Chapter 3
DIGITAL DIVIDE IN INDIA

3.1 General Background

The term digital divide refers to the gap between people with effective access to digital and information technology and those with very limited or no access at all. It includes the imbalances in physical access to technology as well as the imbalances in resources and skills needed to effectively participate as a digital citizen. In other words, it is the unequal access by some members of society to Information and Communication Technology, and the unequal acquisition of related skills. The term is closely related to the knowledge divide as the lack of technology causes lack of useful information and knowledge. The digital divide may be classified based on gender, income, and race groups, and by locations. The term global digital divide refers to differences in technology access between countries or the whole world (http://en.wikipedia.org/wiki/Digital_divide - cite_note-Rice105).

Ever since Jean Jacques Rousseau in his magnum opus The Social Contract and Discourse pointed out the difference between natural and social inequalities (quoted in Beteille, 1977: 3-4), sociologist have evinced more interest in the latter one. Social inequality stems from wealth, prestige and power in Indian society like other societies since time immemorial. Knowledge is an added dimension of source of social inequality in an era of Information and Communication Technology (ICT) and globalization. ICT is assumed to superimpose digital divide on the traditional one. C.E Shannon has pointed out that information may be treated very much like a physical quantity, viz, mass or energy. In 1953, Daniel Bell predicted that information would succeed the raw materials,
natural resources and energy as a commodity. It has taken many decades to realize that the new wealth is neither money nor power but information and knowledge (emphasis added) (Shah, 1999).

Inequality seen at the global level is also reflected at national levels. In the case of India too, the fruits of economic and social development have been similarly unequal. India’s one billion people belong to different economic strata. India has perhaps more rich people than the entire population of Japan and proudly boasts of an indigenous billionaire club; it also has one of the largest numbers of poor (official statistics put the number of poor at a staggering 261 million in 1999-2000). In between there is a vast middle class, ranging from the fringes of poverty to the broader line of being rich and famous. The internet, especially in south Asia, is still an urban centric, largely English oriented medium. Greater penetration of the net in the sub continent will depends on factor like affordability of access in rural areas and relevance of content and service in local language. Hence, much attention is being given on setting up of internet kiosk, and community centers across the vast rural belt.

According to the NSSO report for 1999-2000 the percentage of Below Poverty Line (BPL) people was 26.10% with rural share being 27.09% and the urban poor at 23.62% while percentage wise Bihar tops the list with 54.96%, in terms of number it is U.P that leads the list with 53 million of its people being in Below Poverty Line (BPL) level. An international level, India still has to go a long way in telephone penetration of it wants to compare itself with developing economies like China and Brazil. But if the rate at which teledensity is growing in any indication, the future looks promising.
The toughest challenge for our planners today is to introduce these technologies despite various hurdles like lack of drinking water, electricity, poor health facilities, poverty etc, do not make it an easy choice for the government invest heavily in the Information and communication Technology (ICT) sector (Deepak, 2006: 70-80).

India has barely 30 million telephone connections and less than 4.5 million Internet connections for its 1000 million people. Most of these connections are confined to large cities (around 100 cities). ‘Bharat Sanchar Nigam’ Ltd., the largest basic telephone operator (BSNL), loses money or just about breaks even in providing connections beyond these 100 cities. No private operators have ventured or have any significant plan to venture much beyond these 100 cities. Small towns and rural areas thus have very little connectivity (http://planningcommission.gov.in/reports/8_digital).

The scope of the study is to elaborate the development of an ICT platform for a large rural community through a private public partnership. India has a large number of rural villages that do not have telephone connectivity. Within India the digital divide between rural and urban India is rather large. Bridging the digital gap requires considerable investments. A new technology that uses Wireless in the Local Loop has the potential to reduce the cost and thereby increasing the number of villages that are linked. Digital Convergence is emerging as an opportunity and this concept could be used for reducing the digital divide. Telecommunication infrastructure has been weak in India:

- Nearly 60% of Indian homes in cities have cable TV
- Telephone and Internet in only around 2-3% of Households
- Communication technology with significantly lower per-line cost required
With the cost of providing telephone and Internet connections being around Rs.35,000 per line, a revenue of about Rs.1000 per month is required for an operator to break even. This is affordable to hardly 2-3% of Indian households and mostly in the large cities. In contrast to this, cable television connections have increased from zero barely a decade ago to about 50 million today. The key to this has been the following:

- Affordable cable charges (Rs.60-150 per month)
- Low cost second hand color TVs or new black and white
- Small-scale cable TV entrepreneurs whose overheads are far lower than that of the corporate sector.

Internet Kiosks for Bridging Digital Divide

This has made cable Television (TV) affordable to nearly 60% of the Indian homes, including large cities, small towns and rural areas. However, there is a broad middle class of 150 million people. The per-capita income of this group of people falls between Rs.35,000 to Rs.50,000 in 2002.

Therefore, the amount that the middle-class household would be willing to spend on a telephone is small. The only way the middle class and the people in rural areas can be provided telephones and Internet connection in India, without large-scale subsidy, is by reducing the telecom infrastructure cost. If the per-line cost can be brought down somehow to Rs.15,000 (from Rs.30,000 today), rapid expansion of the telecom network can take place. The question is: can technology be used in an innovative manner to make this possible (http://planningcommission.gov.in/reports/8_digital).

3.2 Key ICT Information

The Table 3.1 highlighting the ICT profile of India. India is highly stratified and vast country. India is the second populous country of the world, and vast inhabitant of
rural population around 72% with low level of literacy rate. Table 3.1 shows that India’s ICT penetration is far below than the other developed countries of the world.

India has about 10 to 12 million Internet users, 8 million cell phone users and a teledensity of just over 3 percent in a country with close to half the population hovering around the poverty line. India has more information workers than Japan and the same number as the USA. India's media industry reaches 180 million readers, 384 million television viewers and 189 million radio listeners. Indian state and federal governments are likely to spend about US$890 million in 2001-2002 towards e-government, according to the National Software and Services Association.

Table: 3.1 ICT Profile - India

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<table>
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<tr>
<td>Total population</td>
<td>1.037 billion</td>
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<tr>
<td>Rural population as a percentage of total population</td>
<td>72%</td>
</tr>
<tr>
<td>Key economic sectors</td>
<td>Agriculture, industry, services, IT</td>
</tr>
<tr>
<td>Literacy in the national language(s)</td>
<td>52%</td>
</tr>
<tr>
<td>Computer ownership per 100 inhabitants</td>
<td>0.6</td>
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<tr>
<td>Telephone lines per 100 inhabitants</td>
<td>4.2</td>
</tr>
<tr>
<td>Internet hosts per 10,000 inhabitants</td>
<td>0.35</td>
</tr>
<tr>
<td>Internet cafés/telecentres per 10,000 inhabitants</td>
<td>0.1</td>
</tr>
<tr>
<td>Internet users per 100 inhabitants</td>
<td>0.33 subscribers, 1.65 users</td>
</tr>
<tr>
<td>Cell phone subscribers per 100 inhabitants</td>
<td>1.73 (2001)</td>
</tr>
<tr>
<td>Number of websites in the national language(s)</td>
<td>20,000</td>
</tr>
<tr>
<td>Number of websites in English and other language(s)</td>
<td>130,000</td>
</tr>
<tr>
<td>National bandwidth to and from the country</td>
<td>1,670.3 Mbps</td>
</tr>
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</table>


Despite of the many hurdles in the ICT growth, India is doing better. India's software sector accounts for close to 325,000 employees, and at least 55,000 new workers are needed each year to meet existing levels of demand. Indian software exports have risen from US$100 million in 1990 to US$5 billion in 2000. Software currently accounts
for over 2 percent of GDP, and is set to cross the 10 percent threshold by 2010. India will have to produce over 2.2 million high-quality knowledge workers in software-related areas by 2008. The total size of the call centre services market in Asia Pacific will grow to over US$4 billion by 2005 from US$1.2 billion in 2000. Out of this, the India-based call centre services market is pegged at US$200 million and is expected to cross US$1 billion in around five years. More than 100 call centers have been granted licenses by the Department of Telecommunications. In India, this industry employs over 35,000 professionals (http://www.apdip.net/projects/dig-rev/info/in).

