage of Internet users use cyber cafés, company leased lines (or company ISDN lines) and other shared resources. Each Internet account belonging to an individual is used, on average, by 2.7 users. Corporate accounts and accounts

belonging to cyber cafés, schools and universities translate to a significantly higher number of users per account.

All ISPs offer dial-up access to the Internet, with practically all ISPs also either offering or planning at least one alternative means of connecting to the Internet.

Most ISPs use VSNL (Videsh Sanchar Nigam Ltd., until recently the monopoly gateway of India and a company owned largely by the Government of India) as the gateway. Most ISPs complain that the gateway services are not transparent. Till a couple of years ago there was a feeling that the gateway services were not competent enough technically but that feeling seems to have evaporated now.

3.3 Market Structure

3.3.1 Access Mechanisms (User)

Access Mechanism	% of Total Internet Users
Dial-up	52
ISDN	20
Leased Lines	21
DSL	4
Cable	3
Wireless	

Table 7: Access Mechanisms (User)[2]

There has been a radical change in the access mechanism over the last one year. Up until last year, dial-up access accounted for almost 80% of Internet users, primarily due to unavailability of reliable alternatives, as well as lack of awareness about alternatives. Most cyber cafés were also using multiple dial-up connections to keep the committed costs of operations low.

With the increase in cyber café patronage, the number of cyber cafes switching to leased lines and ISDN connections went up with a corresponding increase in the number of people using these connect mechanisms for Internet access. Use of leased lines and ISDN lines increases the upfront investment and committed expenses of cyber cafés, but the actual operating costs per hour of customer Internet access go down and yield better margins to the cyber cafés. An increasing number of cyber cafés are therefore now using leased lines and ISDN connections.

The drastic reductions in leased line rentals have also contributed greatly to the use of leased lines by cyber cafés and corporate users for connecting to the Internet.

Another factor that contributed to the decline in dial-up usage is the high telco charge of dial-up access. The telco charges are as high as 10 times the ISP access charges in some cases.

3.3.2 Access Mechanisms (ISPs)

Access Mechanism	% of ISPs Offering This Type of Connectivity
Dial-up	99
ISDN	25
Leased Lines	39
DSL	4
Cable	4
Wireless	2

Table 8: Access Mechanisms (ISPs)[3]

Most ISPs realise that the current volumes lie in the dial-up market and are therefore offering this as the primary form of connectivity. The other access mechanisms were necessitated primarily by the difficulties faced by the ISPs in getting PSTN lines from the fixed service telecommunication providers of India.

In some cases the ISPs offered the other means of connectivity for a brand rub-off effect on their dial-up services – the fact that they were offering the more exotic access mechanisms would help them create an image of technological sophistication that would help in their dial-up business.

3.3.3 Customer Profile

Type of Internet User	% of Total Internet Users
Home Users / Individuals	33
Small & Medium Enterprises	28
Large Corporate Users	23
Cyber Cafes	7
Cable Operators	1
ISPs	1
Educational Institutions & Others	7

Table 9: Customer Profile[4]

The business community was very slow in accepting the Internet as a viable and reliable tool. The bulk of Internet users are still home users. The smaller companies and businesses of India realised that this was a cost effective means of communication and embraced the Internet faster than the larger businesses. The SME (Small and Medium Enterprises) segment forms a larger chunk of the Internet user market compared to the corporate users, also due to the fact that they are simply far larger in numbers than the larger corporate entities.

The SME (Small and Medium Enterprises) segment also views the Internet as a great leveller, or at least used to the earlier years. Some disillusionment has set in with the Internet, as it did not really give as big a competitive leverage to the SMEs as they had initially been led to believe from the media hype.

3.3.4 Time Spent on the Internet

On-line Activity	% Of Internet Connect time
Web Surfing	17
Chat	26
File Downloads	20
E-mail (includes web based e-mail)	31
E-Commerce	6
Idle Connect Time	
Miscellaneous (includes Gaming and On-line applications)	

Table 10: Time spent on the Internet[5]

Web surfing, which used to account for a far larger chunk of on-line time, has lost market share to chat and e-mail. Perception of the Internet has changed from it being “the world’s largest library” to it being an efficient and cheap communication tool.

