Digital Divide in India: Measurement, Determinants and Policy for Addressing the Challenges in Bridging the Digital Divide

Dr. Sumanjeet Singh
Assistant Professor
Department of Commerce
Ramjas College
University of Delhi
Delhi-7, INDIA
E-Mail: sumanjeetsingh@gmail.com

Abstract: In the recent years, the notion of 'digital divide' has been widely researched, and has attracted much debate and speculation for its economic, social and political consequences. Existing studies reveals, the gap that exists between those who have access to ICTs and those who do not create exclusion, endanger social integration and hamper economic growth. The digital divide has many dimensions and can be categorized as global, regional and national. At national level, there is no single divide, but multiple divides: for instance; within countries, between men and women, young and elderly, rich and poor and most importantly rural and urban. The present paper is mainly focused on India and tries to explore problem of digital divide mainly in rural-urban India. In the context of present paper digital divide essentially means teledensity, mobile and Internet divide between the rural and urban areas. The paper reveals that obstacles such as illiteracy, lack of skills, infrastructures, and investment in rural areas must be tackled if India is to diminish the gap of digital divide. At the government front, it should put thrust towards: connectivity provision, content creation, capacity augmentation, core technologies creation and exploitation, cost reduction, competence building, community participation and commitment to the deprived and disadvantaged would definitely help in bridging digital divide.

Key Words: Digital Divide, Access, India, ICTs, Infrastructure

JEL Codes: R58; Z13; O33; I38

Introduction

The Information and Communication Technology (ICT[1]) is one of the important driving forces for modern civilization. The rapid development and proliferation of ICTs has accelerated the economic and social change (Nandi, 2002), across all areas of human activity worldwide-and continues to do at the rapid pace. ICTs enable interactive communication unhindered by distance, volume, medium or time and also reduce the cost of co-ordination (Fletcher et al, 2000), communication and information processing (Dean, 2002; Gordon, 2000). ICTs hold great promise in derive for development and poverty reduction in global south. In many instances, poor people have experienced benefits in

[1] Information and communication technologies in an umbrella term which is currently used to refer to a wide ranges of services (telephony, FAX, Internet etc.), applications (such as distance education and management information systems etc.), and technologies (anything from old technologies such as Television to new technologies such a cellular phones), using various types of equipment and software, often running over telecoms networks.

the form of increased income; better health care; improved education and training; access to job opportunities (Kuhn and Skuterud, 2000; Sumanjeet, 2008; Hecker, 2001; Motohashi, 2001); engagement with government services; contacts with family and friends; enterprise development opportunities; increased agricultural productivity (Poole, 2001; Hooker et al, 2001), and so on (Sumanjeet, 2009). The issue of transparency is easier to manage with ICTs, which may result in monetary savings in addition to stakeholder confidence in the development process and system (Jesus, 2003). ICTs have radically changed the way of doing business. Internet and its enabled business technologies like e-commerce have opened up vast business avenues and transformed the whole business world into a global village. Further, it is expected that ICTs will play a crucial role in the socio-economic development process, and change the pattern of people's economic models and lives. But, the potential to exploits the benefits of ICTs largely depends on the access and adoption of these technologies. In fact, the status of ICT adoption of an economy is an indicator of its potentiality to exploit the economic opportunities affordable by the new technologies-more generally, its prospects for the transition to the 'new economy'. But, as expected the adoption of ICTs vary significantly across countries.

Table 1: Status of ICTs Adoption among Different Regions (Per 100 Inhabitants)

Regions	Fixed Telephone	Cellular Subscribers	Internet Users	Broadband Subscribers
ESCAP[2]	16.2	31.5	11.9	2.9
LLDC	6.6	13.3	4.0	0.1
LDC	0.9	9.3	0.5	11.8
SIDS	15.4	39.5	15.0	0.5
ASEAN	8.6	33.8	10.2	0.2
SAARC	3.3	15.3	5.0	0.1
Central Asia	11.1	20.1	6.3	--
Low Income	4.0	14.5	5.4	2.8
Middle Income	23.5	40.2	11.4	22.0
High Income	46.7	84.6	68.4	--
Africa	3.1	20.9	4.7	--
Latin America & Carib.	17.7	54.2	18.2	2.7
North America	57.8	75.0	69.0	19.7
Europe	45.0	101.4	43.1	15.6
Other Asia Pacific	22.5	51.2	19.3	7.1
World	19.4	40.9	17.4	4.3

Notes: Data for year 2006, complied by researcher; LLDC (Least Developed Countries); LDC (Least Developing Countries); SIDS (Small Island Developing States)

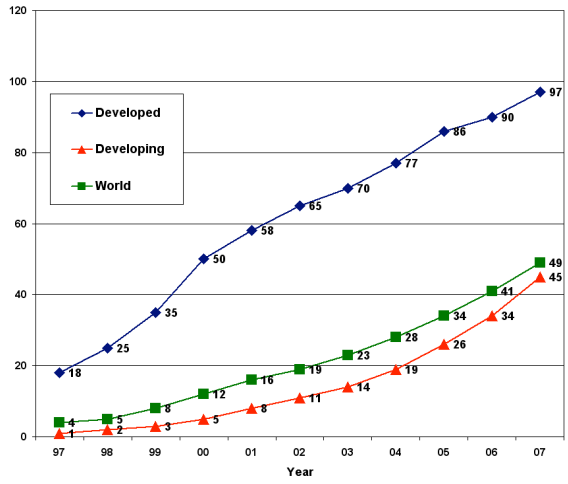
Source: Statistical Yearbook for Asia and the Pacific, 2007;

Table 1 indicates that high-income economies have twice as many fixed telephone lines per capita as middle-income economies, and 11 times the number in low-income economies. In the low-income countries and SAARC member countries-the number of

[2] The United Nations the Economic and Social Commission for Asia and Pacific (ESCAP) is the regional development arm of the United Nations for the Asia-Pacific region. With a membership of 62 Governments, 58 of which are in the region, and a geographical scope that stretches from Turkey in the west to the Pacific island nation of Kiribati in the east, and from the Russian Federation in the north to New Zealand in the south, ESCAP is the most comprehensive of the United Nations five regional commissions

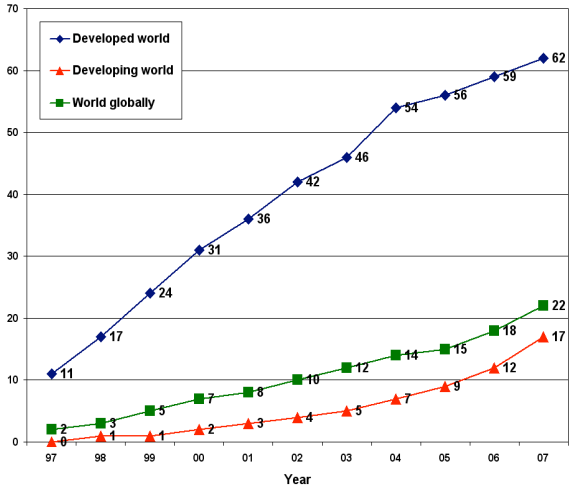
fixed telephone lines per 100 people was just 4.0 and 3.3, respectively. In the least developed countries the number did not even reach 1 in 2006. At the same time, the number of mobile phone per 100 people was 14.5, 15.3 and 9.3, respectively, in low-income economies, SAARC member countries and least developed countries. In high-income economies in the region, there are, on average 68 Internet users per 100 inhabitants, compared with 0.5 in LDC, 11 in middle-income economies and 5 in low-income economies. In 2006, there were 3 broadband subscribers per 100 inhabitants in low-income economies, compared with 20 in North America and 16 in Europe.

Graph 1: Mobile Phone Users per 100 Inhabitants 1997-2007



Source: IUT, 2009

Graph 2: Internet Users per 100 Inhabitants 1997-2007



Source: IUT, 2009

The global disparities in the access to these technologies are more clear with figure 1and 2. As illustrated above the adoption level of ICTs is highest among the developed countries. In these countries, more people have access to Internet and at a higher speed, many more have mobile phones. Developing countries are trying to keep pace with the changing technologies and adopting ICTs at faster rate; however the overall adoption rate is much lower than the developed world. Asian countries have experienced a rise in the use of ICTs in the recent years, though the degree of expansion has varied among the countries. Internet adoption rate is very slow among developing countries.

From the above analysis, it is clear that there are millions of peoples in this world who do not have access to Internet, telephone, mobile phone etc. due to various reasons. Their inability to access ICTs deprives them to reap the benefits of ICTs. This has let to a serious issue *'Digital Divide'* between those who are participating in information technology revolution and those who are not (United Nations, 2006). In the recent past, the digital divide has attracted the attention of both scholars and policy makers for its economic, social and political consequences.