For more people in India have access to a mobile phone than to a toilet, according to a UN study on how to improve sanitation level globally. India’s mobile subscribers totaled 563.73 million at the last count, enough to serve nearly half of country’s 1.2 billion populations. But just 366 million people around a third of the population had access to proper sanitation in 2008, said the study published by the United Nations University, a UN think tank (Times of India, 16-04-2010: P-1)

3.3 Aspects of information

Information has unique attributes, not shared by others. The steel used to construct a building, or the boots worn by workers when constructing it, cannot be consumed by anyone else. Information is different, not only it is available/or multiple uses and users, it becomes more valuable the more it is used. The same is true of the networks that link up different sources of information. We in the policy-making world need to understand better how the economics of information differs from the economics of inherently scarce physical goods - and use it to advance our policy goals.
• It took 38 years for radio to reach 50 million people, and 13 years for television. That many people adopted to information technology (IT) through the Internet in just four years.

• In 1993 there were 50 pages on the World Wide Web; today, there are more than 50 million. A mere 143 million people logged on to the Internet in 1998; by 2001, the number of users will to climb to 700 million.

• There are more computers in the United States than in the rest of the world combined; public telecenters for IT access have been established in places from Peru to Kazakhstan.

• The city of Bangalore in India has become a dynamic hub of innovation, boasting more than 300 high-tech companies. India's software exports alone will exceed $4 billion this year--about 9% of India's total exports--and industry sources project that they will reach $50 billion by 2008.

• Costa Rica's economic growth surged to 8.3% in 1999, the highest in Latin America, fuelled by exports from the microchip industry, representing 38% of all exports.

• The capital that matters most in the digital revolution increasingly is intellectual capital. Hardware costs are declining. This shift from hardware to software as the cutting edge of the industry helps overcome what has been a major impediment to development, the shortage of finance and improves the chances for poor countries to leapfrog some long and painful stages in the development process.

• Yet, transition will not be easy for developing countries, especially the very poor. Lack of resources and skills, inadequate basic infrastructure, illiteracy and
language, as well as concerns about privacy and content, will be problems, but technical solutions will become available to many of them (http://findarticles.com/p/articles/mi_m1309/is_l_37/ai_64830836/).

Keniston, Kenneth and Kumar, Deepak, in their book, entitled “IT Experience in India: Bridging the Digital Divide”, in the last decades, the world has begun to undergo a new technologically driven revolution, allegedly leading toward what is commonly called "the Information Age". Impelled by the phenomenal proliferation of computers and information devices, closely linked to an explosion of processing and access speeds, ever-lowering costs of memory and other critical components, convergence of images, sounds and writing in one digital medium, and propagated by a worldwide network of satellites and broadband fiber optic cables, this Information Age already is a reality to millions in all countries of the world.

To be sure, this revolution is part of the long term development of electronic communication technologies that includes: in the nineteenth century, the telegraph and telephone; in the mid-twentieth, broadcast media like radio and television; more recently, networks like Ernet in India or Ethernet in the U.S. But the last two decades have seen an explosive and unprecedented growth in these commonly called 'Information and Communication Technologies (ICT).

The revolution has been as dramatic, rapid, and far reaching as the agricultural revolution, the first industrial revolution (around factory production and the steam engine), and its sequel, based on the chemical and electrical industries. What is remarkable about the current 'information technology' revolution is the extraordinary rapidity of change it encapsulates. For example, it took at least a century before the
printing press touched 50 million individuals. It took 38 years for radio to reach the same number, and thirteen years for television. But the World Wide Web, in only four years, exceeded the 50,000,000 mark. Never before has a communications revolution spread so rapidly.

Like all technological revolutions, this one has inspired optimistic hopes and fantasies. It is said that the 'Digital Age' has brought (or will soon bring) transparency of government, rationality of markets, universal access to information, the riches of the world's many cultures for all, formation of new international communities, availability of life-and health-enhancing information to ordinary people throughout the world, and finally (it is implied), blessings of democracy and prosperity for all the world's six billion citizens.

Our purpose of this volume is to ask how, if at all, modern Information and Communication Technologies (ICTs) can fulfill this promise, especially for the eighty percent of the world's people in developing nations. For despite all utopian dreams, the Information Age has so far touched only a tiny minority of the world's population. If we define household access to the World Wide Web as a criterion for joining the Information Age, less than 5% of the world's population of six billion had gained access by the year 2002 (doubtless, virtually every reader of this book belongs to that group). The question is how and whether the Information Age can improve the condition of life for the other 95%.

That question suddenly began to be asked with increasing urgency as the "digital divide" became headline news, starting about 1999. Alongside the optimism and hype surrounding the Information Age, new voices noted that most people, in most countries
of the world, remained completely untouched by this revolution. Surveys revealed massive differences between access to 'Information and Communication Technologies (ICTs) in economically developed countries like the United States and Australia, differences between the rich and the poor, whites and non-whites, educated and the non-educated.

Discrepancies in ICT access between the so called North (industrialized and wealthy nations like the U.S., West Europe, and Japan) and the South (virtually all developing nations) are massive, overwhelming and apparently increasing. Our first task is therefore to try to understand the nature of this digital divide or as it will argue, the four digital divides that separate the information rich and poor that is, the divides between those included in and excluded from the Information Age ((Kenneth, Deepak, 2003 (http://www.mit.edu/people).

The Four Digital Divide:

The "digital divide" is widely regarded as a unitary phenomenon. And as a first approximation, it is indeed useful to distinguish, in a general way, between the rich and powerful who are part of the Information Age and the poor and powerless who are not. But viewed analytically, there is not one, there are three digital divides -- and emerging in many nations a fourth.

The first divide is that which exists within every nation, industrialized or developing, between those who are rich, educated, and powerful, and those who are not. For example, income and education in the United States distinguish dramatically between those who own computers and those who do not, as between those who can access the Internet and those who cannot. In the United States, where household telephone
penetration is about 95%, in 1999 households with incomes over $75,000 (roughly, the top 10%) were twenty times more likely to have Internet access than those in the lowest income brackets: 80% of the rich and 5% of the poor had access to the Internet. If we analyze home ownership of computers, rich households were nine times more likely to own one. If we compare Americans with four years or more of university with those who have six years or less education, computer ownership figures are 69% versus 8% and the Internet access percentages are 49% versus 3%. Similar results were found in a survey in Australia.

