BRIDGING (DIMINISHING) THE DIGITAL DIVIDE

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"Free Enterprise was born with man and shall survive as long as man survives".

— **A. D. Shroff**
1899-1965
Founder-President
Forum of Free Enterprise

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Technology and Prosperity:

Mankind has been witnessing a succession of inventions and discoveries, each facilitating further discoveries and inventions at accelerated frequency. Prosperity can be created by a few people, for the enjoyment of a few people if the technology and knowledge are confined to the few. On the other hand, if technologies are widely disseminated, understood and exploited by acquiring the needed skills by increasing number of people, then they conduce to the reduction of disparities in the wealth, comfort and convenience, leisure and toil of all sections of the people. For technology to benefit all, and not a few, it is therefore necessary that all people are educated, knowledgeable and are skilled to use the products of technology. There is no society or nation in the world which is technologically backward and has attained widespread well-being and economic power.

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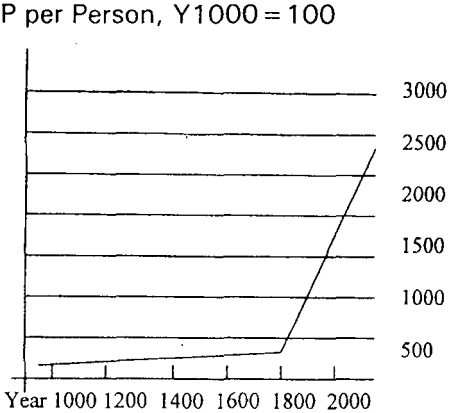
We should therefore realize that no technology will be ever conducing to people's prosperity and well being unless the people are educated, are skilled and are imbibing a culture of hard work, aspiration, achievement and entrepreneurship. This aspect is very important for us to remember when we try to comprehend and discuss what we are going to bridge the **Digital Divide** among our people.

Information & Knowledge for all for Diminishing Disparity: *How do we acquire knowledge?* In the beginning, information and knowledge were transmitted by grandfather to father, to grandson, from generation to generation, by word of mouth. Then writing was invented. But it was on tablets and stone. It could not be communicated extensively over far off areas or to many people. The invention of paper and writing on it, was the next step forward. However, the transmission of knowledge by this means too was slow and confined. It is known that even until the middle ages, in Europe, thousands of monks in numerous monasteries were busy making copies of the Bible by handwriting. Obviously, they could not reach all. Also, they were in Latin, a language not spoken by the commoners. The invention of the moving type and printing by Johannes Gutenberg in 1436 was a revolutionary development. Books could be produced in tens of thousands of copies, their distribution was easy. The printing press brought about a sea-change in the dissemination of information and acquisition of knowledge. Bible in the hands of many and in the local languages led to the questioning of the Pope's authority which was discovered to be having no sanction in the teachings of Jesus Christ. That was Protestantism. All the knowledge that was accumulated by humanity in astronomy, in mathematics, in physics, in biology

etc. was all committed to paper in books which became available to many, so that many more could create further knowledge. The availability of books spurred literacy which went up from under 10% to over 80% by the turn of the century. As all this was happening first in the West, and so it became home to many inventions and discoveries, and the West's exploitation and their acquisition of military and economic power to colonize Asia, Africa, America and Australia. From the graph below one can see how slow was the graph in the per capita gross world product for all the 800 years, 1000 AD to 1800 AD, and how steep it is since then. The rapid growth since the 19th century is entirely due to application of science and technology in every human activity.

World GDP per Person, Y1000 = 100



(Source: Angus Maddison: J. P. Moran)

India, which until the 11th century was a producer and exporter of knowledge and the richest country, lapsed into stagnation because of the subsequent 700-year long mortal struggle against an entirely new brand of invaders. That is

a different story better left to another discussion and deliberation. Suffice it to say that despite the 700-year long struggle, India was until the middle of 18th century still the wealthiest country in the world inviting the envy and entry of the newly power-acquiring European nations – Portugal, England, Netherlands. France, even Denmark.