Methodology

From the above discussion it is clear that the concept of digital divide has many dimensions. Many technological and non-technological gaps can be considered. Added to this, there are many ways to measure the gap of digital divide. The present paper is focused on India and tries to explore the macro aspect of digital divide in India. The paper tries to explore the problem of digital divide within India. Thus, in the context of the present paper digital divide essentially means teledensity, mobile and Internet divide between the rural and urban areas. The main objective of the present paper is to study the problem of digital divide in the Indian context and address the challenges in bridging the gap of digital divide. The study also makes an attempt to identify the causes of digital divide in India. Further, in the end, an attempt has been made to suggest the policies to address the challenges of bridging the gap of digital divide in India. The present paper has been divided into five sections. Section 1 deals with the concept of digital divide. Section 2 discusses the present status of digital divide in India. In section 3, an attempt has been made to study the causes of digital divide in India. Section 4 tries to address the problem of digital divide by suggesting some policy options. Section 5 deals with the concluding remarks.

1. Concept and Measurement of Digital Divide

There has been much discussion and debate about the concept of digital divide[3] and of the empirical analyses of its components (Chen and Wellman, 2004; Companie, 2001[4]; Cooper, 2002; Dewan and Riggins, 2005; Norris, 2001; Nohan, 2000). The notion of a digital divide gained attention in the 1990s with recognition that some people and institutions were not going online or were not going onto broadband. The concept of a "digital divide" between technological "haves" and "have-nots" has been a useful tool in efforts to bring greater, more equal access to powerful new information and communication technologies like the Internet. The term 'Digital Divide' is used to describe situations in which there is a market gap[5] in access to the use of ICT devices measured by, for example the number of fixed line phones per inhabitants, or the number of mobile users or the internet connections in the population. According to OECD (2001) the term 'digital divide' refers to "the gap between individuals, households, businesses and geographic areas at the different socio-economic levels with regard to their opportunities to access information and communication technologies (ICTs) and their use

[3] Just about a year prior to the turn of the century, the concept of the digital divide was dramatically catapulted onto the world stage with disturbingly striking statements such as: "80 percent of the world's population have never made a phone call;" "There are more telephones in Manhattan than in all of rural Asia;" and "There are more Internet accounts in London than in all of Africa." About almost the same time that the dotcom frenzy had reached its height, concern was also being expressed in different circles that the information revolution was in fact bypassing the vast majority of people inhabiting planet Earth.

[4] According to Ccompaine " the digital divide refers to the perceived gap between those who have access to the latest information technologies and those who do not".

[5] Such gaps have narrowed and in some cases, even reversed over time, but other disparities have risen. This suggests that: the digital divide is a dynamic concept, which evolves over time; older technologies tend to be more evenly diffused than newer ones. For example, TV sets are more evenly distributed than 3G mobile phones; there is not a single divide, but multiple divides: for instance, within countries, between men and women, between the young and elderly, different regions etc, and the main factor underlying these divides is differences in wealth, between countries and between individuals. While disparities in wealth continue to exist, the digital divide will persist.

of Internet. It reflects differences among and within countries". This definition is exclusively focused at national and international level. Nevertheless, digital divide exists in variety of other levels; sector, community, and individual level. For example many communities within nation-states are far removed from the rest of the country with regard to information and communication technologies access and use. Such communities reshape ICT to their culture and norms (Barziliani and Barziliani, 2005). Further, digital divide is also referred to as "the spiral of uneven access to and usage of information and communication technologies and the socio-economic rebound causes that have caused the emergence of information inequality throughout the world, both in and between the countries and also locally in communities. Hanimann and Ruedin (2007) the term 'digital divide' essentially describes three distinctive divides: a geographical digital divide (between regions and countries), a social digital divide (between social classes), and an upgraded digital divide (between technology and humans). Norris (2001); Mark, (2003) and Branko (2005) suggest that there are at least three major divides:

- A global divide between the developed and undeveloped worlds
- A social divide between the information rich and the information poor
- A democratic divide between those who do and those who do not use the new technologies to further political participation

Thus digital divide can be defined as economic, social or cultural deprivation generated by missing ICT access and skills. This definition goes beyond conventional definitions and it has a number of practically important characteristics. First, it explicitly spells out the three different dimensions where digital divides are important and where ICTs make a difference. In the modern knowledge- and information-based world, economic opportunities, such as employability, depend on ICT access and skills. ICTs, however, also play an increasingly important role in all social relationships, ranging from political participation to connecting local communities, friends and the family. Second, in the global and culturally diversified world, ICTs are also increasingly important for access to cultural resources and expression. Third, the definition also replaces traditional technology-focused characterizations of digital divide, noting that lack of technology, per se, is not always a problem. It is clear that technology remains inert and useless with knowledge and capabilities to use them, and when they are embedded in social without necessary human skills and competences. Technologies become real when they are combined practices.

Figure 1: Measurement of Gap[6] Elements for 'Digital Divide'

Element 1	**Element 2**
A gap in access to use ICT: Measured by the number and spread of ICTs (first order digital divide)	*A gap in the ability to use ICTs:* measured by skills base and presence of numerous complementary assets (second order digital divide)

[6] As one can deduce, the concept of the digital divide has changed over time. In the beginning, it basically referred to connectivity problems (gap in access to use of ICTs). Later, it began to introduce the concern for the development of capacities and skills required to use ICTs (capacity-building and education), and finally, there is also reference to the use of integrated resources in the technology. Thus, the concept of the digital divide basically focuses on three areas: Infrastructure, capacity building and focus on resource usage.

Element 3	Element 4
A gap in actual use: measured by the telecommunications for various purpose, the number and time of online users, the number of internet hosts and the level of e-commerce, e-business and e-governance	*A gap in the impact of use:* measured by financial and economic returns.

Based on these four elements, many international organizations have defined development policies aimed to reduce the digital divide. However, in spite of the evolution in the concept, these principally emphasize development of a technological infrastructure. National investments and policies for the reduction of the digital divide continue to principally target connectivity development.

2. Digital Divide in India: The State of Art

ICT infrastructure is the backbone of modern society. It is the biggest enabler of change and process reforms with minimum resistance. Various studies (Lawrence and Lee, 1999; Leizero, 2000; Pastor *et al,* 2004; Norris, 2000; Sumanjeet, 2006) revealed that good governance is not possible without the ICTs. The information and communication technologies are being increasingly used by the governments to deliver its services at the locations convenient to the citizens. Further, it brings effectiveness, efficiency and transparency is the system. Therefore, the governments around the world are busy in developing the ICTs infrastructure. India is one of the countries where telecommunication development activities have gained momentum in the past decade or so[7]. Efforts have been made from both governmental and non-governmental platforms to enhance the telecomunication infrastructure. The idea is to help modern telecommunication technologies to serve all segments of India's cultural diverse society, and to transform it into a country of technologically savvies

Various studies (Huberman, 2001; DiMaggio et al, 2001; Guillen, 2006; Servon, 2002) showed that the problem of digital divide is starker in the developing countries like India. The gap of digital divide is significant between the rural and urban India (Dasgupta et al, 2002;, Nath, 2001; Singh, 2007; Mahajan, 2003; Dutta, 2003). The major metropolises are at par with some of the developed countries, but rural areas in states like

[7] After 1995, the government set up TRAI (Telecom Regulatory Authority of India) which reduced the interference of Government in deciding tariffs and policy making. The DoT opposed this. The political powers changed in 1999 and the new government under the leadership of A.B Vajpayee was more pro-reforms and introduced better liberalization policies. They split DoT in two- one policy maker and the other service provider (DTS) which was later renamed as BSNL. The proposal of raising the stake of foreign investors from 49% to 74% was rejected by the opposite political party and leftist thinkers. Domestic business groups wanted the government to privatize VSNL. Finally in April 2002, the government decided to cut its stake of 53% to 26% in VSNL and to throw it open for sale to private enterprises. TATA finally took 25% stake in VSNL. This was a gateway to many foreign investors to get entry into the Indian Telecom Markets. After March 2000, the government became more liberal in making policies and issuing licenses to private operators. The government further reduced license fees for cellular service providers and increased the allowable stake to 74% for foreign companies. Because of all these factors, the service fees finally reduced and the call costs were cut greatly enabling every common middle class family in India to afford a cell phone.

eastern Bihar and Orissa are worse off than several of the least developed countries. The problem can be more understood by studying it under three sub-sections: Teledensity divide, mobile phone divide and Internet divide between rural and urban India.