As of mid 2002, no comparable studies have been conducted in India, where telephone connectivity is extremely low (about 3%) and the installed base of computers and Internet connections even lower. But the overall pattern is clearly similar to that in America. As of early 2002, there were approximately six million computers in India, of which perhaps two-thirds were in businesses, schools, government offices, etc, leaving, at a high estimate, two million computers in households. In mid 2002, there were probably about a million Internet connections in India, again most of them in institutional settings rather than individual households. A figure of 1,000,000 Indian Internet connected households (out of about 200,000,000 households) in 2002 would be on the high side.

Assuming three computer and Internet users per household, we arrive at a figure of six million Indians who have computer access at home and perhaps three million who have Internet access. (This compares with well over 70% household computer saturation and 60% household Internet connection in the U.S. in 2002.) In India, then, in mid-2002, with a billion populations, less than 1% has home access to computers, and at most 0.5% of the population has home access to the Internet.
Who is the 'connected' in India? Obviously, as a group, they are a small, rich, successful and English speaking minority. For all of its ancient cultural wealth, despite the persistence of old elites and the emergence of new elites, India remains one of the world's poorest societies. Details are known to all Indians and are available in any almanac: hundreds of millions go to bed hungry; more than 40% of the population are illiterate; tens of millions of children are not in school; as many as 50% of all Indian newborns are born below ideal birth weight; preventable diseases cause millions of deaths; and in many regions, corruption is widespread and stands in the way of well intentioned programs reaching their intended beneficiaries.

Telephone connectivity in India is about 3% and will not rise much above that level unless the cost of connections (the so called 'last mile' cost) can be lowered. The obstacles are economic, as Ashok Jhunjhunwala notes in this volume: not much more than 3% of the Indian population can afford to pay the real costs of a new telephone line. This group is, by definition, the most affluent group in India, concentrated in the major cities where connections are most widely available.

Despite the success of PCO/STD/ISD booths (manned pay phones) in cities and villages, and despite repeated government promises to provide telephone connections to all of India's 700,000 villages, many Indian villages remain without any. As a result, most rural Indians have never made a telephone call. In short, there can be no doubt of a massive digital divide in India based on income, related to education and urban residence, and correlated with economic, political and cultural power.

A second digital divide, less often noted, is linguistic and cultural. In many nations this divide separates those who speak English or another West European language
from those who do not. But even in the United States, where well over 95% of all inhabitants speak fluent English; there are large differences in access to Information and Communication Technology (ICTs) among different ethnic and cultural groups. For example, in 1998, Asian American households (largely of South Asian or South Pacific Asian extraction) had 55% computer ownership, white Americans had 52%, while Americans of Hispanic origin had 25% and blacks 23% respectively. An even larger gap separated Asian Americans and whites from blacks and Hispanics with regard to Internet access.

It might be argued that these differences in the U.S. are the simple corollary of the income disparities between Americans of European or Asian origin and Americans of African or Hispanic origin. This inference is only correct in part. For example among American households with annual incomes below $35,000 (below the median), in 1998, Internet access among white and Asian American families was more than three times greater than among black or Hispanic families. Similarly, among college students, 80% of white students but only 40% of black students had Internet access. I know of no study that examines the 'culture' of American Web sites; but few sites in the U.S. specifically address the interests, concerns or assumptions of African Americans or Hispanic Americans, while most take for granted the prevailing outlook of the dominant, English-speaking 'Anglo-Saxon' culture.

These cultural disparities, dramatic in the US, are far more notable in India, where they are compounded by linguistic issues. An estimated 60-80% of all Web sites in the world are in English while almost all the rest are in one of the major 'Northern' languages like Japanese, German, French, Spanish, Portuguese, and increasingly Chinese. But in
India, like the rest of South Asia, only an estimated 2-10% of the population speaks fluent English while the rest (more than 900 million Indians and about 1.2 billion South Asians) speak other languages.

For Indians who speak no (or little) English, the barriers to the Information Age are almost insuperable. All widely used operating systems require some knowledge of English or one of the 'Northern' languages. Thus, in practice, unless Indians know English, which most Indians do not, no matter how wealthy, brilliant, educated, prosperous or motivated they may be, computer use and Internet access are effectively out of the question. The result is a self-confirming prophecy: since there is so little software in any language other than English, virtually everyone in South Asia who uses computers knows English. Therefore, software manufacturers can argue, not incorrectly that 'there is no market' for Indian language software.

Of course the 50 or so million Indians who speak fluent English by no means constitute a representative sample of the Indian population: they again tend to be prosperous, urban, highly educated, concentrated in technical fields. They are, in a word, members of the Indian elite, where English is the lingua franca. For the great majority of Indians, however, computers are linguistically inaccessible and therefore useless. As Professor Vijay Chandru of the Indian Institute of Science commented, half seriously, at the 1998 conference BangaloreIT.com, 'The reason Indians don't have computers is because they are so smart. What can the average Indian do with a computer?'

In short, related to the digital divide that springs from wealth and power is a second divide related to the dominance of the English language and of what is loosely called 'Anglo-Saxon culture.' Most Web sites in the world originate in the United States,
in predominantly English-speaking nations like Great Britain, Canada, Australia and New Zealand, or in the English-speaking populations of nations and city-states like India, South Africa, Singapore, and Hong Kong. A few writers have spoken of "American cultural imperialism" on the Internet; a less tendentious phrase would be "Anglo-Saxon linguistic and cultural hegemony."

The third digital divide follows inevitably from the first two; it is the growing digital gap between the rich and the poor nations. The 1999 United Nations Report on Human Development devotes much of a chapter to the widening gap between the information-rich nations of the North and the information-poor nations of the South. At one extreme are the United States and the 'Nordic' countries like Sweden, Germany, Finland, and Iceland, where household telephone connectivity is well over 90%, computer saturation is over 50%, and home-based Internet connectivity averages over 50%. At the other extreme lies most of Africa, most of South America, South Asia, China, Indonesia, and so on the 80% of the world where telephone connectivity is 3% or less (less than 30 million/1 billion in India), home computer ownership is 1 - 2% and Internet connectivity less than half of that.

The reason why the digital divide between nations is increasing seems clear. If widespread access to Information and Communication Technologies (ICTs) gives a nation an advantage, and lack of access leaves it at a disadvantage, then the maxim, "To those who have shall be given" applies with special force to the international digital divide. The international disparity in access to Information and Communication Technologies (ICTs) is of course an aspect of - indeed a reflection of - other disparities between rich and poor nations. But insofar as Information and Communication
Technologies (ICTs) are themselves enabling, facilitating, and wealth-creating, the international divide in information technology widens the already great gulf between North and South.

To these three digital divides we can add, in countries like India and America, yet a fourth: the emergence of a new elite group, which can be called the "digerati." By "digerati" mean the beneficiaries of the enormous successful information technology industry and the other knowledge-based sectors of the economy such as biotechnology and pharmacology. Time and again in India, for example, brilliant graduates of Indian Institutes of Technology or major engineering colleges and universities who chose to concentrate in the natural sciences, mechanical engineering or chemical engineering comment that their equally gifted classmates who entered computer science or biotechnology are now earning many times their incomes and living in an altogether different way.