Electronification & Digitisation of Information: Information and knowledge committed to paper and tens of thousands of the books cannot be kept in everybody's home but only in libraries. To borrow we have to travel. Besides, there is the problem of those printed in one country being available in other countries only after some time or not at all, because of political and state barriers (we may recall the COCOM regime during the Cold War). While the system of libraries and borrowing books and journals and their distribution by post is certainly better than any previous historic mode of transmission of knowledge, information cannot be within reach of every home, and every person, anytime it is needed from every source because of logistics as well as economics. *If it could be de-materialised; that is, electronified* and is transported in that form and reconstructed into readable or viewable form, then it is a revolution which enables every home to have access to every source of information and knowledge and if all the stores of information are linked together globally on the telecommunications network, then any one connected to the telecom network can access and down-load through appropriate devices, transducer information from all the sources' stores.

Mankind has already passed through two revolutions. The first one is agriculture and the second is the industrial revolution. The invention of agriculture led to settled

communities and the development of culture and stable societies and nations and governments. Animal and manpower were what sustained agriculture. That lasted for over 10,000 years without much change. The industrial revolution beginning with the invention of the steam engine has been with us for the last about 300 years. Machine power replaced man and animal power. The conceptualization, development and fabrication of machines and the industrial production processes have come to mean more and more production of goods with less and less material and energy. (For example the first mobile telephones including the battery weighed 9.8 Kgs; now they weigh less than 100 gms, the US GDP more than doubled in the last 30 years but the energy consumption remained the same; i.e. energy consumption for unit GDP halved). World trade between countries has been growing by leaps and bounds bringing more prosperity to the countries involved. This happy outcome is due to extensive use of information technology and telecommunications for dissemination of knowledge.

In the last 100 years, slowly first and very rapidly in the recent years, there has been a revolution in the generation, storage, exchange and transportation of information. The growth of knowledge is captured by the following finding and figures.

Galloping Knowledge:

- By the time the child born today graduates from college, the amount of knowledge will be four times as great.
- By the time he is 50, it will be 32 times as great.
- And 97% of everything known in the world will have been learnt since that child was born.

- The memorising of reams of facts will not be necessary; they will be quickly available on computers.
- But future man will need great wisdom if only to know what is it he wants.

Telecoms & Information Infrastructure: Primarily the digital technology consists of electronifying information, as contained in voice, text, images and data. Telegraph electronified what is written on paper; it was converted into electrical signals and transmitted at the speed of light. Then came the telephone which electronified our voice and put people in conversational contact over distances. Radio did away with wires. Voice as well as text and images went over radio waves. When broadcast, they cover the whole globe. Communications satellites from 1965 onwards enabled voice, text and images to be sent from any point on the globe to any other point annihilating distance and time. Telegraphy, telephony, radio and TV broadcasting and the transmission of text are all based upon communication technologies, invented over successively diminishing time intervals. This is because of the rapidity with which information and knowledge are getting disseminated by the new communication systems and devices ranging from the simple Morse Key tele-printer, the telephone switches and telephones, vacuum tubes, transistors, integrated circuits (LSI, VLSI, MSI) computers (macro, mini, micro, molecular..), communications satellites, Optical Fibers, software, packetisation, packet switching, compression, encryption / decryption, repeated use of radio frequency spectrum, mobile communications, annihilation of difference between mobile and fixed and local, long distance and international calls etc, solid state memories storing giga bytes of information.

The storage, retrieval, transmission and exchange of information is becoming less and less expensive and so universally affordable in an increasing measure because of technological developments in telecommunications and information technology (solid state memories, computers and networking). How these developments are bringing down costs can be seen from the following:

Declining Cable Costs and Cost/minute of Telephony

Year	Cable	Are/CCT	Cost/MNT
1956	TAT # 1	$ 213,996	$ 2.443
1988	TAT # 8	$ 10,285	$ 0.117
1996	TAT # 13 SDH/SONET	$ 1,080	$ 0.012

(TAT – Trans Atlantic Telephone)

Information Technologies – Storage

Density bytes/inch^2)	63.5m	3G	10G
Storage cost/ Megabyte (bytes/inch^2)	$ 11.52	$ 0.10	$ 0.02

We now have a global network of high-speed broad-band telecommunications network which should more appropriately be called the electronic-photonic transportation system

comprising of terrestrial and satellite microwave radio and terrestrial and submarine Optical Fiber cables (voice, images, text and data) transport and storage. This system connects continents, countries, cities and villages and homes. Within the countries it is called the National Information Infrastructure (NII). The NII is extensive and broad-band, high-speed in some countries and less so in others like India. The costs for conversing across the globe as well as storing or transmitting electronified information have been dramatically coming down so much so that these are tending to be nominal. It can be said that ***carriage will be free but the content will be priced. This is what technologies are facilitating.***