2.1 Teledensity[8] Divide

Teledensity is low throughout the countries of the South Asia. Pakistan has highest teledensity in Asia and Bangladesh has lowest. India is by far the largest South Asian country, in terms of population, economy and telecommunication network. However, there are huge disparities extant within the country, and this is evidenced in the uneven distribution of telecommunication access. The recent extraordinary growth in telecommunication connections in India[9], which topped 15 million per month in January 2009, has understandably grabbed the headlines. These huge numbers, however, disguise a disturbing reality, which is the enormous variation within India. Many of the less developed states have state-wise average penetration rates of below 20 per cent, including Bihar (12.13), Assam (13.67), Andaman & Nicobar Islands (17.94), Uttar Pradesh (15.58), West Bengal (13.78) Orissa (14.28), Madhya Pradesh (19.54) Uttranchal (10.37) and Bihar (12.13). Teledensity in some states like Jharkhand (3.49), Chhattisgarh (4.18) and North East-II (8.71) are less that 10 per cent (Table 2)

Table 2: State-Wise Urban and Rural Teledensity in India (In %)
(As on 29/02/2009)

Circle/States	Teledensity		
	Rural	Urban	Overall
Andaman & Nicobar Islands	13.89	24.77	17.94
Andhra Pradesh	10.15	72.44	27.34
Assam	3.85	72.46	13.67
Bihar	3.1	89.13	12.13
Chhattisgarh	1.31	14.27	4.18
Gujarat	15.57	58.15	32.34
Haryana	16.06	57.67	29.45
Himachal Pradesh	30.5	118.64	39.9
Jammu & Kashmir	7.35	59.4	20.99
Jharkhand	1.14	11.38	3.49
Karnataka	11.14	73.38	33.68
Kerala	25.5	97.46	43.98
Madhya Pradesh	4.96	58.34	19.54
Maharashtra (-) Mumbai	11.66	55.16	26.18

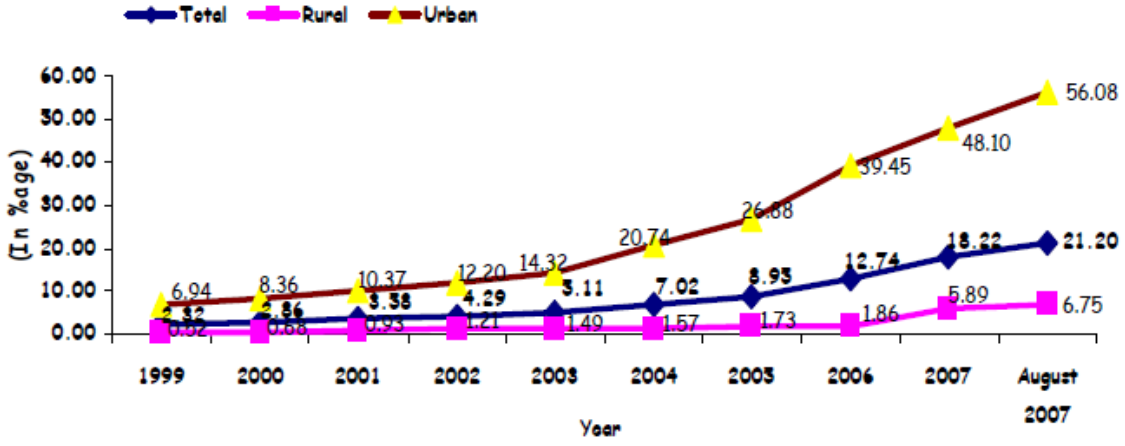
[8] The number of landline telephones in use for every 100 individuals living within an area. A teledensity greater than 100 means there are more telephones than people.

[9] Whether the country has adequate teledensity commensurate with its development can be best judged by reference to a table prepared by the United Nations some years ago in which the co-relation between the per capita income and teledensity was worked out. According to the table, for a per capita income of $1000 an annum, a teledensity of 3 per cent is considered adequate. So, India has adequate teledensity, as we have not reached the per capita GDP of $1000 (it is about US$ 400).

North East -I	6.65	89.45	26.32
North East - II	3.06	27.47	8.71
Orissa	6.66	53.64	14.28
Punjab	24.83	80.63	46.85
Rajasthan	12.07	57.98	22.98
Tamilnadu (-) Chennai	15.37	56.8	34.01
Uttaranchal	5.03	24.43	10.37
Uttar Pradesh	6	50.36	15.58
West Bengal (-) Kolkata	7.02	55.43	13.78
Kolkatta	#	57.43	62.3
Chennai	#	100.13	101.62
Delhi	#	107.96	107.96
Mumbai	#	81.41	81.41
India	**9.03**	**64.48**	**25.34**

Source: TRAI, 2009

Graph 3: Urban & Rural Teledensity (Per 100 Inhabitants 1997-2008)



Source: ICRA

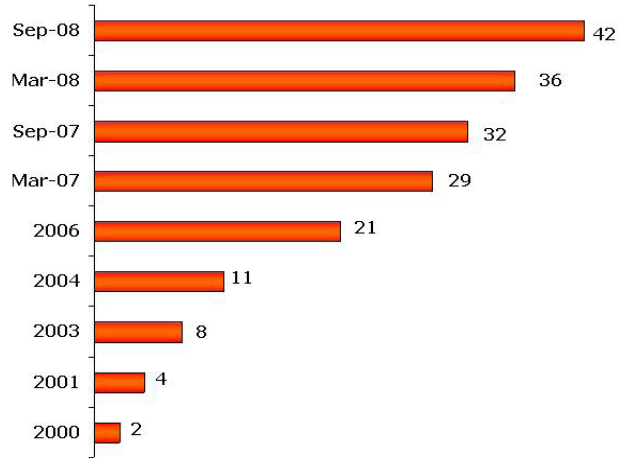
More perilous, however, is the inequality between rural and urban India (Graph 3). Despite several policy initiatives to promote rural penetration, growth in teledensity continues to be skewed in favour of urban India. In fact, the rural population is much worse than it was, a few years ago compared to its urban counterpart.

2.2 Internet Divide

Internet came to India in the early 1990. Videsh Sanchar Nigam Limited (VSNL) introduces Internet in India via dial up in the 6 cities on August 14, 1995. At that time, there was limited Internet access only in a few major cities, all in the hands of the government. VSNL, the agency responsible for Internet activities, and the DOT (Department of Telecommunications) provided an agonizingly erratic connectivity, with miserly bandwidth and far too few phone lines. Connection rates ran as low as 5% (for every 20 dialups you might get connected once) and users were frequently cut off. And the rates for this pathetic level of service were among the highest in the world. Domestic users paid about $2 per hour, and lease lines, for the few companies that could afford

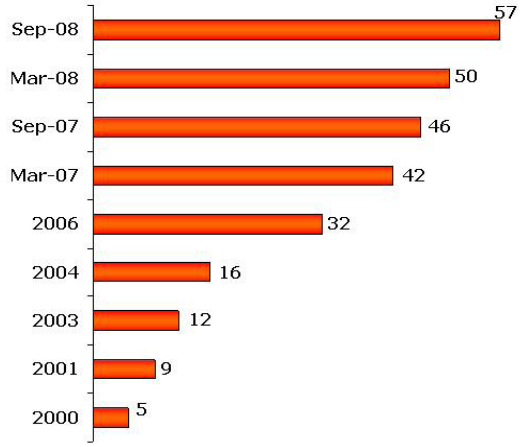
them, ranged over $2000 per month for a 64 Kpbs line. By the end of 1998, after three years of government monopoly, there were barely 150,000 Internet connections in India. But, today the government monopoly is largely over. Many small to large Internet Service Providers have set up shop, triggering a price war and an improvement of service. Users are now estimated (57 Million claimed users) at over 49 million (42 Million as on September 2008) and, with a growth predicted to reach 1 billion in the next five years (Graph 4 and 5).

Graph 4: Active[10] Internet Users in India



Note: Figures in Millions
Source: IAMAI

Graph 5: Claimed Internet Users in India



Note: Figures in Millions
Source: IAMAI

Small Internet kiosks have set up even in small towns, and the governments, both State and Central are pushing for growth in the Internet sector. Internet is the new buzzword. But data shows that Internet seems to be on a move in the metros of India and not the buzzword for small towns too. Today almost 70% of the total Internet users in India are coming in from the top 7 cities-Mumbai, Delhi, Bangalore, Hyderabad, Chennai, Kolkata and Pune. Only 30% access is happening from all other cities put together. Added to this disparity among the rural and urban Internet users is also very high (Table 3).

Table 3: Urban-Rural Internet Users in India (In Millions)

Internet User-ship in India (Rural-Urban)	2005	2006	2007	2008
Urban-Internet using individuals (Regular)	17.63	21.95	25.17	30.03
Urban-Internet using individuals (Occasional)	5.20	1.65*	5.15	10.31
Urban-Internet using individuals (Total)	22.83	23.60	30.32	40.34
Rural-Internet using individuals (Regular)				5.06
Rural-Internet using individuals (Occasional)				4.00
Rural-Internet using individuals (Total)				9.06
All India-Internet using individuals (Regular)				35.09
All India-Internet using individuals (Occasional)				14.34
All India-Internet using individuals (Total)				49.40

[10] Active Internet users are those who have used the Internet at least once in the last one month-this is an internationally accepted benchmark for enumerating Internet users.