Unlike older Indian elites, the privileges of the new digerati are based not on caste, inherited wealth, family connections or access to traditional rulers, but on a combination of education, brainpower, special entrepreneurial skills and ability to stay on the "cutting edge" of knowledge.

On the outskirts of Chennai, Poona, Bangalore, Mumbai, Delhi, and Hyderabad luxury apartments are rising to house this new group. Although initially concentrated in information technology, this new digerati are also found, to varying degrees, in the biotech, pharmaceutical and other high-tech areas. In India, their salaries are still relatively low by Western standards, but, with annual salary growth rates of over 20% for
the last five or ten years, far above those of their otherwise equally educated classmates in India.

In America a similar phenomenon is visible in areas like Silicon Valley, Austin TX, the Research Triangle of North Carolina, and a dozen other "high-tech" areas. Before the market correction of "Dot-com" stocks in 2000, it was said that in Silicon Valley, 64 people became millionaires every day. The world of high-level programmers, systems analysts, entrepreneurs, and venture capitalists has a culture, a life style, and a level of affluence that distinguishes itself from older American elites. Annalee Saxenian's paper in this volume suggests that a similar culture may be emerging with a distinctive Indian flavor in cities like Bangalore. The emerging digerati are to be found not only in nations like India and the U.S., but in Israel, Ireland, Taiwan, and other countries or city states with vibrant information industries. Of the prosperity of these elite there can be no doubt; similarly, there is little doubt that given worldwide labor shortages in the information technology industry, this prosperity will continue and increase.

The critical question about the fourth digital divide, however, is whether the prosperity of these new digital elite spreads to the rest of society, especially to urban poor and to rural villagers, or whether it creates an increasingly separate, cosmopolitan, knowledge-based enclave. In India, in the immediate surround of the IT industry in cities like Bangalore, there are of course visible ancillary benefits to workers in supporting industries: to the builders of the new apartment buildings, the employees of the boutiques, coffee houses, and shops, the owners of the travel agencies the digerati patronize, and the drivers and servants whom they employ. But it is a long way from these IT-related enterprises to life in rural villages less than 100 km. away. Similarly,
whether the newly-minted millionaires of Silicon Valley of the American IT industry will improve the conditions of life of the laborers who actually make the computer chips on which the millionaires' prosperity is partly based is a moot question. In neither country has a systematic effort been made to share the wealth generated by the digital revolution (Kenneth, Deepak, 2003, http://www.mit.edu/people).

3.4 India face huge Digital Divide, In spite of Change

As the rest of the world talks of a slow down in the US economy, e-commerce, portals and cyber money, India worries that the rapid strides being made in IT will widen the gap between the county's privileged urban population and its forgotten rural populace. On the one hand, professionals in IT sector continues as the apples of the eye for most developed and computerized economies, including the US, Germany and Japan. On the other, internet blue chips, online shopping and nano second e-mail have failed to cure country old malaises like illiteracy, poverty, and unemployment in India. India has 22 telephone lines per 1000 people compared with 70 in neighboring in China and 3 PCs per 1000 compared with 9 in China. The installed base of PC in the country is five million, which means only five out of every 1000 people have a PC. The software industry is undoubtedly the brighter star of the Indian economy that growing by around 6% a year and faster than the 3 to 4 percent froth rate in earlier decades. The expected $6 billion of software sold abroad in the current financial year equivalent to 23% of India's export will help the country to ride out high global oil prices, partly off setting its estimated $20 billion oil import bill.

But the new economy industry has directly benefited only a small proportion of the population. Software companies employ just 340,000 out of India's one billion strong
populations. IT has yet failed to touch the lives of the average citizens in the rural areas. But in several parts of the country, farmers are beginning to realize how relative information made available either through state sponsored or private initiatives, can help them earn better prices for their crops. But the political leadership in some states is unconvinced. In Bihar, for instance, the political leadership does not consider IT a useful tool but an elitist phenomenon with little relevance to India.

Experts therefore, argue that if the political leadership in states like Bihar has such convictions, the people there will lag behind their counterparts in other states in today knowledge based age. In such a scenario they feel, IT can not be termed as the cause for the divide. Issues like taking the IT revolution to rural India can not be left to the government alone to solve and private sectors participation is needed to bridge the gap. At current rate, that will take a long time (http://www.ils.unc.edu/MSpapers/2910.pdf).

3.5 Digital Divide: A problem in India

India's growing digital divide separates a narrow upper crust of bandwidth-hungry urbanites from the vast majority of their malnourished, illiterate countrymen, who may have to walk days just to get to the nearest working telephone. At a symposium marking World Telecom Day on Friday, industry leaders and policy makers concurred that India was not going to make any headway in bridging the digital divide unless telecom infrastructure was improved and the money was found to do that. "In the Indian context, bridging the digital divide essentially means bridging the teledensity divide between rural and urban areas," said R R N Prasad, a member of the Telecom Regulatory Authority of India (TRAI). Table 3.2 shows the state wise teledensity in India in 2003. Himachal Pradesh has the highest rate of teledensity in India, followed by the capital of India, Delhi.
whereas Chhattisgarh & Jharkand have the lowest teledensity. The table below is showing the difference of teledensity in urban and rural India. Urban India is having the higher teledensity than rural India. The table is showing the same trend of regional imbalance in terms of teledensity in India, the reason is the economic, inaccessibility and lack of infrastructure.

Table: 3.2 State Wise Tele Density in India

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<tr>
<th>States</th>
<th>Urban</th>
<th>Rural</th>
<th>Total</th>
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<tbody>
<tr>
<td>Delhi</td>
<td>30.2</td>
<td>0</td>
<td>26.9</td>
</tr>
<tr>
<td>Punjab</td>
<td>25.7</td>
<td>4.6</td>
<td>11.6</td>
</tr>
<tr>
<td>Kerela</td>
<td>23.7</td>
<td>7.9</td>
<td>11.1</td>
</tr>
<tr>
<td>Andaman &amp; Nicobar</td>
<td>15</td>
<td>7.7</td>
<td>9.6</td>
</tr>
<tr>
<td>Maharashtra</td>
<td>19.3</td>
<td>2.2</td>
<td>9</td>
</tr>
<tr>
<td>Himachal Pradesh</td>
<td>39.6</td>
<td>5.4</td>
<td>8.4</td>
</tr>
<tr>
<td>Tamil Nadu</td>
<td>15.2</td>
<td>2.1</td>
<td>7.8</td>
</tr>
<tr>
<td>Gujarat</td>
<td>17.8</td>
<td>2.5</td>
<td>7.4</td>
</tr>
<tr>
<td>Karnataka</td>
<td>15.8</td>
<td>2.4</td>
<td>6.5</td>
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<tr>
<td>Haryana</td>
<td>16.5</td>
<td>2.3</td>
<td>6.1</td>
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(Source: Ministry of Communications and Information Technology, http://dqindia.ciol.com/content/top_stories/103101501.asp)

The major metropolises are at par with some of the developed countries, but rural areas in states like eastern Bihar and Orissa are worse off than several of the least developed countries. Barely a decade ago, India and China, the world's two most populous countries, had about 5 million telephone lines each. But while India now has 50 million connections, China has some 150 million and is adding to these at the rate of 25 million a year. Speakers at the symposium attributed India's slow telecommunications
expansion compared with its giant neighbor to a number of factors, including tight bureaucratic control, poor policies and inadequate investment by private companies and lack of funds of the government, which until recently held monopoly control.