File download has also lost market share, reflecting an increase in non-technical Internet users. The early adopters of the Internet were primarily software professionals who spent a lot of on-line time download demo versions of software. There is a far lesser incidence of file downloads now.

The share of file downloads is perhaps even lower in terms of number of files downloaded. The time spent on file downloads would have decreased a lot more had the software versions not bloated so much over a period of time. Larger packages mean more time to download, even though the number of downloads has gone down.

File download time has also gone down due to the fact that over the last year or so, most Indian IT magazines have started issuing software CDs with the magazines in line with the world trend. The need for file downloads has also thus gone down.

3.3.5 Type of E-mail Account

Type of Primary E-mail Account	% Of People Having this type of account
Free Web Based	58
ISP Provided	12
Corporate E-mail Account	21
E-mail Account Provided by E-mail Service Providers (different from ISPs)	2
Others	7

Table 11: Type of e-mail account[6]

There is a lot of churn in the ISP market. ISPs lose customers to each other at very regular rates. Email accounts given by the ISPs are therefore not permanent addresses for the users, as the users do not intend to stick with the ISP forever.

Since there is also a lot of churn in the job market with people switching jobs regularly, the corporate e-mail account is also not the primary e-mail account for most people. Fears of corporate policing of email accounts also contribute to this phenomenon.

The bulk of the email accounts of Indian Internet users are thus free web-based mail accounts of the likes of Hotmail, Yahoo and so on.

3.3.6 Type of Free Web Based E-mail Account

Type of Free Web Based E-mail Account	% Of People Having this type of account	Mail Server Location
Account ending with .com	94	Outside India
Account ending with .co.in	0	Probably Outside India
Others	6	Outside India

Table 12: Type of Free Web Based E-mail Account[7]

Hotmail (including MSN) and Yahoo have the largest share of the free web based mail accounts favoured by Indians. The other popular web based mail accounts such as Rediff, IndiaInfo, IndiaInfoLine, IndiaTimes and so on are also hosted on servers that are outside India. AOL, the web based mail service that is amongst the more popular services worldwide does not seem to be very popular in India.

This is one of the biggest causes of the bandwidth crisis at the moment. Since these .com mail accounts hosted on servers residing primarily in USA store the bulk of the e-mails received by Indians, the need for bandwidth between India and USA is used to a large extent to deliver e-mails from one resident Indian to another. Two people within India communicate with each other using expensive international bandwidth.

3.3.7 Type of Messenger Used for Chatting

Type of Messenger used	% Of People Using this messenger	Chat Server Location
Yahoo	52	Outside India
MSN	30	Outside India
Rediff	9	Outside India
Others	9	Most Outside India

Table 13: Type of Messenger Used for Chatting[8]

This is the second cause of unnecessary demand for international bandwidth for India. Chatting is a popular Internet application and accounts for a large amount of data transfer too. And the bulk of the chatting even between two resident Indians happens via chat servers that are not located in India.

3.3.8 Type of Tariff Plan for Internet Access

(For Accounts Purchased from ISPs: Numbers do not include people who pay significantly higher charges for access through cyber cafes or people who access the Internet for free using corporate or other accounts. Note: 1 US$ = 47 INR)

Type of Tariff Plan (ISP Charges per hour of connectivity)	% Of People On This Tariff Plan
Free Access ISP	26
Access Charge < INR 4 ($0.09)	21
INR 4 < Access Charge < INR 6 ($0.13)	44
INR 6 < Access Charge < INR 9 ($0.19)	7
Access Charge > INR 9	2

Table 14: Type of Tariff Plan[9]

The local call charges form a large percentage of the total Internet access charge and most people do not really mind paying the nominal ISP access charge. Hence there are still a large number of takers for the paid ISP services rather than the free ISP services.

The perception is that the free ISPs are very slow and the user ends up paying a lot more money by way of local call charges while trying to save on the ISP connect charges. The market shares given above are on the basis of number of registered customers and not on the amount of time spent on the Internet. User market surveys show that even people who have signed up for free ISP accounts often use the paid ISP accounts for normal Internet connectivity. Usage wise market shares for the free ISPs are thus far lower than it may seem from table 14.