All Urban internet users as % of Indian Population	7%	7%	9%	12%
All Rural internet users as % of Indian Population				1.2%
All India internet users as % of Indian Population				4.5%

Note:*May have been underestimated because of relatively less deeper coverage of SEC 'D' and 'E'in the land survey.

Source: Juxtconsult India Online, 2008

In rural India only 1.2 per cent people have Internet access whereas it is 12 per cent in the urban India. Urban users continue to dominate Internet use contributing to 40.34 million of the 49.40 million odd users. 30.3 million urban people are using Internet on regular basis where only 5 millions are in rural areas. In September last 2007, the number of active Internet users in urban India was 30 million. Disparities within the Indian states are huge. State like Delhi, Maharashra and Tamilnadu have highest number of Internet subscribers followed by Kerala, Karnataka and West Bengal. Assam, North East-II, Orrisa, Andaman and Nicobar and Uttranchal have lowest Internet subscribers States of India.

2.3 Mobile Divide

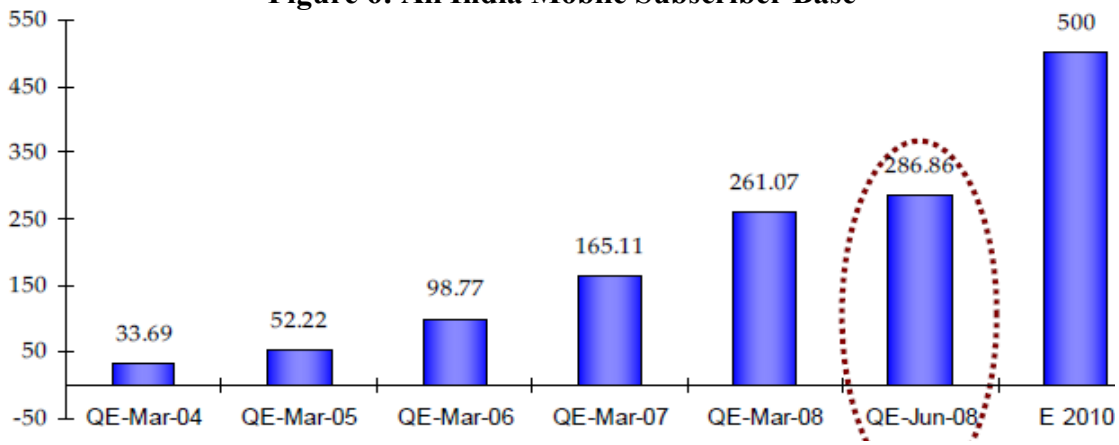
Far from being a lifestyle product, Mobiles have now become a necessity. India has seen a huge spur in mobiles in the past 5 years and it has penetrated even to the rural areas of India to a good extent. With entrants of CDMA[11] (Code Division Multiple Access) like Reliance communications and Tata Indicom the call rates have been reduced and usability has been increased. The launch of the revolutionary offer of a mobile phone along with a connection by Reliance for Rs.500 boosted the mobile sales to sky soaring limits. Over and above with the STD rates and the call rates reducing day-by-day and new competitors entering, the mobile market has flung open high growth prospects.

Globally in terms of mobile subscriptions, India is the world's second largest wireless market after China. At the end of June 2008, the total wireless subscribers (GSM[12], CDMA & WLL (F)) base was 286.86 million (Graph 6).

[11] Short for Code-Division Multiple Access, a digital cellular technology that uses spread-spectrum techniques. Unlike competing systems, such as GSM, that use TDMA, CDMA does not assign a specific frequency to each user. Instead, every channel uses the full available spectrum. Individual conversations are encoded with a pseudo-random digital sequence. CDMA consistently provides better capacity for voice and data communications than other commercial mobile technologies, allowing more subscribers to connect at any given time, and it is the common platform on which 3G technologies are built.

[12] Short for Global System for Mobile Communications, one of the leading digital cellular systems. GSM uses narrowband TDMA, which allows eight simultaneous, calls on the same radio frequency. GSM was first introduced in 1991. As of the end of 1997, GSM service was available in more than 100 countries and has become the de facto standard in Europe and Asia.

Figure 6: All India Mobile Subscriber Base



Note: QE stands for Quarter End; E stands for Estimated; Figures in Millions
Source: TRAI

A total of 8.94 million wireless subscribers were added during the month of June 2008 as against 8.62 million wireless subscribers added during the month of May 2008. As a result the overall tele-density rose to 28.33% by end of June 2008 as against 27.59% in May 2008. This growth of the sector can be clearly attributed to the favorable and improved regulatory structure, declining handset prices and innovative pre paid tariff structure. It is expected that by the end of the year 2010, India will have 500 million mobile phone subscribers and the break up could be: out of the 500 million subscribers, 60 million would have video capabilities, 10 million music, 200 million radios, 250 million camera capabilities, while 250 million will have net connections.

Thus, India has become the fastest growing mobile market in the world. The only country with more mobile phones than India is China. But, there is huge divide between mobile phone users in urban and rural areas. Still, rural mobile penetration is pretty low-just 4.92 percent (Table 4), though it has touched double digits in some prosperous states like Punjab, Kerala and even Himachal Pradesh. However, overall rural penetartion remains far away below the 43.88 percent mobile density in urban areas.

Table 4: State Wise Mobile Users (Urban and Rural) in India

Top 15 States in Terms of Rural Mobility	**Rural Mobile Connections (in Million)**	**Total Rural Population (in Million)**	***Penetration in Rural Areas (in %)***
Punjab	2.24	10.83	*20.69*
Himachal Pradesh	1.0	5.85	*17.09*
Kerala	2.66	25.03	*10.63*
Haryana	1.66	16.27	*10.20*
Gujarat	3.20	34.42	*9.31*
Tamil Nadu	2.8	32.86	*8.52*
Andaman & Nicobar Islands	0.02	0.27	*8.27*
Rajasthan	3.27	48.66	*6.72*
Maharastra	3.79	59.67	*6.35*

Karnataka	2.25	36.56	*6.15*
Andhra Pradesh	3.27	59.27	*5.52*
Jammu & Kashmir	0.43	8.24	*5.21*
West Bengal	3.01	62.48	*4.81*
Orissa	1.28	33.06	*3.88*
Uttar Pradesh	4.60	147.00	*3.13*
Total	**35.51**	**580.47**	***6.12***
All India (Total)	**39.46**	**802.00**	**4.92**

Source: Voice and Data, 2008

But, it is expected that the gap will narrow down in the coming years. Mobile industry players are eyeing rural India as their new area of opportunity. Cellular service providers seem to be answering the call of the wild as they are entering the so far ignored rural market. Although a huge market in the urban segment remains tapped, most of the cellular operators have turned towards Rural India to broaden their base and reach. So the real growth is expected from this geography in near future. The low population density in rural areas has necessitated more towers of higher altitudes raising the costs further. Rural India, experts say, that the next phase of mobile phone growth would come from the hinterland.

3 Determinants of Digital Divide in India

From the above discussion it is clear that there is huge gap of digital divide between rural and urban India. However, this gap varies from State-to-State. In some States like North East, Uttranchal, Bihar, Jharkhand, Orrisa and Anadaman and Nicobrar Island the gap of digital divide is really very significant, in some other states it is narrow like Punjab, Maharashtra and Kerala. Added to this, the gap also varies from technology-to-technology. Some States are not able to adopt even one technology but others have adopted very efficiently. In some states overall adoption of technology is high, but, adoption rate is rural areas is very low. In some cities like Delhi, Mumbai, Kolkata, Banglore, Hyderabad, Noida etc, ICTs adoption rate is very high, whereas in some other cities like, Patna, Lucknow, Ahemdabad (even these are the capital of States)etc, adoption rate is very low. The undeniable fact is that there is noticeably problem of digital divide in India. It is a massive problem and a very complex problem too. It is not just about people who have access and those that do not; it is not just about haves and have-nots. It is about people becoming knowers and know-nots; and doers and do-nots; those who can communicate with the rest of the world and those that can not. In this light it is also important to find out some of the important reasons behind the digital divide in India. There are many reasons, which can be held responsible for digital divide in India. Compared to many developing and developed countries, India's capacity to bridge the digital divide is very poor. Table 5 clearly indicates India's ICTs adoption capacity at international level.