Shyamal Ghosh, chairman of the Telecom Commission and secretary in the Department of Telecommunications (DoT), said that the privatization of telecommunications pursued since 1994 had brought in investments. But these were concentrated in the profitable urban centers because private players were unwilling to invest in the non-profitable rural areas, where 70 percent of India's 1 billion people lived, he added. Ghosh said this was a pity because investment in the rural areas could transform the lives of millions of farmers not only in terms of freeing them from the stranglehold of middleman traders with reliable, real-time market information, but also by getting to them and their families virtually non existent health care and educational facilities.

The solution, increasingly popular in the southern state of Tamil Nadu, uses radio waves to beam telephone signals from local exchanges into homes within a 10 kilometer radius, using Wireless in Local Loop (WiLL) technology. Feeling threatened, private cellular-telephone companies petitioned the Supreme Court for a stay, but the court has refused to oblige and said that technology could not be held down. Apart from reliable voice communication, this revolutionary technology also provides reliable fast and affordable Internet at 70 kbps (kilobits per second), says Jhunjhunwala, who thinks it could become a model for other developing countries (http://unpan1.un.org/intradoc/).

In Tamil Nadu's Nellikuppam district, sugarcane farmers are already using a WiLL system to check their accounts with a local sugar mill and also market prices of
fertilizer and pesticides. The system has spawned numerous Internet connections and
Internet kiosks run by villagers in the area surrounding Nellikuppam. The facility is
expected to be extended to 200 odd surrounding villages in a 25 kilometer radius,
benefiting more than 25,000 farmers in the region. In central Madhya Pradesh state, the
WiLL system is being used by the state government to help farmers' access land records
and also check on agricultural prices and also make complaints, in a prime example of e-
governance.

But groaning under basic problems such as illiteracy, malnutrition and sheer
poverty, India's rural populace may as well be living on a planet different from, say,
Bangalore, which, according to the United Nations Development Program (UNDP)
human development report for 2001, is better off than many cities in the United States,
Europe and Japan when it comes to technological innovation. In fact, among the 46 cities
identified in the report, Bangalore secured a joint fourth slot along with the US cities of
San Francisco and Austin, Texas, and the Taiwanese capital Taipei. It is even ahead of
New York, Montreal, Cambridge, Dublin (where the European Media Lab is located),
Tokyo, Paris, Melbourne, Chicago, Hong Kong, Kuala Lumpur and Singapore.

The report clearly brought out India's digital divide between a few urban centers
and the vast rural hinterland. Among India's 1.4 million Internet connections, more than
1.3 million are cornered by the states of Delhi, southern Karnataka (of which Bangalore
is capital), Tamil Nadu and western Maharashtra. But the UNDP report also took note of
Jhunjhunwala's WiLL technology in providing Internet access as well as the Simputer, a
cheap hand held computer that allows users to handle sound files and e-mail through
icons on a touch-sensitive screen, overcoming the language and literacy barrier.
Developed by the Indian Institute of Science (IIS) in Bangalore, the simputer (short for simple computer) is due to ship later this month. Costs have been pared down using free Linux software and cheap chips and the final shelf price is expected to be less than $250. A WiLL kiosk with a personal computer, printer, telephone, and power source can be set up at total cost of $900, which compares well with the present average cost to the government of providing a telephone line $800. In the late 1980s, the Center for Development of Telecom (CDOT), the government's research and development wing for telecommunications, indigenously developed rugged electronic switches that worked without the need for air conditioning. CDOT switches, available at a third of the cost of imported equipment, continue to support half of all the telephone exchanges working in India. But along with privatization and globalization came big transnational corporations with their high-priced equipment, which Jhunjhunwala said could only ensure that telecommunications services remained unaffordable to most Indians. Source: (http://www.atimes.com).

3.6 Digital Divide in Hyderabad

Information and Communication Technology group opens new facilities in Hyderabad, India; Company expands offshore operation infrastructures and strengths Back-office Business Process Outsourcing capabilities.

Hyderabad, The Secretary-General of the United Nations, Mr. Kofi Annan, expressed concern over the 'digital divide' the growing gap between the information haves and have-nots - and said there was a danger that the world's poor will be excluded from the knowledge-based global economy. He was addressing a cross section of the industrialists at a session on 'Closing the Digital Divide', organized by the Confederation
of Indian Industry (CII), here on Saturday. Mr. Annan was concerned about State monopolies that charged exorbitant prices for the use of bandwidths, and countries that lacked the trained workforces and legal and regulatory frameworks to attract investments.

Newton, Pa. ICT Group, INC. (NASDAQ:ICTG), a leading global provider of customer management and Business Process Outsourcing (BPO) solutions, today announced the opening of its newest facility in Hyderabad, India, to handle the increased demand for back-office business processing solutions and voice transaction support services from cost-effective, offshore locations. This expansion is consistent with our strategic development initiatives to continue building our global operations infrastructure and pursue additional growth opportunities with our existing and prospective customers. Initially equipped with 100 workstations, the Hyderabad facility will have the ability to expand to 300 workstations, based on projected client demand. The facility will provide voice and back-office business support services across a range of targeted applications for existing and prospective clients within the financial services, mortgage banking, healthcare and insurance industries in North America, Europe and Australia.

Information and Communication Technology Group will initially focus on providing high value data capture and application processing services from its Hyderabad facility. The operation will also be technology enabled to provide voice transaction support services. Hyderabad is among the largest cities in India, with a population of over 5 million. Located in South India, the city is recognized for its solid IT/telecommunications infrastructure, cost-effective, qualified resources and favorable retention rates.
ICT Group's facility is located in the Banjara Hills region of Hyderabad, an established business and residential district. Information and Communication Technology Group, headquartered in Newtown, Pa., is a leading global provider of customer management and business process outsourcing solutions. The Company provides a comprehensive mix of customer care/retention, acquisition, up-selling/cross-selling, technical support, market research and database marketing as well as e-mail management, data entry/collections, claims processing and document management services, using its global network of onshore, near-shore and offshore operations.

Information and Communication Technology Group also provides interactive voice response and advanced speech recognition solutions as well as hosted Customer Relationship Management technologies, available for use by clients at their own in-house facility or on a co-sourced basis in conjunction with the Company's fully integrated contact center operations. This press release contains certain forward-looking statements concerning expansion of Information and Communication Technology Group's operations in India and demand for Information and Communication Technology Group's services.

Information Technology was not a magic formula which could solve all problems by itself. But IT, when imaginatively applied, may offer poor countries the chance to leapfrog some of the long and painful stages of development that other countries have had to go through, Mr. Annan said. The United Nations (U.N.) recognized that the benefits of IT could be spread only by joining forces with the private sector, civil society and research institutions, and that the United Nations (U.N.) must itself provide
leadership at the international level, complement the market and act as catalyst, cheerleader and coalition builder.