It is also said that the free ISPs, in order to keep costs down, have fewer than required number of PSTN lines to give Internet access to customers and it is therefore difficult to even get connected to the ISP – all the ISP PSTN lines are busy.

Most Internet users in India are by now “regulars” and so there is a higher take-up of the low cost access packages even though this means that there is a higher commitment over a period of time. Most people believe that they will end up using the entire block of time that they are committing for over the validity period of their Internet accounts, especially as most ISPs offer access packages with a long validity period like 3 years.

The high cost packages are used by the casual users (as expected) – these are the people who do not want to make a high commitment of usage, as they are not that hooked to the net.

3.3.9 Type of Tariff Plan for Internet Access

Type of Tariff Plan	% Of ISPs Offering Such Plans	% Of People On This Tariff Plan
Free Access (No Telco Charges Payable)	0	0
Free Access (Telco Charges Payable)	2	26
Unlimited Access for fixed monthly fee (No Telco Charges Payable)	4	2
Unlimited Access for fixed monthly fee (Telco Charges Payable)	60	14
Low Annual Usage Commitment, Relatively Higher Access Charge	99	20
Medium Annual Usage Commitment, Moderate Access Charge	91	25
High Annual Usage Commitment, Relatively Lower Access Charge	87	13

Table 15: Type of Tariff Plan for Internet Access[10]

Access accounts with a fixed monthly commitment and no telco charge are largely the cable and DSL accounts. These are relatively new and not even available in most areas, so the take up is not significant in terms of numbers, but enthusiasm for these access accounts is very high and they will drive the growth of the Internet in India.

Unlimited access accounts for a fixed monthly fee have already proved to be popular even when they are offered over the dial-up mode (with local call charges payable) and this is an indicator of the fact that the fixed charge accounts are going to be very popular in India.

4 Internet costs

4.1 User Costs

User Costs basically fall into 4 broad categories – direct payments to ISPs for Internet connectivity, local call charges, infrastructure charges (PC, telephone line rentals and so on) and "inefficiency charges".

Inefficiency charges are the charges that the user bears due to the inefficiencies of the service providers or rather due to the inefficiency of the service itself. This includes additional costs borne by the user due to dropped connections, improper authentication, slow data transfers and so on.

Most of the information presented here is derived in bits and pieces from various interviews given by ISP authorised personnel and some of it is from interviews conducted for the purpose of getting this specific information. Since quite a bit of this information is of a sensitive nature, information source names are not given anywhere.

WESRA conducted a user survey that gave a lot of information that corroborated whatever data was derived from the ISP sources. Where the user survey gave information that was contrary to what the ISPs told us, we have relied more heavily on the results of the user survey.

The user survey was administered to 1100 people. The questionnaire was sent to the prospective respondents by e-mail. To date a total of 489 people have responded to the questionnaire.

The 1100 people were selected at random from the user lists of various ISPs that we have access to. The selection was perfectly random with no credence given to any parameter of the user data. All the user lists were aggregated and a small computer program picked the 1100 people randomly from this list, irrespective of the ISP, town, age or any other parameter.

4.1.1 User costs for dial-up access

Local Call Charges: Variable as per the number of calls made per month, but since most Internet users would be in the "high-use" category, we have considered those charges. In India, high use does not normally mean a bulk discount. There is generally a higher charge for the higher use. The rationale being that at the low usage levels the telephone is a

necessity while at the high usage levels it is a luxury that can be charged luxury prices. This is true in most tariffs in India including power.

Each call is on metered pulses rather than the completion of a call. The pulse rate for a local call is 3 minutes and the call charges (at the high use levels) are INR 1.20 (US$ 0.03) per metered unit. This translates to INR 24 (US$ 0.51) per hour of usage. (1 US$ = 47 INR).

Most ISPs have local POPs around the country and where a town does not have a local POP from any ISP, calls to the nearest POP (in neighbouring towns) are charged at local rates. Most national level ISPs offers single number nationwide access.