Table 5: India's ICTs Adoption Capacity among Different Countries (Ranking)

Countries	Internet Users*	Broadband Subscribers**	Computers In Use*	Communication Technology	IT Skills	Computers Per Capita
India	55	51	12	31	10	55
China	52	41	2	47	54	51
Singapore	13	21	41	1	2	19

Hong Kong	--	--	29	3	--	--
Japan	7	14	3	17	22	21
Korea	12	3	7	20	18	18
Malaysia	29	42	21	30	23	32
USA	10	17	1	12	4	2
UK	14	12	5	24	25	10
Israel	15	15	31	15	3	17
Germany	19	20	4	6	24	13
France		13	6	22	--	20
Denmark	28	1	--	--	--	--
Sweden	1	--	--	--	1	1
Finland	--	--	--	--	13	--

Note:*Rank for 2007; **2006; Internet Users and Broadband Subscribers per 1000 inhabitants)
Source: Voice and Data; IMD World Competitiveness Yearbook, Various Issues

It is clear with the table 5 that where India stand at international level as far as various capabilities to measure the gap of digital divide is concerned. In case of broadband subscriber, India has lowest rank of 51 among the selected countries, same in the case of computer per capita and Internet users.

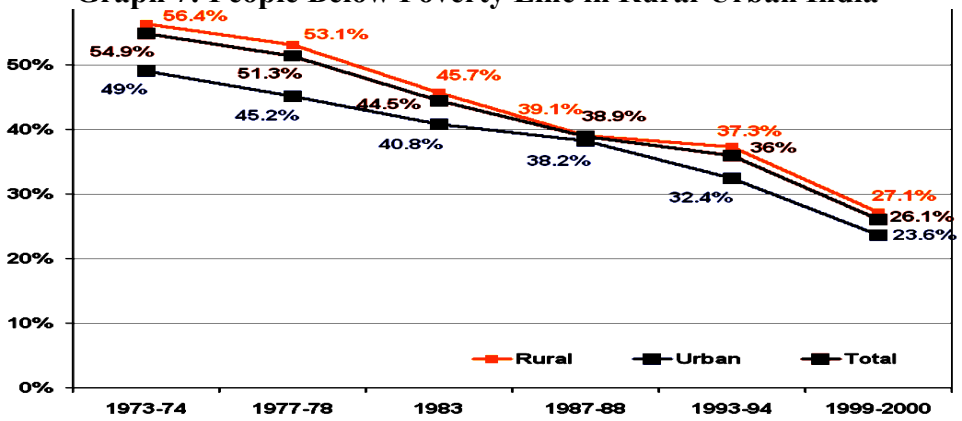
As India is a multicultural, multi-language and multi-religion country with complex socio-economic conditions, there are six main difficulties in serving rural communities, each one of which has appeared insurmountable: poverty, unemployment, age and education.

A Nation Online Survey (NTIA, 2002) found computer and Internet use correlate with poverty[13] (family income), employment status, and educational attainment. Even age[14] is also a major factor (Lenhart, 2000). Rural India has more than 70 per cent of Indian population. 75% of the poor are in rural areas, most of them are daily wages, self-employed householders and landless labourers.

[13] Although Indian economy has grown steadily over the last two decades, its growth has been uneven when comparing different social groups, economic groups, geographic regions, and rural and urban areas. Between 1999 and 2008, the annualized growth rates for Gujarat (8.8%), Haryana (8.7%), or Delhi (7.4%) were much higher than for Bihar (5.1%), Uttar Pradesh (4.4%), or Madhya Pradesh (3.5%).Poverty rates in rural Orissa (43%) and rural Bihar (41%) are among the world's most extreme. 80% of Indians live on less then half a dollar a day.

[14]The Oxford's research finds that age is the primary factor determining Internet usage patterns in developed Western countries, not money. Almost 98 percent of students in Britain regularly use the Internet, while only 22 percent of British retirees' surf the Web. All youngsters, whether or not they are numerate or illiterate, appear capable to access the Internet. Professor Richard Rose, the lead researcher on the project, indicates that the idea of wealth-based divide is wrong. It is all about age and not so much about social class. Rose's observed pattern of Internet usage is similar across Western Europe. Russians under 30, for example, are 10 times more likely to surf the Web regularly than Russians over 60.

Graph 7: People Below Poverty Line in Rural-Urban India



Note: Percent of population living living below poverty line, which is 356.35 rupees or around $7 a month in rural areas.

The Planning Commission of India uses its own criteria and has estimated that 27.5% of the population was living below the poverty line in 2004–2005, down from 51.3% in 1977–1978, and 36% in 1993-1994. Again unemployment rate is high in the rural India than the urban. Unemployment rate in agriculture sector is 62 per cent (Planning Commission, 2007) whereas it is only 16 per cent in manufacturing sector, 10 per cent in the services sector and 12 percent in other job sectors.

The better educated are statistically more likely to have and use connected PCs. In particular those with college degrees or higher, are ten times more likely to have access. Literacy rate is high in the urban India (79.9 percent) whereas it is only 58.7 percent in the rural India. Overall literacy rate in India is 64.8 percent. There is also huge difference in male (75.3 percent) and female literacy rate (53.7 percent).

Another important reason of digital divide in India is knowledge divide[15]. Knowledge divide is directly related with digital divide. More educated people[16] with computer knowledge and English language are able to access new technologies. Rural India had 368 million literate people out of whom only 63 million were found to be English-speaking as on March 2008. Given the high levels of literacy in rural India and very low levels of English speaking population and computer savvy population[17], IMAI , 2008 made a clear case of content and applications in local languages in order to ensure higher and faster adoption of internet in rural. Internet use is primarily associated with a large section of the English-knowing urban population-though they account for only 31 per cent of the total urban population of 250 million-as many, as 84 per cent of them are PC literate. Internet penetration extended to only 0.6 per cent of the population in rural areas, with the number of active Internet users estimated at 3.3 million.

---

[15] Usually the concept of digital divide is used to relate the technological aspect of knowledge gap.

[16] Literacy rate (2001) in Kerala was 90.86 per cent against 47.00 per cent in Bihar. Life expectancy at birth (2001-2006) is 71.61 for males and 75 for females in Kerala. In Bihar, it is 65.66 for males and 64.79 for females. Infant mortality (per 1,000 live births, 2002 provisional data) was only 10 in Kerala against 61 in Bihar. Birth rate (per 1,000, provisional) is 16.9 in Kerala against 30.9 in Bihar. Death rate (per 1,000, provisional) is 6.4 in Kerala against 7.9 in Bihar. The differences clearly indicate that literacy is the key to improvement in quality of life

[17] According to I-Cube 2008, a survey jointly undertaken by IMRB International and Internet and Mobile Association of India, there were 3.3 million active internet users in rural India as on March 2008.

Electricity is the most basic condition for using ICTs and many studies established that relationship between the level of electrification and digital divide. Rural India has low electricity coverage (Table 6). Almost 10 per cent villages of India have no electricity. Some areas may get 'agricultural power- two hours in the morning and evening-but even this is the exceptional. Added to this the cost of electricity is very high. In this situation, one can not even think about using computers and Internet.

Table 6: Reported Status of Rural Electrification (As on March 2004)

States	Electrified Villages (%)	Electrified Households (%)	States	Electrified Villages (%)	Electrified Households (%)
Punjab	100.00	91.90	Madhya Pradesh	97.43	70.00
Haryana	100.00	82.90	Rajasthan	98.38	54.70
Gujarat	100.00	80.40	Chhattisgarh	94.00	53.10
Maharashtra	100.00	77.50	West Bengal	83.63	37.50
Tamil Nadu	100.00	78.20	Orrisa	80.15	26.90
Kerala	100.00	70.20	North-East	75.32	33.20
Andhra Pradesh	100.00	67.30	Uttar Pradesh	58.73	31.90
Himachal Pradesh	99.38	94.80	Bihar	50.00	10.30
Karanataka	98.91	78.50	Jharkhand	26.00	24.30

Source Planning Commission, 2005

The digital divide is not simply an issue of access, but also of obstacles to use ICTs. Various studies (Tracy *et al*, 2003; Winter and Huff; 1996; Spender, 1997; MacKenzie and Wajcman, 1985) revealed that even when women and men have equal access to the internet either through home, work or school, they may not have the opportunity to access the Internet or engage in a wide variety of uses. Women have been online less than men (Kennedy *et al*, 2003). They have been online for fewer months and when they do go online, they spend less time. The gender issue is highly relevant in the developing countries like India. Women have less access than men in India due to various social and personal factors.

Added to these**,** the growing population, insufficient funds, affordability[18], and delays in implementation of government policies and programmes have been some of the challenges that have lead to unequal development in the society, which is responsible for digital divide.