It is now possible to have all this information / knowledge available to any and every person whether sitting in an office or staying in the home or moving on roads, sailing on the seas or flying in the air, at any time because all the electronified information is kept in solid state memories of computers all of which are coupled to the telecommunications network. Laboratories and research institutions, factories, companies, homes, super market etc., are all generating and exchanging information. For money we once had coins; we are having paper money; we are going to have electronic money. Money can be transferred instantaneously. Every day one and a half trillion dollars worth of foreign exchange alone is being transferred across the world on the telecommunications network through computers, micro-processors. We need not have books and journals. We already have publishers asking us whether we would like the journals and magazines in electronic form or on paper.

Telephone & Internet: The Internet is the 8th and the most magnificent wonder of the world. It is network of networks of computers, to which the computers of individuals, companies, governments, universities, research organizations, newspapers, publishers, banks, businesses ..... are connected and their information stored on the websites. This is a convergent platform for telephony, video, text and data. The worldwide web (www), the marvelous invention which is just 10 years old is at the heart of the Internet. As of 2002 there are over 100 million hosts and 750 million users. Six billion pages of information is stored on this www.Everyday about 2 billion pages are seen by the Internet users. There are over 500 million e-mail addresses and these are growing at 40% a year. Two billion e-mails per day are being exchanged. Besides mails, company business, trade and commerce, financial transactions and transfers of money, international- citizen interchanges and transactions, auctions, merchandising, campaigning, advocacy, education, return-filing ....etc., every type of transfer of information besides broadcasting and telephony are taking place on the Internet.

The Internet now can be summarized to be : Post Office, Telephone, Broadcast Studio, Soap Box, Auction House, Sound Recording, Movie Theatre, Used Car Showroom, Insurance Office, Distribution Warehouse, Studio for Fashion Designer, University Class Room...., Political Campaign, Medical Diagnostics, Financial Transaction and Clearing House..... Information / knowledge is sitting in electronic form on the solid state memories organized into websites on the Internet. The transportation network by way of global telecommunications reaching homes by wires and wireless is available, or should be made available, so that

every home and person is connected. For that knowledge to be available to every person, he should have access to the network by wire or wireless and he must have devices both for putting information and retrieving the information. Information is in multi-media, voices, images, graphics and text. Either one can have in all this media or only voice or as simple data and text.

Various access devices with different capabilities are becoming available and fortunately and pleasantly at decreasing prices. The telephone, the TV set with a set top box, the PC, the simple and mobile broad-band hand-held or pocket size telephone instrument, handset with a built-in digital camera and what else can be made available, we can not predict at this stage, for the developments are so rapid.

The digital divide: This is a phrase which is now being used by sociologists and politicians, especially the populist variety. Internet has immense potential to benefit any person provided he is educated and has affordable access to it. Those who are educated preferably with proficiency in English and have a telephone connection better still, a broad-band data connection (which can transport information from 8 to 8000 times faster than by an ordinary telephone connection) and a PC or 3rd generation mobile telephone with a built-in digital camera (that enables pictures to be taken and instantaneously transmitted over the Internet to any desired person) are the haves of digitized information knowledge from across the world. Since knowledge is power and is a great source they can become wealthy, healthy, powerful and dominant, not only within the confines of a state but world-wide because of the globalization of economies and

trade under the regime of the World Trade Organization (WTO). For them the whole world is the market, the whole world is the resource, the whole world is the area of exerting influence and ingestion of knowledge. There are those who are not literate, not educated, not skilled to use any device or do not have the money to acquire any of these capabilities. The former category are the haves of the digitized knowledge. The second category are the have-nots of the digitized knowledge. The former will prosper rapidly and become richer and richer. The latter may improve only by the (questionable) trickle-down effect. The disparity between the digital-haves and the digitally connected on the one hand and those unconnected digital – have–nots on the other is what is referred to as the digital divide. As such a division is deeply destabilising and distressing. The policy-makers including engineers and the knowledge producers are exercised about this digital divide.