Some useful data:

Average Connect time per day per user	52 minutes
Average connect time per connection per user (time that the user stays connected each time he connects)	19 minutes
Average number of connects to the Internet per user per day	= (52 / 19) = 2.74
Average number of calls wasted per successful call attempt per user (Note 1)	0.09
Average download speed as a percentage of expected download speed	40%
Average time spent in data transfer as a percentage of the total connect time	28%
Average time during which the connected bandwidth is idle as a percentage of the total connect time	72%

Table 16: WESRA Estimates of user side Internet access data

Note 1: Users were asked how many call attempts were wasted (for every 100 successful call attempts) on account of:

a) Difficulty in getting through to the ISP (in case of dial-up or ISDN or other non-permanent connections types)

b) Improper handshake (you can hear the modem make the connection noise but then you are not actually connected to the Internet at all – in case you normally give the user name and password manually after connecting, you are not asked for this information at all)

c) Improper authentication (you are told that the user name and password that you have given are not valid though you are sure that what you have keyed in is correct)

d) You are connected but are unable to reach any web site (you are told that the server that you are trying to reach is unavailable and you get the same message irrespective of which server you try to reach)

e) Slow data transfer rates (the web pages or e-mails take a very long time to come down to your machine)

f) You get disconnected from the Internet automatically

g) Any other problem you face (please specify).

Of these, points b to f and point g in most cases resulted in the user being charged for the call attempt even though he got nothing in return. These are termed as wasted calls or wasted metered units.

Since the average time of each successful connect attempt is 19 minutes, the user is charged for 7 metered units for each successful connect attempt. Adding the wasted metered units, the user pays for 7.09 calls for the 19 minutes of connect time to the Internet, giving **22.40** charged metered units per hour of Internet connect time.

Total cost per hour of connect time is this 22.40 * 1.20 (local call charges) + 5 (average ISP connect charges) = INR 31.88 (US$ 0.68. 1 US$ = 47 INR).

For every hour of connect time, 28% of the time is when data transfer happens and the rest is time when the user is working (as in reading the material on the screen, typing something out and so on) but the bandwidth is idle (there is negligible data transfer). This means that 16.80 minutes in every hour of connect time are spent on data transfer. (WESRA Estimates)

This data transfer happens at an efficiency of 40% (WESRA Estimates) meaning that it takes 2.5 times as much time for the data to come down, as it should have taken in the ideal case. Thus, for 100% efficiency of the network, the user would have spent not 16.80 minutes on the data transfer but only 16.80 / 2.5 = 6.72 minutes.

For every hour of connectivity, the user is thus getting only (60 – 16.80) + 6.72 = 49.92 minutes of “Internet time” and more than 10 minutes are being wasted on the inefficiencies of the network.

Effective cost per hour of Internet connectivity = 31.88 * 60 / 49.92 = INR 38.32 (US$ 0.82. 1 US$ = 47 INR).

This situation is valid for most dial-up connections. The monthly telephone rentals as allocated to Internet usage would further add to this cost. Current rentals are INR 190 (US$ 4.04) per month. One off installation charges are INR 800 (US$ 14.02) and there is a security deposit of INR 3,000/- (US$ 63.83).

For cable and DSL connections, this is not the case. There are no local call charges and hence the network inefficiency charges are also greatly minimised.

It has not been possible to determine usage patterns for people using cable connections or leased lines or even ISDN lines as these are largely "shared" connections where the same Internet account is used by a number of people and talking to a single user would not yield usable data. Project time did not permit any attempts at interviewing a statistically significant number of administrators of systems where such shared connections are prevalent.

Average time per day per dial-up user in the Internet is 52 minutes. Cost per hour of connectivity (not effective connectivity) is INR 31.88 (US$ 0.68). Thus, the average monthly Internet bill per user is 31.88 * 52 / 60 * 30 (30 days in a month) = INR 830 (US$ 17.66). Most service providers price Cable access at INR 999 (US$ 21.26) per month, so they are pricing the service at a rate that is marginally higher than the average monthly Internet bill at current usage levels.

Since the early adopters of cable connectivity are the high usage Internet customers whose current monthly bill may by significantly higher than the average Internet bill, they are bound to find cable access far more attractive, even if the speeds were not significantly higher than dial-up.

