

# ICT Diffusion and Digital Divide in India: Implications for Economic Policies

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### Abstract

ICT revolution, worldwide has changed the way people live, learn, work and interact. But ICT has also created a new type of divide in the society that is those who have and those who do not have access and ability to use ICT. This paper investigates the extent of ICT diffusion in India and evaluates inter-state and rural-urban technology divide. The rural-urban technology gap has increased twelve times during 2000 to 2012. Rural internet usage was estimated for the first time in 2008 and there is huge gap between rural and urban internet users' proportions of population. The paper investigates extent of ICT diffusion and digital divide across the selected Indian states. Various determinants of digital divide and ICT diffusion including poverty, education, knowledge divide and electricity consumption have been discussed. The paper also suggests the policy implications to bridge the gap of digital divide in India.

**Keywords:** ICT Diffusion, Digital divide, Rural-urban technology

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### Introduction

The information and communication technology (ICT) is one of important driving forces for modern civilization. The rapid development and proliferation of ICT has accelerated the economic and social change across all the areas of human activity. (Nandi, 2002). Footprints of ICTs can be seen in the massive growth witnessed in the recent years across sectors including education, healthcare, financial services, BPO etc. ICT can be classified into two large sectors of information technology and telecommunication. Information technology refers to computer software and hardware. Communication technologies include telecommunication equipment through which information can be assessed, for e.g., phones, faxes and computers. The impact of ICT can be seen from perspective of two inter related issues ICT growth and ICT diffusion. ICT growth refers to growth of IT related industries and services like telecommunication, IT industry and ICT diffusion refers to IT induced development, which increases productivity, competitiveness, economic growth and human welfare from the use of technology by different sectors of economy (Saundarjya, 2005). Diffusion of ICT and its role in promoting the objectives such as universal education, reduction in mortality and

health hazards , sustainable development and in bridging socio-economic as well as digital divide in the world has been well documented.(Saith, 2004).

The benefits of ICTs, however, have not been reaped equally either by countries across the world and by sectors of the economy and sections of the society within countries. The sharp divide between the countries in terms of ICTs access has been termed as international digital divide. Perhaps, equally acute, is the problem of intra-national digital divide that refers to extreme inequality across the regions, sectors and sections within a country in terms of their ICTs access. Further, the term 'digital divide' refers to describe situations in which there is a marked gap in access to the use of ICTs devices measured, for example, by the number of fixed line phones per hundred inhabitants or number of mobile phone users ;or the internet users in the population (Singh, 2010)

The present paper is focussed on the problems of digital divide in the Indian context and highlights the challenges in bridging the gap of digital divide. The paper has been divided into three sections. Section 1 explains the concept of digital divide. Section 2 deals with the analysis of rural-urban and inter-state digital divide in India. Section 3 tries to explain the determinants of digital divide in India and suggests policy initiatives for addressing the challenges of digital divide.

**Concept of Digital Divide**

When information technology became popular in applications in 1970s, debates on the impact of this technology were centred on 'information gaps' between the developed and developing countries. This awareness gave birth to another term the 'digital divide' 'in 1990s which encompasses broader meaning than information gap (Fong, 2009).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(ICT)and their use of internet”. This definition is exclusively focused at national; land international level .Nevertheless digital divide exist in variety of other levels, i.e. sector, community and individual level. Thus. digital divide primarily refers to inequalities in the availability and the use of ICT and the multiplier effects of these technologies on socio-economic lives. Hanimann and Ruedin explain the digital divide in terms of geographical digital divide-between regions and countries, social digital divide-between social classes and upgraded digital divide-between technology and human. Noris(2001),Mark(2003) and Branko(2005) explain digital divide in terms of three distinctive divides

1. A global divide between the developing and developed worlds
2. A social divide between the information rich and information poor
3. 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 and cultural deprivation generated by missing ICT access and skills

**Various Dimensions of Digital Divide**

Lack of education, skill and ICT cause many type of economic, social and cultural deprivations. Digital divide can be expressed with the help of various dimensions as given in the table.

**Figure: Dimensions of digital divide**

Service availability	The services made available through the use of ICTs should be freely available to all who might wish to make use of them
Awareness	Everyone is aware of how they might be able to use ICTs for their own benefit
Opportunity to learn and use new media	Everyone has the opportunity to attain computer literacy
Mastery of technologies	Everyone understand which t ools are best suited for which tasks
Experience	Everyone is able to accumulated sufficient experience with the use of ICTs to enable them to fully exploit their potential

Skills	Everyone has the right skills for performing ICT related tasks
Support	Everyone has access to appropriate assistance when they need it to help them make good use of ICTs
Attitudes	Everyone is encouraged to participate in the sharing of benefits available from equal access to ICTs'
Cultural	The other dimensions are adapted as required to the cultures of all potential users
Disability	The other dimensions are adapted as required so that disability is not a barrier to the equal enjoyment of benefits of ICTs
Gender	The other dimensions are adapted as required as so that gender is not a barrier to the equal enjoyment of ICT benefits
Empowerment of civil society	Structural, political and governance factors do not impede equal enjoyment of the benefits of ICTs
Linguistic	Linguistic factors do not impede equal enjoyment of the benefits of ICTs

Source: Mohanti(2008)

### Rural–Urban and Inter-State Digital Divide in India

No doubt, Information and Communication Technology (ICT) has a crucial role to play in socio-economic development process and in changing the pattern of people's lives .But the potential to exploit the benefits of ICT largely depends upon access and adoption of these technologies. The issue here is that adoption of ICTs varies significantly not only across the countries but also within a country that is intra-national digital divide. In case of India there is large urban rural digital divide as indicated by the indicators of teledensity, mobile users and internet users.