4. Policy for Addressing the Challenges in Bridging the Digital Divide

Despite India taking significant steps towards acquiring competence in information and technology, the country is increasingly getting divided between people who have access to technology and those who don not. India has around half a million software developers and is second only to the US, but 300,000 Indian villages do not have a phone connection, 70 per cent of the Indian population have no access to any form of technology, 26 per cent of the population lies below the poverty line and 35 per cent illiterate. There are only 5 PCs per 1000 people, 9 mobile lines per 1000 and 37 fixed

[18] "Unfortunately telecom networks are designed for people who can afford to pay around US$35 in monthly bills, and very few people in the rural areas can afford that," said Ashok Jhunjhunwalla, a professor at the prestigious Indian Institute of Technology (IIT).

lines per 1000 people in India, which is extremely low when compared to China. The challenge in front of the Indian government is to bring down this digital divide and ensure development and adoption of technology. The government has made encouraging steps to bridge the gap of digital divide in India. Most of the initiatives[19] are directed towards bridging the gap of rural and urban digital divide. The Indian government has passed Information Technology Act, 2000 to make to e-commerce and e-governance a success story in India. Recognizing the potential of ubiquitous Broadband service in growth of GDP and enhancement in quality of life through societal applications including tele-education, tele-medicine, e-governance, entertainment as well as employment generation by way of high-speed access to information and web based communication; The government has announced Broadband Policy in October 2004. In the field of international telephony, India had agreed under the GATS to review its opening up in 2004. In an effort to strike a balance between a purely market driven system of allocation which would tend to concentrate on main cities and on the largest and wealthiest customers) and a social consideration reducing the rural-urban disparity and improve teledensity in rural areas, the Government of India had designed a Universal Service Obligation (USO) fund[20]. The USO as a tax on service providers to facilitate redistribution of resources to 'unprofitable' rural areas. Complementing this is the access deficit charge[21] (ADC) regime put in place by the Telecom Regulatory Authority of India to help service-providers Bridge the gap between cost of supply and provision of access, especially in rural areas. Since the costs of expansion and maintenance of rural networks are high compared with dense urban areas, the USO funding was extended for mobile services and rural infrastructure in 2006. This was expected to provide incentives for private operators to break into the rural market. Recently, the regulator Telecom Regulatory Authority of India[22] (TRAI), in its recommendations on growth of telecom services in rural India, had prescribed infrastructure sharing as the solution for improving

[19] For example Microsoft has announced a slew of initiatives to accelerate IT literacy and enable e-governance to bridge the digital divide in the country. The low-cost device, developed jointly by the Indian Institute of Technology (IIT), Chennai, and Indian Institute of Science (IISc), Bangalore, for the human resource development (HRD) ministry, is aimed at bridging the digital divide and making access to computer literacy affordable to the masses.

[20] The Universal Service Support Policy came into effect from 01.04.2002. The guidelines for universal service support policy were issued by DoT and were placed on the DoT website www.dot.gov.in on 27th March 2002. Subsequently, the Indian Telegraph (Amendment) Act, 2003 giving statutory status to the Universal Service Obligation Fund (USOF) was passed in December 2003. The Fund is to be utilized exclusively for meeting the Universal Service Obligation by providing access to telegraph services to people in the rural and remote areas at affordable and reasonable prices. The USO Fund was established with the fundamental objective of providing access to 'basic' telegraph services. Subsequently, an Act has been passed on 29.12.2006 as the Indian Telegraph (Amendment) Act 2006 to amend the Indian Telegraph Act, 1885 to enable provision of all types of telegraph services.

[21]The Telecom Regulatory Authority of India (TRAI) has phased out Access Deficit Charges (ADC) on domestic calls and slashed ADC on international calls to 50 paise from the present Re 1, effective April.

[22]TRAI's mission is to create and nurture conditions for growth of telecommunications in the country in a manner and at a pace, which will enable India to play a leading role in emerging global information society. One of the main objectives of TRAI is to provide a fair and transparent policy environment, which promotes a level playing field and facilitates fair competition. In pursuance of above objective TRAI has issued from time to time a large number of regulations, orders and directives to deal with issues coming before it and provided the required direction to the evolution of Indian telecom market from a Government owned monopoly to a multi operator multi service open competitive market.

rural tele-density. In 2007, the Telecom Regulatory Authority of India (TRAI) further lowered the Access Deficit Charge (ADC) rates to push mobile growth in rural areas. With all these development in place, the ministry of telecommunication went ahead with a bid call for subsidy for rolling out the mobile networks in 2.5 lakh villages. Recently Indian government has decided to push WiMAX technology[23] especially for broadband connectivity in rural areas.

The Government has announced the guidelines for Mobile Number Portability[24] (MNP) Service Licence in the country on 1st August 2008 and has issued a separate Licence for MNP service w.e.f. 20.03.2009. The government has in a pioneering decision, decided to auction 3G & BWA spectrum[25]. The broad policy guidelines for 3G & BWA have already been issued on 1st August 2008 and allotment of spectrum has been planned through simultaneously ascending e-auction process by a specialized agency. Apart from the 123.51million fixed and WLL connections on March 2009 provided in the rural areas, 57167 uncovered VPTs have been provided as on March 2009. Thus, 85% of the villages in India have been covered by the VPTs. More than 3 lakh PCOs are also providing community access in the rural areas. Further, Mobile Gramin Sanchar Sewak Scheme (GSS) – a mobile Public Call Office (PCO) service is provided at the doorstep of villagers. At present, 2772 GSSs are covering 12043 villages. Also, to provide Internet service, Sanchar Dhabas (Internet Kiosks) have been provided in more than 3500 Block Headquarters out of the total 6337 Blocks in the country. The target of 80 million rural connections by 2010 has already met during year 2008 itself. USOF subsidy support scheme is also being utilized for sharing wireless infrastructure in rural areas with about 19,000 towers by 2010.

From the above discussion it is revealed that most of the government initiatives is directed towards developing the sound telecom infrastructure in the rural area. But, this is

---

[23] WiMAX stands for Worldwide Interoperability for Microwave Access. It is a telecommunications technology providing wireless data over long distances in a variety of ways, from point-to-point links to full mobile cellular type access. It is based on the WirelessMAN (IEEE 802.16) standard. WiMAX is a highly scalable, long-range system, covering many kilometers using licensed spectrum to deliver a point-to-point connection to the Internet from an ISP to an end user. WiMAX can be used to provide a wireless alternative to cable and DSL for broadband access, and to provide high-speed data and telecommunications services. WiMAX can also be used to Connect many Wi-Fi hotspots with each other and also to other parts of the Internet.

[24] The Department of Telecommunication (DoT) has already issued licences to two global companies (M/s Syniverse Technologies Pvt. Ltd. and M/s MNP Interconnection Telecom Solutions India Pvt. Ltd.) for implementing the service. MNP is to be implemented in Delhi, Mumbai, Maharashtra & Gujarat service areas of Zone – 1 and Kolkata, Tamil Nadu including Chennai, Andhra Pradesh & Karnataka service areas of Zone - 2 within six months of the award of the licence i.e. by 20.09.2009 and in rest of the service areas within one year of the award of the licence i.e. by 20.03.2010.

[25] The 3G will allow telecom companies to offer additional value added services such as high-resolution video and multi media services in addition to voice, fax and conventional data services with high data rate transmission capabilities. BWA will become a predominant platform for broadband roll out services. It is also an effective tool for undertaking social initiatives of the Government such as e-education, telemedicine, e-health and e-Governance. Providing affordable broadband, especially to the suburban and rural communities is the next focus area of the Department. BSNL & MTNL have already been allotted 3G & BWA spectrum with a view to ensuring early roll out of 3G & WiMax services in the country. They will pay the same price for the spectrum as discovered through the auction. While, Honbl'e Prime Minister launched the MTNL's 3G mobile services on the inaugural function of 'India Telecom 2008' held on 11th December 2008, BSNL launched its countrywide 3G services from Chennai, in the southern Tamil Nadu state on 22nd February 2009.

only aspect of addressing the problem of digital divide in India. Added to this, government should adopt the following policy to bridge the gap of digital divide in India:

- First, as our earlier analysis suggests that relationship between education and ICT is critical. International evidence suggest (Pluss, 2004; Rheingold, 2000; Smith, 1998) that education is strong complement to use of technologies like Internet and that the relevant education levels are secondary and tertiary levels as they are expected to upgrade the national capacity for adaptation and innovation[26]. Like many other developing countries, the main emphasis of Indian government is boost primary education that yields the higher rate of social returns. But, to bridge the gap of digital divide government should introduce some innovative policy measures to encourage students to go for further education in the rural areas. The expenditure, which Indian government is doing for rural education, is far below the level of satisfaction (Table 7).