There are various types of divides not all of which are of equal concern and consequence. The divide between educated and uneducated; the urban and the rural; the wealthy and the poor; those who have electricity and those who do not have; those who have access to and can afford health care and those who do not have either of these; those who have radio and TV and those who do not have; those who have a telephone and those who do not have. Each one of these divides has a penalty and deprivation for the have-nots. In fact the "leftists" go on asking whether any information technology or the PCs are worth the investment of the nation, when there are so many people deprived of or lacking education, drinking water, housing, health care, bank loans, TV sets, etc. It is not for engineers alone to

answer these questions and spend their time on removing all these divides, before or along with the digital divide. However, as common citizens we can agree that access to the digital network, to the Internet which is a repository of tremendous amount of enabling information and knowledge about every thing from a job opportunity to a market for handicrafts, and for admission to different schools etc. as well as for obtaining services from Government from their immediate neighbourhood is a matter of consideration.

Public Policies to Diminish the Digital Divide: Years ago, first the engineers and then the policy makers were all concerned about the ***"missing link"***, a term that was used like ***"digital divide"*** now to make distinction between those who have telephone and those who do not have it. In fact, the International Telecommunications Union (ITU) considered this issue at a plenary meeting; appointed a high powered International Commission which came to be known as the Maitland Commission under the authority of United Nations. The report produced by it was titled as, ***"The Missing Link"***. Several studies were undertaken in different countries in the world to establish the relationship between having adequate number of telephones per hundred of population or a telephone for common use by a community throughout the national territory of a country and its economic growth, the ease with which commerce and trade could be conducted etc. They were able to find a relationship between the tele-density i.e. number of telephones per hundred of people and the rate of growth of the economy; the penalties that people and communities and nations were suffering because of inadequate telecommunications for governance, for justice, for peoples' participation in governance, for the conduct of

commerce and trade etc. The ITU/UN recommended that all Governments must make adequate investments in telecommunications so that they cover all the population centers including the remote and rural villages and communities. It was known then that there were people below poverty line, that many communities do not have protected drinking water, that health care was not there, that they even do not have roads. But yet, that ***the existence of a telephone in the community would vastly improve their life for economic exchanges and for getting services they needed*** was established. If there is a telephone in a village for the community use, what were the savings that were accruing because of avoided travel by bus or other means of transport; or wasted trips to get their agricultural inputs or sell their outputs or to get their entitlements and so on were established. If the existence of a mere telephone can mean so many benefits, how much more should be the benefits if people have access to all the information and knowledge that is available everywhere and anywhere in the world provided that is in the language that they can understand.

The ***missing link*** problems with regard to telephone is tackled in India in an admirable way. We decided that in a gradual manner, the telecommunications network should be extended throughout the country and that a telephone should be placed for community use in every village. The larger villages are to get the public telephone first and then those with lesser population. Also, in order to reduce the distance for gaining access to a public telephone the criterion was not population but that no person in a habitation should have to walk for more than so many minutes before he could get

at a telephone. It is on the basis of this criteria that public telephones (PTs) are being installed in our villages. Today about 450,000 villages out of 650,000 have a telephone. Nearly 90% of the rural population is now covered. The 200,000 untelephoned villages are mostly each with a population of about 100 and they are in difficult areas like the Rajasthan desert area, forest areas of Madhya Pradesh or hilly areas in the northeast and a few other places. Now that radio technology especially, low cost Very Small Aperture Terminals (VSATs) to work through communications satellites are becoming available, even these very low population centers will get a public telephone within the next one or two years. ***The existence of the telephone network is the basic requirement for digital connectivity i.e. to the Internet.***

Even in urban areas there are millions of people who cannot afford a telephone. Therefore, public telephones are placed in huge numbers in the urban areas also. There are now about 1.2 m public telephones in the country and 40% of them are in the villages. It is not the teledensity (that is, the number of telephones per 100 people) at 4.5 including the mobiles that is a true indication of access to the telephone whether every village has got a publicly usable telephone and in the cities and towns whether it is available in every street or not, is a better indication of the equity in regard to the availability of such a facility for the public. In this regard we are doing extremely well.