4.1.2 User Costs for Other Forms of Internet Access

Leased line charges

Sr. No.	Access Speed	One Time Registration & Installation Charges (INR)	Annual Charges (INR)
1	64 kbps	30,000 (US$ 640)	360,000 (US$ 7660)
2	128 kbps	30,000 (US$ 640)	550,000 (US$ 11700)
3	256 kbps	50,000 (US$ 1064)	765,000 (US$ 16275)
4	512 kbps	50,000 (US$ 1064)	1,100,000 (US$ 23400)
5	1 Mbps	50,000 (US$ 1064)	1,820,000 (US$ 38725)
6	2 Mbps	60,000 (US$ 1275)	3,000,000 (US$ 63830)

Table 17: Leased line charges (1 US$ = 47 INR)

ISDN Access Charges

64 kbps: INR 5 / hour (US$ 0.11)

128 kbps: INR 10 / hour (US$ 0.21)

4.2 ISP costs

Component	Monthly Cost (INR)	Monthly Cost (US$) (1 US$ = 47 INR)
20 Staff	140,000	3,000
2 Mbps International IP link	348,333	7,410
700 Tel lines	133,000	2,830
Office Rent (Mumbai – other places are significantly cheaper)	600,000	12,765
Electricity Rates	65,000	1,380
Voice Calls	80,000	1,700
Marketing	250,000	5,320
Insurance	120,000	2,550
Transport	12,000	255
Equip Depreciation	125,000	2,660
Total	1,873,333	39,860

Table 18: Monthly Budget for a 10,000 User ISP[11]

Average ISP Revenues (10,000 customer ISP mentioned above)

No. of customers = 10,000

Average Internet Usage per day per customer = 52 minutes

Average rate per hour charged to the customer = INR 6 (US$ 0.13)

Total Monthly revenues = 10,000 * (52/60) * 6 * 30 (= days per month) = INR 1,560,000/- (US$ 33200)

Net Loss per customer per month = INR 31.33 (US$ 0.67)

Net Loss per hour of user Internet access = INR 36.15 (US$ 0.77)

At this rate, for the ISP to make a 10% profit on costs incurred, the average usage per customer would have to go up to around 69 minutes per day which seems to be a fairly achievable target. In fact a majority of customers already use the Internet for more than this duration.

The downside is that with cable access being offered at lower rates and going further south, the average price charged to the end user for dial-up access is likely to go down further to around INR 4 per hour. At this rate, the average usage would have to be around 103 minutes per day for the ISP to make a 10% margin over costs. This is almost exactly double the current average usage.

The price charged to the ISPs for the international IP links is governed by TRAI, which is not about to let the telcos make abnormal profits. This indicates that this is just about enough to cover the cost of the IP link for the telco plus allocation of overheads plus a nominal (15% – 25%) pre-tax profit for the telco.

5 Projections

The growth of the Internet in India has been hampered so far due to the low teledensity and the fact that dial-up is the only way to connect to the Internet for most individuals.

Low PC penetration also contributes to this problem.

Most ISPs realise that these two problems can be addressed by encouraging more and more cyber cafés to come up. Cyber cafés also benefited from the reduction in leased line rates in India.

The availability of cable access to the Internet will be the biggest driver of the Internet revolution in India. Television penetration is almost 7% in terms of number of people but more than 20% in terms of number of households (and most homes in India that have a TV set have only one TV set) and this will form the backbone of the Internet revolution in India.

Cable also promises to take care of the other big deterrent to Internet usage, this being the high cost of local calls that have to be made to the ISP in order to get connected to the Internet (India bills local calls on a time basis and not a call basis).

Since DSL also takes care of the local call charges and the lack of a second telephone line at home (in addition to offering higher access bandwidths), DSL will also see a rise in popularity but will eventually fall short of the popularity of the cable.

Wireless access also holds promise in this large country. Mobile phone penetration is on the rise and it will probably keep pace with the world trend of overtaking fixed line phones over a period of time.

If wireless access speeds improve beyond the current 30 kbps (and they will with GPRS and 3G), then wireless access to the Internet will gain in popularity.

Cellular service providers in India offer WAP access at a very moderate INR 99 (US$ 2.11) per month with no additional charges or any sort (local call, airtime charge or ISP charges). The average WAP usage in Mumbai is 119 minutes per month per subscriber (to the WAP service) with there being some high users who use it for as much as 10 hours a month.