There was great potential for India and Africa to work together. Some African countries had taken steps to lay the groundwork for a digital revolution of their own, and they could benefit from India's experience, technology and assistance, Mr. Annan said. It was because of the perceived digital divide, the United National Economic and Social Council established an Information and Communications Technology Task Force. The United Nations (U.N.) has also launched a number of other initiatives, in which India was playing key roles. One such idea was the high tech volunteer corps, known as UNITES, to train people in developing countries in the uses and opportunities provided by IT. India was the first to form such a group and its volunteers were working in Orissa, providing information to help with reconstruction efforts following the 'super cyclone' two years ago. One of these volunteers used the internet to track the trajectory of another cyclone, and was able to pass on the information so quickly that a massive and unnecessary relocation effort was avoided, he said. India will host the pilot project for another UN initiative the Health Inter Network, which will use the internet to provide information for public health.

Indian companies were also participating in the Global Compact, a U.N. initiative for improving corporate citizenship in human rights, labour rights, environmental protection and development. Mr. Annan said it was a pleasure to see for himself the high-tech centre of Hyderabad, one of the success stories of the digital revolution.

Andhra Pradesh was laying foundation for a 'Knowledge Society' by establishing innovative institutions and concepts like the Indian Institute of Information Technology,

3.7 Background of the ICT Cluster in Bangalore

With over 925 software companies employing over 80,000 ICT professionals (of the total of 500,000 in India), Bangalore is the undisputed IT Capital of India. In 2000-2001, every week, at least one company with 100% foreign equity participation has set up shop in this city. Apart from IT majors like Infosys, Wipro, Tata Consultancy Services and Microland, the world’s leading IT companies like GE, Texas Instruments, CISCO, Digital, IBM, HP, Compaq, Motorola, Hewlett-Packard has for example production facilities in India, besides Mexico, Singapore, Scotland, India and some other countries. Lucent Technologies, Microsoft, Sun Micro Systems, Oracle, Novell and several others have made Bangalore their home.

India’s first Aircraft factory was founded in Bangalore during World War II and hence the city had one of the most technological advance industries and a well trained workforce in India. Bangalore is now known as centre for outsourcing the development of software, an industry which came up in the 1970s. The improvement of satellite communication has been a catalyst to this outsourcing. In 2002, about two-third of Indian software exports went to the US, and in total more than 500,000 people were working in the Information and Communication Technology sector in the country. Indian software expanded almost twice as fast as the leading US software industry in the same period.

The major software companies in Bangalore are Wipro, Satyam, Infosys, but new activities are developing particularly what is called Business Process Outsourcing (BPO)
industries, ranging from call centers to managing back office task. Many Information and Communication Technology companies selected Bangalore for setting up plants because of the availability of cheap specialized labours and because of this was the first state in India to develop its own Information and Communication Technology policy.

In the year after independence the national government established some of the country’s biggest public sector factories in Bangalore, notably Indian Telephone Industries, Hindustan Machine Tools and Bharat Electronics, and Bharat Earth Movers. They have been the divers of Bangalore’s fast growth. The government has sought public-private partnerships for infrastructure developments. Indian software exports total $1.9 bn during the last three months of 2001, a 25% increase compared with the same period in 2000 (Baskar, Ashwani, 2005: 444-446).

The southern states in India (in particular Andhra Pradesh, Karnataka and Tamil Nadu) have developed a strong reputation as a source of software development services. In particular Bangalore, the capital of Karnataka, is often called the Indian version of Silicon Valley. This refers to the concentration of computer related enterprises in this city. Since the 1970s software production has been outsourced to specialized companies. It took some time before India was accepted as a source for mass-production products of acceptable quality levels. Cost cutting has been high on the agendas of many computer firms and led to outsourcing. A catalyst to outsourcing has been the improvements in satellite communications.

Bangalore is a city of about 5 million inhabitants, of which a quarter is estimated to live in one of the 700 slums. It is not the only ICT cluster in the country, but is often called India’s ICT capital, specialized in software production. The capital of Andhra
Pradesh (Hyderabad, or Cyberabad as the Chief Minister likes to call it) and the capital of Tamil Nadu (Madras or Chennai) are important competitors. In the years after Independence the national government established some of the country’s biggest public sector factories in Bangalore, notably Indian Telephone Industries, Hindustan Machine Tools and Bharat Electronics and Bharat Earth Movers. They have been drivers of Bangalore’s fast growth. Bangalore is now known as a center for outsourcing the development of software, a practice that came up in the 1970s.

The improvement of satellite communications has been a catalyst to this outsourcing. Presently about two third of Indian software exports goes to the US and in total more than 500,000 people are working in the ICT sector in the country. TCS, Infosys, Wipro, Satyam and HCL are considered the big five in India in IT (Economic Times, 21-22: 2002). India’s capital New Delhi also has an important concentration of computer-related industries. These labs will provide the kind of support Stanford University has provided to Silicon Valley, adds that overstaffing resulted in skill supply for other enterprises and resulted in plenty of specialists, many of which became entrepreneur at their own account.

The private sector took advantage of the large number of engineers and skilled workers trained in the public sector companies. Contributing to the growth of was the establishment of the Peenya Industrial area, later called Electronics city. Wipro is now India’s largest listed software services company and earns about a third of its global ICT revenues by providing research and development (R&D) services in areas such as broadband to equipment makers such as Nortel.
Indian software expanded almost twice as fast as the world leading US software industry. Major software companies in Bangalore are Wipro, Satyam and Infosys continue to grow, but also new activities are developing in particular what is called business process outsourcing industries, ranging from call centers to managing back office tasks.

Many Information and Communication Technology companies selected Bangalore for setting up a plant because of the availability of cheap specialized labor and because this was the first state to develop its own Information and Communication Technology policy. The city is known for its favorable climate and cosmopolitan character. The city grew rapidly due to migration. It has been the State’s capital since the early twentieth century and had one of the first polytechnics in India. The availability of Internet has facilitated this development and is used now to identify excellent Indian companies, which have registered for outsourcing.

The main reasons why Information and Communication Technology companies have chosen Bangalore are the low price of specialized labor and the fact that this was the first state which developed its own Information and Communication Technology policy. Also the presence of a number of good research and training institutes is often mentioned, just like the climate, which is slightly better than in many other Indian cities, because the city is located at a certain altitude. (Castells and Hall, 1994, http://www.eadi.org/fileadmin/WG_Documents/Reg_WG/vandijk1.pdf).

The tech meltdown in the US had serious implications for the Indian information technology industry. However, US demand in 2001 was again 40 percent higher than in the pre crisis year 1999. Indian software exports totalled $ 1.9 billion during the last three
months of 2001, a 25 percent increase compared with the same period in 2000. This is a slower growth than in the previous ten years, but it shows a basically resilient ICT industry sector. The year 2001 was the first recession the ICT sector in Bangalore has faced. However, they weathered the recession quite well and even achieved some growth in their production.