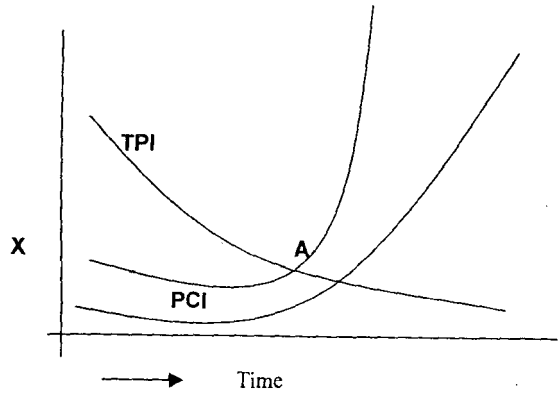
The important problems tackled for providing the public telephone was where should these telephones be kept and how illiterate people who do not have any skill can use this telephone. This is a question which is equally relevant to

the digital connectivity and the use of Internet because we still have lots of illiterate people, unskilled people and people who do not have the knowledge of English, even if otherwise they are educated. In regard to telephone, this was solved by putting the telephone in a common place, usually the village grocer or a tailor or teacher or a Government official or any other person whose services are needed by and available for everybody, irrespective of caste. Such a person is sufficiently skilled or easily trained to dial or key the telephone number for illiterate and unskilled users, obtain connectivity and make over the handset for the caller to speak. ***It is this attendant and his skill and service that are getting over the problem of illiteracy and non-skill among users.*** The Information Technology Task Force constituted by the Prime Minister in 1998, considered the problem of making the Internet accessible just like the telephone to every habitation. The answer was simple. ***Just upgrade the village Public Telephones (PTs) into Public Tele Information Centers (PTICs) by equipping them with Internet*** connecting devices like the PC and now, it could be the Simputer. Given sufficient training to the attendant of the upgraded public telephone, he can obtain the information which the seeker wants from the Internet. Even if it is English, an English-knowing attendant would interpret to the illiterate or non-English knowing seeker of information. If the PTIC is equipped with a telephone – now it is the IP/VOIP telephone – and also with a scanner and if the connection is broad-band enough, then electronic mails can be sent in any language and even video conference can take place. We will just leap-frog from an unconnected disadvantaged village into a globally connected (for voice, image, text and data) facility. We

have the technical means and system in this fashion to bridge the digital divide.

The next question is: is it affordable? With 30% - 40% of our people below the poverty line, obviously it is unthinkable that many could subscribe to a telephone, much less to the Internet. Due to our developmental plans, the per capita income will rise. Due to developments in technology, the cost of the telecommunications Network and Internet and communications will go down. Due to the combined effects of the rise in PCI and fall in the telecom prices, the affordability will non-linearly rise. As could be seen in the graph below:

$A \propto PCI / TPI$



- PCI : Per Capita Income
- TPI : Telephone Price Index
- A : Affordability

What we have, therefore, to do is ***create conditions for telecommunications and Internet to be available throughout***

the territory of India in all the population centers and along the roads, streets and lanes along which homes and offices are situated. Our aim should be to increase the affordability and therefore to create a system for the full force of competition to come to the market so that the use of ever newer technologies will reduce costs and therefore, the prices to the user. Just as more and more people are having first black and white TV sets, then colour TV sets and then cable TV, more and more number of homes will have a telephone and PC with Internet connection. In the meanwhile, those who cannot afford will use the community PTIC.

In the last seven years, we have been de-monopolizing the telecommunications. Private sector companies are being allowed to provide the full variety of telecom and information services including the Internet. There is competition. There is domestic and foreign private investment into the sector. Unlike until 2-3 years ago, today one can have telephone on demand especially the mobile one. Unfortunately, ***we have made the service costlier than what it could be by imposing entrance fees, revenue share, cost-unrelated interconnection charges and high spectrum costs. None of these have got any relationship with the network or service costs. They are simply meant to generate revenues for the Government.*** The Information Technology Task Force viewed access to information and knowledge as promotive of human development and just as health services and medical bills are not taxed, the recommendation of the Task Force not to put any unrelated costs on Internet, were accepted. That is why for the provision of Internet Service (ISP) there is no entrance fee, no license fee, no revenue sharing. If all the telecom licenses are migrated from the present system

where they have to incur extraneous costs to one like the ISP, then straight away telephone would become cheaper by 40% and I reckon that the demand would be doubled. China has recognized the wisdom of not imposing external burdens on telecommunications and Internet service. This is the main reason why the affordability is growing up phenomenally. ***China is now adding about 50 million mobile and over 20 million fixed telephones a year compared to our figures of 3 and 5 million respectively. It has over 35 million Internet users compared to less than 4 million in India. As one of the essential measures to reduce the digital divide, Government should do away with the entry fee, revenue share and the money gauging interconnection charges dictated by the high market power wielding incumbent, namely, the Bharat Sanchar.***

Rural areas are by conventional wisdom held to be unattractive for any telephone of Internet service provider company. The capital cost involved is high and the revenues are poor. When such is the situation ***it would be wise for Government to require any company or organisation wanting to provide a public telephone or an Internet kiosk in the rural areas to need a license.*** Any enterprise should be free to provide these just by registering with the TRAI/DOT, mentioning its area of operation and some details as to what services it would provide. The only condition should be that the technology that it uses for connecting the telephone or the Internet device to the network is compatible with the telephone or Internet system available in the area. It should be left to it and the network operator to which he connects for the system of sharing of revenues and quality of services.