Table 7: Table 7: Expenditure on Education (Rural vs. Urban)

Components of Education	Monthly Household Expenditure (In Rs. At 2004-05 Prices) Rural		Urban	
	1993-94	2004-05	1993-94	2004-05
Books and Journals	8.9	12.6	21.3	21.7
Newspapers & Periodicals	1.7	2.9	16.7	20.5
Library Charges	0.2	0.1	0.6	0.1
Stationary Articles	7.2	14.9	15.5	21.8
Tuition Fees	7.5	29.1	67.7	118.3
Private Tutor	5.4	10.3	25.8	41.7
Others	6.1	2.8	13.7	5.5
Total Education	37.0	72.7	161.3	227.7

Source: Consumption Expenditure Data from 50th and 61st Rounds of NSS

Table indicates that there is huge difference between expenditure on education for rural India and urban India. Prime Minister of India also realized the need to increase the level of investment in education in rural India. Nevertheless, one does not need to rely exclusively on the government for promoting secondary and tertiary education. Many individuals who would like to take advantage of ICT opportunities are economically well off and may no need government financial assistance. For others, improve availability of education loans from the financial institutions can be a major held in financing their educational expenses. In addition to formal education, there is need to promote technical education in rural India and among the women of India. 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

[26] Much of the Internet based information is textual and in English. In India, significant portion of the rural population is either illiterate or has an education no higher than the elementary level. Therefore, a large segment of the Indian rural population may not be able to access and comprehend the web-based information.

utility of ICT's must always be judged against the role they can play in meeting core human needs.

- There is need to promote technologies which are best suited for the rural India. For example to bridge the gap of digital divide in its real sense there is need to increase PC penetration. The reason is very simple; mobile cannot do everything a PC can. But, mobile are cheaper, more portal and their extended battery life is suited to regions where access to electricity is lacking or non-existent. The infrastructure needed to connect wireless devices to the Internet is easier and less expensive to build. There are also no learning curve, no literacy barrier and no technical-support challenges to overcome. There are no costly and burdensome applications to load, maintain and update. Thus, mobile is best suited for the rural people. Therefore, not only government but also private players should encourage mobile penetration in India.
- The main barrier in Indian rural society is the fact that people do not associate the benefits of the Internet and other communication technologies with their personal needs, believing that "computers are not for them". As a result they behave very passively towards the ICTs. In order to bring 'passive people' to the Internet and ICTs, a broader understanding of the 'ICTs for everyone' notion has to be promoted, the motivational barriers being the main barrier to passive people. To remove this barriers, media productions such as T.V. serials etc. enjoying great popularity among 'passive people' to be exploited. Only after the broad social barriers have been removed, more specific services will become more attractive to the current non-users.
- There is need to develop innovative strategies to address constraints the world's women face in their access to and use of ICTs. For women, content is directly linked to use. If women are to be able to make use of the Internet for income-generation, education or advocacy, there must be more relevant content. This includes both substance and languages. Women are producers as well as consumers of information and knowledge and this is an important area of support.
- Like many other developing countries, in India as well great attention has been paid to ICT training in the recent years. Government schools across the country are making use of the computer literacy programmes funded by giant transnational companies like Microsoft Corporation and IBM. In an ironical twist, it is the world's largest technology companies who have taken it upon themselves to help bridge the "digital divide" in India. Microsoft Corp, the world's largest software maker, has signed MoUs with nine governments around the country, and has committed $20 million to promote computer literacy among disadvantaged kids in rural areas. The Confederation of Indian Industry (CII), and the Global Leaders Of Tomorrow (GLT) of the World Economic Forum (WEF), have launched an initiative called 'Shiksha India' in December 2001 during the India Economic Summit primarily to bridge the digital divide and promote better quality education in Indian Schools. There are many more examples. It is expected that these project will undoubtedly play a great role in overcoming the lack of interest and will help in bridging digital divide. However, the problem that is likely to arise with the elderly population is that the newly emerged interest may wane if one sees barriers rapidly appear, particularly if the language

problems inhibits coping with the user interfaces of computers and one's relatively poorer ability to memorize hampers learning the necessary operations. Psychological obstacles may be the unwillingness "to reveal one's lack of skills". Therefore the effectiveness of the training programmes will have to be evaluated (to make sure that the trainees have become convinced Internet users) and improvements made where necessary.

- Promotion of telecommunication infrastructure in the rural India is the most important condition for bridging the rural-urban digital divide and Indian government can play a very significant role in creating the IT infrastructure in the rural India. A special expenditure should be marked for bridging the digital divide among the regions. It is clear for international experience (Rowan et al, 1998; Wahid, 2006; Mwesige, 2004; Mosse and Sahay, 2003) that bridging the digital divide is impossible without additional expenditure from the national budget. India should learn from China. In China, government has not only invested heavily in the creation of IT infrastructure, but also in the universal telecommunication access in rural and remote areas. To bridge the widening Internet connections gap between rural and urban areas, the Chinese government has launched 'every village has a phone, 2004' and 'Gold Farm Engineering, 1994' projects which promoted telephone access and Internet applications in the rural areas.
- Linguistic issues are of major policy importance in India, given the dominance of English language in software and Internet. The desire to promote cultural diversity is one reason behind interest in linguistic issues, but so is the avoidance of social exclusion among non-English speaking population of India. Hence, these matters are critical to various aspects of digital divide. How can they be addressed? One roundtable example came from New Zealand, where language especially Maori-is a prominent feature of political, cultural and educational life. The New Zealand web portal for teachers is bi-lingual, with the Maori contents presented before the English version. As far as provision for early childhood learning is concerned, there is Maori ICT network across different centers, characterized by strong focus on family and inter-generational learning. It would be useful to compile similar examples from other communities and countries in policy framework.

Further, there is need for greater resources and investment by the private sector; as funds from governments and developed countries in implementing the ICT projects have been on the decline due to budget constraints and global economic slowdown. Last but not the least, with the effective deployment of ICT applications in the core areas of education, healthcare, and connectivity for redressing the grievances of the people in the countryside, the digital divide can be narrowed as wireless and satellite links have made them economical and affordable.

5. Concluding Remarks

The explosive development of ICT, its applications, and the emergence of a global information society are changing the way people live, learn, work and interact. Enhanced access to knowledge is rapidly becoming a potent tool for empowering the people and communities in their quest for new opportunities, dignity and a better life. The divide

between technology's haves and have-nots threatens to exacerbate the gaps between the rich and poor, within and among countries. Unfortunately, in India all people have access to the Internet and ICT, and an amazingly large number of people especially from the rural areas does not have abilities to use the ICTs in a proper way and, therefore can not draw the advantages from its usage. The issues of "digital divide is posing a herculean task before the Government of India to provide the maximum benefits to the stake holders. However, some IT experts believe that digtial divide is vanishing myth from India. But, the present paper cleary highlights the problems of digital divide in rural India. Added to this, the paper revealed that the problems of digital divide also exist within and among the varioius States of India. While some people are rich and have many resources, others do not. The educational system of India also has been slow to achieve the set target framed by various commissions and committees and schemes launched from time to time. The lack of sound ICT strategies and policies in India is the main cause of these troubles. Added to this, Inadequate Internet and telephone connectivity to India's rural areas, where more than 70 percent of India's population lives, is a key challenge for a number of government agencies, NGOs (non-government organizations), and multilateral aid agencies. The corporate sector too is discovering that bridging this digital divide could translate into new market opportunities. Therefore, obstacles such as illiteracy, lack of skills, and infrastructures in rural areas must be tackled if India is to diminish the gap of digital divide. At the government front, it should put thrust towards: connectivity provision, content creation, capacity augmentation, core technologies creation and exploilation, cost reduction, competence building, community participation and commitment to the deprived and disadvantaged would definitely help in bridging digital divide. It is evident that many projects have failed to address to bridge of the gap between rural and urban India. In order to increase the benefits of its projects for women, who constitute a huge mass of people; efforts have to be made by the Government to bridge the "gender digital divide". There is also need to strengthen the capabilities of local communities and organizations to create, communicate and exchange their knowledge, through the use of ICTs.

As far as future of digital divide is concerned in India, it is really very difficult to predict it. But, it is true that the present situation in India is not alarming (if not highly satisfactory). The gap of digital divide is getting narrower. It is expected the government policies and public private partnership will help in bridging the digital divide. But, it is not possible to completely bridge the gap of digital divide in India, as gender, age, culture, language, sex, etc. are all fundamental components that often affect daily activities and experiences including the virtual world.

Acknowledgment: While bearing full responsibility for any mistakes, I wish to thank Prof. L. N. Dahiya; Prof. S. D. Vashistha and Richard Nyangosi for reading the earlier versions of this paper and making a number of helpful comments and constructive criticisms. I also thank the comments and suggestions of anonymous referees, which were also of great importance. However, I am solely responsible for all the remaining errors and inadequacy.