Although, most companies have tried to diversify their production, still two third of the orders come from the US. However Bangalore is a state capital and it became the first concentration of Information and Communication Technology industries in India, but it is not one of the most important cities in India, rather it happened to be the first technology center in India. Bangalore seeks to improve the quality of its urban environment by restructuring the inner city and stimulating expensive housing areas. In Bangalore a weak demand for its products was not an issue, because of the important exports. In terms of our theoretical framework, quite a few educational institutes and research centers are located in Bangalore.

However, this was not a crucial factor except for providing the skilled labor. There are maybe not enough relations between the existing Research and Development (R&D) institutions, the universities and the Information and Communication Technology sector. The low wages and the high number of skilled worker worked to the benefit of Bangalore.

This labor force also spoke English and has received a solid technical education. Indian government policies focused on creating an enterprise friendly environment and on attracting foreign capital to the city. The authorities did use the locally available knowledge resources as a sales factor. Bangalore has also some large enterprises.
However, a more important factor for its success was the better climate and the presence of already established high-tech industries. The development of the software sector in India in general and in Bangalore in particular has had a demonstration effect for other industrial sectors.

Information and Communication Technology industries are non-polluting and labor and knowledge intensive. It showed other companies that export orientation can pay off, that foreign investment can give access to technology and markets and those strategic alliances may be very rewarding. It has also improved India’s image abroad in terms of entrepreneurial and technological capabilities (http://www.eadi.org/fileadmin).

3.8 Internet Connectivity

Even if connectivity in the form of a communications link is established, there is no guarantee that this can be viably expanded to connect India's villages to the world through the internet. Despite its large population, the success of its IT industry and the government's stated intent of wiring India's villages, India today lags far being many other developing countries in terms of the bandwidth necessary for people to simultaneously access information flow through the Internet. In 2001, the International telecommunications Union estimated bandwidth availability in India at 1475 megabits per second (Mbits/sec), as compared with 2639 in Singapore, 5432 in South Korea, 6308 in Hong Kong and 7598 in China. A composite measure of e-readiness that places e-governance initiatives alongside other IT achievements has been employed by NCAER in a national level survey.

The survey rated the states' performance on six broad parameters, network access, network learning, network policy, network society, e-governance, and network economy.
Even though performance on e-governance is one of the parameters in this survey, one can argue that the effectiveness of e-governance may itself be implicitly dependent on the other parameters constituting e-readiness. Open Source is taking off because buying and upgrading proprietary software is expensive. It is safer to entrust knowledge in the public domain to Open Source, which is also in the public domain, than to proprietary platforms.

The parameters are described below:

- Network access included indicators such as tele-density, percentage of households with phones and cable TV, cellular phones, number of PCs and Internet connections, average price per hour of Internet use, number of cellular operators, telecom staff per 100 lines, and the number of villages covered under the village public telephone network.

- Network learning was monitored in terms of percentage of colleges and schools with Internet access and computer labs, universities offering infotech courses, number of websites of schools and colleges, number of registered training centers, percentage of students passing out from ICT courses, percentage of IT-qualified teachers, and percentage of government employees covered under online training programmes.

- Network policy was evaluated on the governments' efforts to address issues related to telecom, e-commerce taxation, presence of IT policy, and cyber laws.

- Under e-governance, the study monitored rural connectivity; IT applications in agriculture, education, and health services; and, computerization of land records.
Network society and economy were measured by the number of online companies, local language websites, and number of households having access to Internet. The number of IT parks, employment in the IT parks, and sales turnover of the companies in the IT parks were also taken into consideration.

The NCAER survey identified Tamil Nadu, Karnataka, Andhra Pradesh, and Maharashtra as the leading States in terms of "e-readiness". It must be mentioned here that the parameters may provide crude proxies to understand the relative performance of states across different IT-related parameters, but nascence in the process of ascribing weightages to the parameters makes ranking a difficult exercise. Also, we must bear in mind that the parameters described cover e-readiness for embracing the IT revolution rather than e-governance per se.

IT Policy and IT initiatives taking a human development perspective to look at states (http://dqindia.ciol.com/content).

3.9 ICT Policies in India

This section will take a look at IT policies in the various states and examine them from how governments have conceptualized the use of IT to meet development goals. While it is important to critique failures in implementation, it is equally important to look at statements of intent and identify their lacking.

The breadth of vision obviously has a critical role to play in the length of achievement. Interestingly, at least two states - Karnataka and Andhra Pradesh - have redefined their policies, bringing out the second version, in the light of the rapidly changing macro context and to plough back their own learning. In our analysis of state
policies, six areas of focus agriculture, health, education, local language, welfare of socially disadvantaged groups and e-governance, have been selected to scan through these policies. Some broad observations are as follows:

- Agriculture is an area conspicuously absent in policies. Even in a predominantly agrarian state like Haryana, there is no mention of use of IT in agriculture extension.

- References to the use of IT for health is confined to few policies and even here, there is a lack of clarity on how exactly IT can help the larger goal of health.

- IT literacy (learning IT) is dealt with in great detail by most governments. However, there is very little reference to the use of IT as a learning tool (learning through IT). Karnataka is one of the states that have discussed the potential of multi-media applications to promote literacy. Many policies have a narrow emphasis on IT education, focusing on employment in low skilled jobs in data entry, marketing, transcription, call centers, content creation and data processing. Some even look at this as a revenue spinner. Clearly, this is a short-term and narrow perspective.

- Development of applications in local languages has been promised in many policies, but the depth of perspective on what needs to be done to evolve standards, promote local language content and applications and appropriate hardware, is limited to few states like Karnataka, Madhya Pradesh and Tamil Nadu.

- The use of IT to help the socially disadvantaged, including in terms of promotion of enterprises by socially disadvantaged has received attention from very few
states. Even where IT is seen as having potential for empowering women and the economically disadvantaged, like in the case of Karnataka, the vision is operationalized in terms of creating beneficiary data bases to monitor programmes and automating social welfare departments. The emphasis is on managing programmes rather than on empowering people.

- E-governance is limited mostly to e-services and vision on how IT can help governments to interact, transact and elicit citizen participation in agenda-setting is absent. GIS, which can be a critical tool for mapping resources and requirements is sought to be used in very few states like Andhra Pradesh.

One overall observation is that there seems to be a lack of clarity of vision in conceptualizing and operationalizing the power of IT for development. It might be worthwhile for states to revisit their policies a la Karnataka and Andhra Pradesh. In 2001, the ITU estimated bandwidth availability in India at 1.5 Gbps, compared to 2.6 Gbps in Singapore, 5.4 Gbps in S Korea, 6.3 in Hong Kong and 7.6 in China. We have come some way since then, but it’s a long road ahead...

- Development of applications in local languages has been promised in many policies, but the depth of perspective on what needs to be done to evolve standards, promote local language content and applications and appropriate hardware, is limited to few states like Karnataka, Madhya Pradesh and Tamil Nadu.

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- E-governance is limited mostly to e-services and vision on how IT can help governments to interact, transact and elicit citizen participation in agenda-setting is absent. GIS, which can be a critical tool for mapping resources and requirements is sought to be used in very few states like Andhra Pradesh (E-Governance: 20 Hot E-Gov Projects in India, http://dqindia.ciol.com/content/top).