5.1 Number of Internet users

Year	No. of Internet Accounts (million)	No. of Internet Users (million)
2001	1.40	10
2002	3.09	18
2003	12.00	*38
2005	35.00	85

Table 19: Number of Internet Users[12]

* Another estimate puts this number at 50 million riding on the cable boom.

5.2 Access Mechanisms (User)

Access Mechanism	% of Total Internet Users 2002	% of Total Internet Users 2005
Dial-up	20	7
ISDN	2	0
Leased Lines	9	7
DSL	6	5
Cable	55	70
Wireless	8	11

Table 20: Access mechanisms (user)[13]

5.3 Access Mechanisms (ISPs)

Details of access mechanisms to be offered by the ISPs are not known. Most ISPs vaguely promise to be with the market and hence we shall see most of them trying to get to the cable front, but they will find themselves seriously lacking in infrastructure and we expect to see a further consolidation of the ISP market with the total number of ISPs being less than 30.

5.4 Time Spent on the Internet

On-line Activity	% Of Internet Connect time
Web Surfing	15
Chat	19
File Downloads	4
E-mail (includes web based e-mail)	20
E-Commerce	8
On-line Applications (ASP Model)	8
Education	6
Entertainment	20

Table 21: Time spent on the Internet[14]

With fixed charge connectivity at higher speeds afforded by cable and DSL, the time spent on file downloads will go down even further. This will also reduce as a result of the fact that a greater number of Internet users are non-programmers who do not download too many files (unless they are e-mail attachments – this time is added to the e-mail time).

Entertainment, E-mail and chat will be the prime reasons for people to be on the Internet. Entertainment will be the biggest gainer of the bandwidth growth as also of the growth in non-metered access to the Internet. Video and Audio on demand will take up the bulk of Internet time of users in India. Slightly lax copyright protection laws will see rampant audio and video piracy unless steps are taken to curb this practice.

On-line education will be the next biggest gainer of these phenomena. India as a country has a lot of value for education and the problem of lack of infrastructure that cripples the growth of education in India will be partly solved using technology.

Permanent high-speed connectivity will also see the rise of on-line applications. Application Service Providers will grow in revenue terms. On-line education, accounts, portfolio management and other such services will see a lot of takers and will account for a fair amount of on-line time.

5.5 Type of Tariff Plan for Internet Access

Type of Tariff Plan	% Of People On This Tariff Plan
Free Access (No Telco Charges Payable)	0
Free Access (Telco Charges Payable)	5
Unlimited Access for fixed monthly fee (No Telco Charges Payable)	45
Unlimited access with a fee based on amount of data transfer rather than time spent	25
Unlimited Access for fixed monthly fee (Telco Charges Payable)	4
Low Annual Usage Commitment, Relatively Higher Access Charge	15
Medium Annual Usage Commitment, Moderate Access Charge	4
High Annual Usage Commitment, Relatively Lower Access Charge	2

Table 22: Type of tariff plan for Internet access[15]

All these applications will see the emergence of ISPs who offer connectivity at rates determined by the amount of data transfer rather than the time that the user stays connected (the time that the user stays connected becomes irrelevant due to the permanent connectivity, non-PSTN type access systems such as cable and DSL).

For all this to happen, the cable network of India will have to be drastically upgraded. This will call for a lot of investment (this has already started flowing in) and recovery of this investment will entail a slight upward movement of access charges from current levels unless volume growth makes this unnecessary.

End user prices in that case can also be reduced by a further liberalisation of the terminal and switching equipment imports. Adequate protection of intellectual property rights will also be essential though this may result in an increase in the cost burden to the end user.

6 List of References

All web sites were visited during May 2001.

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[2] WESRA Estimates, Corroborated by Independent Industry Research
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[4] WESRA Estimates, Corroborated by Independent Industry Research
[5] WESRA Estimates
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[7] WESRA Estimates
[8] WESRA Estimates
[9] WESRA Estimates
[10] WESRA Estimates Corroborated by Independent Industry Research
[11] Derived from table compiled by Mike Jensen and altered to reflect the Indian scenario
[12] WESRA Estimates and general industry view
[13] WESRA Estimates
[14] WESRA Estimates
[15] WESRA Estimates, Opinions of Industry Experts