References

Barziliani, Nohan and Barziliani, G. (2005) *"Cultured Technology: The Internet and Religious Fundamentalism",* The Information Society, Vol. 21, No.1, pp 25-40.

Branko Milanovic (2005) *Worlds Apart: Measuring International & Global Inequality* Princeton University Press: Princeton. .

Chen, W. and Wellman, B. (2004) *Charting and Bridging Digital Divides: Comparing Socio-Economic, Gender Life, Stage and Rural Urban Internet Access in Use in Eight Countries,* AMD Global Consumer Advisory Board (GSAB),

Companie, B. M (2001) *Digital Divide: Facing a Crisis or Creating a Myth*? MIT Press, MA: Cambridge.

Cooper, M. (2002) *Does the Digital Divide Still Exists? Bush Administration Shrugs, But Evidence Says 'Yes',* Consumer Federation of America, Consumer Union, The Civil Right Forum, Washington, DC. Accessed on http: www.chnm.gmu.edu/digitalhisotry/links/pdf/introduction/0.26a.pdf.

Dasgupta, S.; Lall, S. and Wheeler, D. (2002) *Policy Reform, Economic Growth, and the Digital India,* Policy Review Working Paper of the World Bank, No. WPS-2567, Washington, DC.

Dean, Parham (2002) *"Productivity Gains: Importance of ICTs",* Agenda, Vol. 9, No. 3, pp 195-210.

Dewan, S. and Riggins, F. J. (2005) *"Digital Divide: Current and Future Research Direction",* Journal of Association for Information Systems, Vol. 6, No. 2, pp 298-337.

DiMaggio, Paul; Eszter Hargitti; W. Russell, Newman and John, P. Robinson (2001) "*Social Implications of Internet"*, Annual Review of Sociology, Vol. 27, pp 307-336.

Dutta, Subrat. (2003) "*Impact of Information Communication Technology on Society."* Yojana, Vol. 47, No.2, p 24.

Fletcher, Ameila; Simon, Gaysford and Adele (2000) *"OFT Study on E-Commerce and Competition",* accessed on http://www.out-law.com/page-954.

Gordon, R. (2002) *"Does the 'New Economy' Measure up to the Great Inventions of the Past?"* Journal of Economic Perspective, Vol. 14, No. 4, pp 49-74.

Guillen, Mauro (2006) "*Explaining the Global Digital Divide",* Social Forces, Vol. 84, pp 681-708.

Hanimann, Thomas and Ruedin, Etienne (2007) Digitale *Gräben oder Digitale Brücken? Chancen und Risiken für Schwellenländer* , accessed on http://eprints.rclis.org/11455/

Hecker, E. Daniel (2001) *"Employment Impact of Electronic Business*", Monthly Labor Review, May.

Hooker, N. H; J. Heilig and S. Ernst (2001) *"What is Unique about E-Agribusiness?",* IAMA World Food and Agribusiness, Symposium, Sydney: Australia, June.

Huberman, Bernardo (2001) *The Law of Web: Patterns in the Ecology of Information*, MIT Press: Cambridge.

Jeusus, M., Frias (2003) *"The Importance of ICTs for Developing Countries",* Interdisciplinary Science Review, Vol. 28, No. 1, pp 10-14.

Kuhn, Peter and Mikal, Skuterud (2000) *"Internet and Traditional Job Search Methods, 1994-1999"* paper Presented to the IRPP and CERF conference on Creating Canada's Advantages in an Information Age, May.

Lawerence, Steve and Lee, Giles (1999) *"Accessibility of Information on the Web",* Nature, Vol. 400, pp 107-109.

Leizerov, Sagi (2000) *"Privacy Advocacy Groups Versus Intel: a Case Study of How Social Movements are Tactically Using the Internet to Fight Corruptions*", Social Science Computer Review, Vol. 18, pp 461-483.

Lenhart, Amanda. Who's not online: 57% of those without Internet access say they do not plan to log on. (September 21, 2000). Available: http://www.pewinternet.org/reports/toc.asp?Report=21

MacKenzie, D. and Wajcman (1985) *The Social Shaping of Technology: How the Refrigerator Got Its Hum,* Milton Kenynes, Open University Press, UK.

Mahajan, Subrat. (2003) "*Impact of Digital Divide on Developing Countries with Special Reference to India."* SERALS Journal of Information Management. Vol. 40, No. 4, pp 328–329.

Mark Warschauer (2003) Excellent Technology and Social Inclusion: Rethinking the Digital Divide, MIT Press: Cambridge.

Mosse, E. and Sahay, S. (2003). Counter networks, communication and health information systems: A case study from Mozambique. In Korpela et al. (eds.) Organizational Information Systems in the Context of Globalization, Kluwer Academic Publishers, Boston/Dordrecht/London.

Motohashi, K. (2001) *Economic Analysis of Information Network Use: Organizational and Productivity Impact on Japanese Firms,* Research and Statistics Department, METI Tokyo: Japan. 22-23.

Mwesige, P.G. (2004). Cyber elites: A survey of Internet café users in Uganda. *Telematics and Informatics*, Vol. 21, No. 1, pp 83-101.

Nahon, K. Barzilai (2006) "*Gap and Bits: Conceptualizing Measurement for Digital Divide/s"*, The Information Society, Vol. 22, pp 269-278.

Nandi, B. (2002) *Role of Telecommunications in Developing Countries in the 21st Century,* 14th Biannual Conference, International Telecommunication Society: Seoul.

Nath, V. (2001) *"Employment and governance through ICTs: Women's Perspectives",* The International Journal of Information and Library Review, Vol. 33, pp 317-339.

Norris' (2001) The Digital Divide: Civic Engagement, Information Poverty & the Internet Worldwide,: Cambridge Uni Press: Cambridge

Norris, P (2001) *The Digital Divide" Civic Engagement, Information Poverty and Internet Worldwide,* Cambridge University Press: Cambridge.

Norris, Pippa (2000) *"Information Poverty and the Wired World"*, The Harvard Journal of International Press Politics, Vol. 5, pp 1-6.

OECD (2001) 'Understanding the Digital Divide', OECD, Paris.

Pastor, Satorras; Romualdo and Alessandro, Vespignani (2004) *Evolution and Structure of the Internet: A Statistical Physics Approach*, Cambridge University Press: Cambridge.

Pluss, Martin (2004) “Digital Divide and the Role of Education” accessed on http://plu.wikispaces.com/file/view/dd_education_04.pdf.

Poole, B. (2001) *How Will Agricultural E-Markets Evolve?,* Paper Presented at the USDA Forum, Washington DC, February 22-23.

Rheingold, Harold. (2000). The Virtual Community: Homesteading on the Electronic Frontier. Cambridge, MA: MIT Pres.

Rowan, Brian, and Andrew W. Miracle, Jr. (1983). *"Systems of Ability Grouping and Stratification of Achievement in Elementary Schools."* Sociology of Education Vol. 56, pp133-44.

Servon, Lisa (2002) *Bridging the Digital Divide: Technology, Community and Public Policy,* Blackwell: Oxford.

Singh, Neena (2007) *“Bridging the Digital Divide in India: Challenges and Opportunities”,* World Libraries, Vol. 17, No. 1.

Smith, Mark and Peter, K. (1998) *Communities in Cyberspace*, Routledge: New York .

Spender, D. (1997) “*The Position of Women in Information Technology-or Who Got There First and With What Consequences*”, Current Sociology, Vol. 45, No. 2, pp 135-147.

Sumanjeet (2006) *“E-Governance: An Overview in the Indian Context”,* Indian Journal of Political Science, Vol. 67, No. 4.

Sumanjeet (2008) “*Impact of E-Commerce on Economic Models: Little to Lose; More to Gain”,* International Journal of Trade and Global Markets, Vol. 1, No. 3, pp 319-337.

Sumanjeet (2009), *“Social Implications of Electronic Commerce*”, Journal of Social Studies, accepted for publication

Tracy, Kennedy; Barry, Wellman and Kristine, Klement (2003) “*Gendering the Digital Divide”,* IT & Society, Vol. 1, No. 5, pp 72-96.

United Nations (2006) *Encyclopedia Britannica,* accessed on http:search.eb.com/eb/article-250455.

Wahid, F., Furuholt, B., Kristiansen, S., (2006). Internet for development? Patterns of use among Internet café customers in Indonesia, *Information Development*, Vol. 22, No. 4, pp 278-291.

Winter, D. and Huff, C. (1996) *“Adapting the Internet: Comments from a Women-Only Electronic Forum*” The American Sociologists, Vol. 27, No. 1, pp 30-54.