The Cor-DECT wireless data-cum-voice technology developed

indigenously is the cheapest system for deployment in the rural and low density user areas. Any nation-caring Government should encourage, in fact, assist the companies which use this equipment for connecting telephones and Internet devices in the rural areas. There has been so much hesitation and reluctance that it is a wonder how this equipment has at long last met with condescending approvals. It is heartening that one private operator is intending to place an order for 1.5 million lines of Cor-DECT system for deployment in the rural areas. As this would bring down costs, we can look forward to a larger number of people using the Internet and therefore reducing the digital divide.

For the index of territorial coverage what is mentioned for our radio and Doordarshan coverage is relevant for telephony as well as Internet. Now that wireless in the local loop i.e. connecting a communications device like telephone to the network need not be by wire and cables but even more economically by radio. We should establish a large number throughout the territory of India, of radio base-stations to which the customer premises equipment, be they telephones or PCs or other communication devices are wirelessly connected. The radio-base stations form part of the information infrastructure (telephone exchanges or Internet). Then we can say that the Internet or the telephone is accessible on say 80% or 90% of the territory of India for say, 95% of the people. Whosoever whenever can afford a communication device, be it telephone or PC or equivalent can get connected to the information network-telephone or the Internet.

Certain progressive State Governments are wanting to give education and health information through Primary Health

Centers and Government schools. They are to have receive-only VSATs. Curiously and regrettably, the Telecom Regulatory Authority of India (TRAI) recommended that even these receive-only VSATs should be licensed and that there should be an entry fee and revenue share. This is totally anti-people. The recommendation can come from only a taxation consultant and not from a facilitative organisation. Receive-only matter is education and health, for human development and welfare. Why should they be taxed? In many countries especially in the 15-nation strong European Union, receive-only VSATs require only registration and not a license, much less any license fees. Government should reject the TRAI recommendation and also tell them that it is not a taxation recommendation organisation.

The bulk of Internet users gain access to it on the telephone lines. This is called the ***"dialup access"***. Competition among the ISPs has brought down the charge for Internet use provided by the ISPs from over Rs. 40/- per hour to about Rs. 10/-. But since there is virtually no competition in the fixed telephone service, access to the Internet from the telephone network is costing Rs. 25/- per hour. ***Nowhere in the world is the dialup access 2.5 times the prices for use of the Internet.*** There is absolutely no engineering justification for this high dialup access price. The regulator and the Government must bring it down drastically. In several countries the local telephone calls are not timed. It is a flat rate. Whatever may be duration of conversation, you pay the same charge. In India, every 3 minutes is charged one local call unit. The minimum that we should ask for is either– (a) increase the time of unit charge from 3 minutes to 15 minutes. Then the dialup cost would be costing about half

of the Internet usage charge, or (b) ask the telephone companies to share the telephone charges with the ISP. The former of course is logical and relieving to the consumer.

If the Internet should serve the poorest of the poor people, for wanting to talk to their relatives elsewhere in the country, then Internet telephony is the cheapest voice communication. Government should therefore allow IP telephony not only from any Internet booth to telephones outside the country, but to any telephone within the country also. Current restrictions are to protect the interests of the incumbent and not the promotion of inexpensive telephony for the masses.

Governments are putting in extraordinary efforts to promote literacy (ability to read and write of 5th standard) and education (SSLC standard). If we are to do away with the dependence of an attendant for telephony or Internet use from the public telephones and public Internet kiosks, we must include acquisition of computer skills i.e. the ability to use a PC or an equivalent device to connect to the Internet, as part of education in all our schools for standards 8,9 and 10. Governments of Karnataka, Tamilnadu, Andhra Pradesh and Kerala now (I am not aware of other State Governments) are introducing computer education by outsourcing the equipment and instruction to computer companies. In the State of Andhra Pradesh, for a 3 year course, it is coming to over Rs. 2,000/- per year per student. We do not spend that much on the whole of the rest of the education. We must rethink as to how most affordably Governments can impart adequate enough computer skills among all the literate.