3.10 Lessons from India

The Workshop on "Equity, Diversity, and Information Technology", held at the National Institute of Advanced Studies at the Indian Institute of Science in Bangalore was an effort to address the several digital divides. The debates and discussions following the Workshop have suggested a number of lessons can be drawn. Taken together, they reflect what an unstated consensus among the participants as to the ways in which ICTs might be used to increase equity and promote diversity.

1. Information technologies should be introduced when (and only when) they constitute the most effective available way of meeting basic human needs and fulfilling fundamental human rights. ICT's can have a positive role in development. But ICT's are neither a panacea nor necessarily the first line of attack in combating poverty, misery, and injustice. The utility of ICT's must always be judged against the role they can play in meeting core human needs.
2. The most creative uses of ICT's in development may not entail computers, e-mail, or Internet access, but rather the use of other computer-based technologies, including embedded chips, satellite based information, etc. in order better to meet local needs. Modern information technologies should not be simply equated with text manipulation, Web page construction, sending e-mail, e-commerce, or surfing the Net. Increasingly, ICTs have a variety of other uses and embodiments.

The example of creative use of sophisticated ICTs involves fishermen on the Andhra Pradesh coast of the Bay of Bengal and the Kerala coast of the Arabian Sea. In both areas, scientists associated with the Indian Space Research Organization (ISRO) download from satellites information on ocean temperatures. Ocean temperatures help predict where fish will be most likely found offshore. ISRO scientists translate the digital satellite information into maps of the offshore fishing areas, which are transmitted by telephone or fax to the coastal regions, in turn increasing the probability that fishing expeditions will produce profitable results. Here, sophisticated satellite technologies are placed in the service of local fishermen to improve their livelihood.

Other examples were discussed in the workshop: for example, the "Honeybee" project in Gujarat, with its original concept of 'knowledge rich, economically poor' rural people and its use of Internet to disseminate local knowledge and enable local communities to profit from this dissemination. Another prime example was the use of cell phones.

3. ICT projects must build on an assessment of local needs, as locally defined by local people. There is a frequent tendency of well-wishing government officials, officers of international aid agencies, and workers in NGOs to assume that they know what is
needed at the grassroots. Given the widespread enthusiasm for computers, Internet, Web, e-commerce, etc., the promise is often made to place "a computer in every village", scatter "info kiosks" throughout the state or nation, or establish "universal computer-based education." Often, however, these projects are not based on any real assessment of local needs.

Furthermore, they assume that providing computers and/or Web connections will provide increased social justice, enable local peoples to sell their products in the world market, feed the hungry, meet unmet medical needs, and so on.

4. Local language and local content are essential. The interventions discussed above underline another point often neglected in schemes that propose "wiring the masses" namely, the critical importance of local language and local content. Indians are too smart to waste money on computers; referring in part to the lack of local language software and local culture content. Absent the kind of content that could be created in Telugu, Hindi, Marathi or Tamil, even villagers wired with broadband connections to the Internet will find virtually the entire content of the Internet incomprehensible or (if comprehensible) irrelevant.

5. Projects must be (or soon become) economically self-sustaining. Another conclusion emerges from projects like the milk producer's project in Gujarat or the cell phone project in that same state and Bangladesh. Too many projects in both the United States and India have failed because they lack a self-sustaining economic base. Such projects often succeed brilliantly as long as government or private funding is available to finance outlays on an experimental basis. But if they lack economic roots in their user
communities, once initial enthusiasm and funding disappears, the project disappears as well often without a trace.

Several experiments, however, suggest that some grassroots projects can indeed sustain themselves financially. The Grameen Bank work with cell phones in Bangladesh, like the parallel work reported by Rekha Jain in Gujarat, indicates that cell phones may be an economically viable form of communication for some users in rural areas.

6. Beware of inflated rhetoric and grandiose plans: look for results. Another lesson emerged from these papers and from the discussion that surrounded them. With regard to ICTs and development, the ratio of rhetoric to achievement is still, in the year 2002, dangerously high. As the "digital divide" became fashionable as an object of concern, dozens of agencies rushed to fill the gap by proposing programs of intervention. Meetings and conferences on the topic abounded; persons as distinguished as Kofi Annan and the President of France deplored the digital divide and urged steps to bridge it; groups as different as the World Bank and Oxfam, foreign aid agencies in the developed countries and agencies for development within the developing countries, state governments throughout India - all announced projects to bring Information and Communication Technologies (ICTs) to the impoverished sectors of the world's population.

7. Do not simply assume that a flourishing IT sector will trickle down to the rest of the people. The connection between a flourishing IT industry and bridging the digital divide is complex and problematic. As Annalee Saxenian notes, the successful software business in India, centered in cities like Bangalore, Chennai, Hyderabad, and Mumbai has brought prosperity to some of the residents of those cities, added to India's export earnings and increased the traffic of gifted Indians between India and the United State (U.S). A
McKinsey report on the potential of software in India suggested that the total size of the industry could reach 20 billion USD per year in the year 2008 if certain preconditions were met.

As India's most rapidly growing industry, with annual growth rates of over 50% sustained over almost ten years, the IT industry is clearly a boon to India's balance of payments and to the many talented engineers, entrepreneurs, and ancillary professionals employed by that industry. The rise of the "digerati" is one result. So is the growing prosperity of those who immediately serve this group.

8. Be sure that ICT programs actually really reach and benefit their intended beneficiaries. A central problem for many projects is actually reaching their intended beneficiaries. Like all the others, this problem is transnational. Senator Daniel Moynihan, for a time a cabinet member in the administration of U.S. President Richard Nixon, once described the American "War on Poverty" of the 1960's as a "welfare scheme for the professional classes". His point was that the poor benefited relatively little but their "helpers" middle-class professionals, academics, professional members of NGOs, social workers, and so on benefited greatly.

9. Information and Communication Technology (ICT) for development efforts need to share experiences within and between nations, especially about actual successes and failures at the grass roots level. The Working Group found little communication between ICT projects, both within India and in other nations, which have similar goals. With a few notable exceptions, Information and Communication Technology (ICT) projects in South Asia involving efforts to reach larger numbers of disempowered citizens are
uncoordinated and, in many cases, unknown to each other. Parallel projects in other regions, e.g., East Africa, Latin America, and South Pacific Asia, go mostly unnoted.

10. The voices and interests of the disadvantaged need to be represented in bodies that make ICT policy concerning regulation and infrastructure. Another key conclusion was the almost complete absence of the voices of the digitally unempowered in the councils of state defining IT infrastructure regulatory and policy.

In India, too, the voice of the poor, of the non-English-speaking, of tribals, backward and scheduled castes is almost completely absent from the task forces and advisory groups convened by the Government of India and by the governments of the Indian states. Major software producers, assemblers, designers, manufacturers, and producers of content, together with government officials and civil servants, are the loudest voices heard in circles where policy is defined. The example mentioned in the Working Group is making available for communication purposes existing unused copper cables, which link thousands of villages and are owned by Indian Railways, for purposes of telephone and Internet connection. Doing so could extend the availability of Information and Communication Technologies (ICTs) to millions of Indians at low cost. But the decision to allow access to these copper lines is a political and economic decision which can only be made at the Centre, not by local communities. (Kenneth, Deepak, 2002, 2004, http://www.mit.edu/people/kken/PAPERS).