We must provide a telephone and Internet connection in all high schools (about 100,000 in India; about 12,000 in

Andhra Pradesh alone) and other educational institutions. In the United States, by special efforts and an e-rate Cess on telephone companies during the Clinton administration, not every school but every classroom in all the high schools in the United States, a telephone and Internet connection has been provided. This may be unrealizable by us for quite some time, but it should be our aim, say at least in the next 15 years.

If the educational standards and employment and business opportunities in the rural and remote areas are not adequate, then the digital milieu will accentuate the divide. We believe that millions of I.T. enabled service jobs would be available to India. Should our educated young flock to towns and cities which only are having excellent telecom facilities, to get jobs? It is not necessary, if we extend the reliable, secure broadband, high speed electronic photonic (telecommunication) infrastructure to all our small towns and rural areas. Then the I.T. enabled services can be rendered from those places. Jobs for the educated and the disadvantaged in their areas of residence have a great value. They go to reduce the ill-effects of the digital divide. ***So we must have a specific plan to extend the network and to encourage I.T. ES companies to locate in small towns.***

Telecommunications and information technology and Internet are essential for economic and human development. States are competing to attract business, industries and to create worldclass professionals. Connectivity is essential. Therefore telecoms can no longer be left to the exclusive jurisdiction of the Union. They should, like education and roads, be in the concurrent jurisdiction for within the state networks. Actually, all telecommunications companies except the

Bharat Sanchar have state-wide licenses only. The Convergence Bill before Parliament must provide for devolution of regulation to the States.

Universal Access: The most important question is how do we fund the extension of the telecommunications and Internet system to the un-remunerative rural areas. As the revenues realizable will not meet the costs there should be subsidies. How do we raise the fund for subsidy and how do we administer and how do we carry out the obligation of providing universal access? People sometimes loosely talk of universal service. Universal service is internationally understood to mean a telephone (and Internet nowadays) connection in almost every home including those in the rural and remote areas with no discrimination in the quality and range of services as between the rural and remote area on one hand and urban areas on the other.

Universal Access generally means a telephone in every home. In advanced countries it has also come to mean not only Internet connection but broadband Internet connection. We just cannot afford such a scheme with 40% of our people below poverty line.

Universal Access (UA) means that any citizen anywhere in the country must be able to make use of a telephone which is for the community and not of a private subscriber. We have been implementing this through what we have been calling the Village Public Telephone (VPT). Through a series of steps, we have graduated to the current position, namely, about a million public telephones with about 420,000 of them in the villages.

Now that Internet has also come to be viewed as an essential enabler, our public telephones must be upgraded into Public

Tele Information Centers (PTICs) by fitting each of them with a PC and giving them broadband Internet connection. Access to the PTICs which include the telephone also, for the public throughout the national territory of India must be defined as "Universal Access".

Because we have competition between interconnected Public Switched Telephone Networks (PSTNs) from Bharat Sanchar and numerous basic and cellular private telephone companies, a PTIC can be connected to the nearest network point, be it the telephone exchange or the radio base station of the cellular system. Access should be defined to include the equipment at the PTIC location and connection to the nearest network point, i.e. the telephone exchange of the basic telephone operators or the radio base station of the mobile company.

The connection or the "last mile" can be wired or terrestrial radio or satellite radio. The wires could be either copper or optical fiber. The equipment at the PTICs could be a telephone with a chip inside to give access to the Internet or a PC or a Simputer or a TV with set-top box etc.

The provision of universal access in the rural and remote areas and perhaps in some poor quarters of urban areas, is a social obligation of the Government. This will have to be subsidized. Raising the subsidy amount should be by imposing a universal access cess on the gross revenues of the telephone service companies, basic, limited mobile and mobile. This fund should not go into the Consolidated Fund of India but kept as a separate amount to be administered either by the Telecom Regulatory Authority of India or the proposed Communications Commission of India (CCI) or the Ministry of Information Technology and Communications.

Since rural and remote areas are held to be un-remunerative and since the general wisdom is that no telephone company would like to involve itself in loss operations, Government must declare that anybody can provide the universal access in any place(s) he chooses to the specifications of the MIT. It is ridiculous to require a company to take a license to provide a loss involving service. It would be sufficient for the universal access provider to register himself; the requirements of the registration should be fulfillment of the specifications for provision of universal access.

The revenue from PTICs will belong to the company to whose network the universal access facility is connected. In most cases, it will be the Bharat Sanchar because Bharat Sanchar has got 30,000 exchanges and in most cases the nearest exchange could be that of Bharat Sanchar and not of its P-Telco rivals. Also, as the distance between the as yet un-telephoned villages and the nearest telephone exchange will be least for Bharat Sanchar, the capital required and ease of maintenance for providing the universal access will be least if the PTIC is connected to the Bharat Sanchar's network. But this choice could be left to the universal access provider.

The administrator for the provision of universal access may list out the villages district-wise which are as yet un-telephoned and invite bids for the provision of universal access, defined in the previous paras, for a period of, say 10 years to the specifications (technical, operational and maintenance and interconnection) prescribed by the MIT. That company which asks for the least annuity for the ten-year period may be given the license to provide the universal access, in the specified area.

It is possible that a bidder may get several districts or even a State. It should not matter for us. The amount of annuity payable to the universal access provider is all that matters. It may be Bharat Sanchar in some States or districts or its rival P-Telcos or absolutely a new enterprise. It should not matter for Government.

The amount required for the total subsidy i.e. annuity payments for blocks of three years might be worked out to assess. How much money is required to sustain the universal access. The universal access levy on the telephone companies may be varied in the light of these requirements.

The system described here is what is followed in its broad outlines in Chile and Peru. This is also like what we are doing for the National Highway Project. The National Highway Authority is inviting bids for stretches of the highways for construction, maintenance and operation for a specified period and is awarding the contracts to the company which is bidding for the least annuity. The amount required for this purpose is being collected by levy on diesel and petrol. It is also supplemented by some loans. May be part of the vehicle tax will be utilized to service those roads. But in the case of telecommunications we may not require any loan. We may so fix the universal access levy to generate the required amount.

What are the services that PTICs provide can be periodically reviewed. It may be just telephone in some districts for some period; it may include Internet connection; it may include even a video conferencing.

The PTICs can also be utilized to deliver electronic services – for example, the e-Sevas (30 of them of the Government

of Andhra Pradesh to citizens from e-Seva Kendras). The PTICs can become agents for the e-Seva of the Government. They may levy user charges. In that case maybe, we have to review the amount of annuity to be payable.

The PTICs should be operated either by the universal access provider or it may be entrusted to a physically disabled person or to any unemployed person. Whether that agent or the service delivery shall be part of the universal access provider can be discussed. There may not be a uniform solution. In fact the decision may be left to the network operator to whose exchange the PTIC will be connected because the billing will be done by that network operator. He would have to realize the money from the PTIC operator.

The system advocated is totally competition-neutral; technology-neutral; time-neutral and ensures the most economic way of discharging the public service obligation of the Government.

Content: The most important and difficult part of bridging the digital divide is what is the information or what is called the "content" on the Internet websites or the services that are available and are relevant and useful to the people. Today, about 90% of the content on the Internet websites and the information flowing on the Internet, is in English. The rest is in French, German, Japanese and Chinese. For our people for whom we are putting PTICs in the rural areas and in poor quarters of towns, information about their agriculture and the inputs and markets that are connected with it and the services they must receive from Government are relevant. Government is having a variety of welfare measures like public health information, population,

environment, scholarships etc. Will all content concerning these will be created and made available in all the major local languages. Also who would develop this as the costs of such development may not get any return for a business? Currently, we have some non-Governmental Organisations (NGOs) and even companies connected with agriculture (Coromandel Fertilizers, Nagarjuna Fertilizers, for example) preparing a lot of material for their customers in the agriculture sector. But even that is in English. Will we be satisfied if the PTIC attendant acts as intermediary between the non-English knowing user and English content?

Globalization is entirely in tune with our thought, with our culture, with our aspiration and with our past. Today, information and communication technologies are enabling us to realize our ancient aspirations. The digitization of knowledge and digital connectivity will hasten Sri Aurobindo's vision of the emergence of the superman and the life divine. That is why we must endeavour to reduce the digital divide between countries and between peoples, within countries.

The views expressed in this booklet are not necessarily those of the Forum of Free Enterprise.

"People must come to accept private enterprise not as a necessary evil, but as an affirmative good".

— **Eugene Black**

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