### Teledensity Divide

One major reason for persistent gap between rural and urban areas in a country is telecommunications infrastructure gap, which results in information gap between rural and urban areas. It is clear from table 1 that rural and urban teledensity divide is widening over time. Although there is an increase in rural teledensity since 2000, but that increase is much less if we compare it with urban teledensity. Thus rural-urban teledensity gap has increased from 7.58 in 2000 to 109.40 in 2012; thereby indicate that information revolution in case of India is more of an urban phenomenon.

**Table 1**

**Rural-Urban Teledensity**

Year	Rural Teledensity	Urban Teledensity	Difference
2000	0.68	8.36	7.58
2001	0.93	10.21	9.28
2002	1.21	12.20	10.99
2003	1.49	14.32	13.83
2004	1.57	20.74	19.17
2005	1.73	26.88	25.15
2006	2.34	38.28	35.94
2007	5.89	48.10	42.31
2008	9.46	66.39	57.94
2009	15.11	88.84	73.73
2010	21.19	110.69	89.40
2011	37.5	167.21	129.71
2012	39.9	149.30	109.40

Source: Telecom Regulatory Authority of India, *Annual Report*, various issues, Government of India, New Delhi

### Internet Divide

Internet came into India in the early nineties. Videsh Sanchar Nigam Limited (VSNL) introduced internet in India via dial up in six cities in 1995. National Telecom Policy 1999 created a lot of opportunities for many small and large

internet service providers which resulted in improvement of services and decline in price. The table 2 shows that penetration of internet is very slow in India. Internet penetration was only 0.1 percent in 1999; however it has increased to 11.4 percent in 2012.

**Table 2**  
**Internet Penetration in India**

Year	Users(numbers)	% Penetration
1999	1400000	0.1
2000	2800000	0.3
2001	5500000	0.5
2002	7000000	0.7
2003	16500000	1.6
2004	22500000	2.1
2005	39200000	3.6
2006	50600000	4.5
2007	40000000	3.6
2008	42000000	3.7
2009	81000000	7.0
2010	81000000	6.9
2011	100000000	8.5
2012	137000000	11.4

Source: www.itu.org

But internet usage is more concentrated in metros of India and not in small towns or rural areas. Almost 70 percent of the total internet users are coming from top seven cities- Mumbai, Delhi, Bangalore, Hyderabad, Chennai, Kolkata

and Pune and only 30 percent access are from all other areas. Apart from that disparity among the rural and urban areas is also very high as shown in table 3. (Juxtaconsult.india.online; 2009)

**Table 3**  
**Urban Rural Internet Users(millions)**

Internet user ship in India	2005	2006	2007	2008	2009
Urban-internet using individuals(regular)	17.63	21.95(24%)	25.17(14%)	30.03(19%)	33.15(10%)
Urban –internet using individuals(occasional)	5.20	1.65(68%)	5.15(100%)	10.31(100%)	5.85(-43%)
Urban –internet using individuals(total)	22.83	23.60(3%)	30.32(33%)	40.34(33%)	39(-3%)
Rural-internet using individuals(regular)	Na	Na	Na	5.06	5.42(7%)
Rural-internet using individuals(occasional)	Na	Na	Na	4.00	2.07(-48%)
Rural-internet using individuals(total)	Na	Na	Na	9.06	7.49(-17%)

Source: juxtaconsult.online, 2009

It is clear from the table 3 that growth rate of urban internet users is higher as compared to that of rural internet users .It is interesting to note that rural internet usage was estimated

for the first time in 2008 .Further there is a definite 'slowdown ' in the growth of internet usage, both in urban as well as in rural internet usage.

**Table 4**  
**State-Wise Indicators of ICT Diffusion**

States	Teledensity (per 100) 2012	Wireless Phones(in millions) 2012	% of village telephones to overall (2012)
Andhra Pradesh	76.88	66.82	38.55
Assam	46.50	14.08	54.95
Bihar	46.53	63.48	49.90
Gujarat	85.19	53.32	35.83
Haryana	76.72	22.55	47.57
HP	102.70	7.97	63.09
J&K	58.41	6.30	44.85
Karnataka	91.26	55.71	29.25
Kerala	100.76	34.07	46.30
MP	52.23	51.62	41.33
Maharashtra	72.62	70.46	45.73
Orissa	59.70	26.61	51.96
Punjab	101.92	31.95	36.81
Rajasthan	68.31	49.59	47.63
Tamilnadu	109.64	77.67	23.93
Uttar Pradesh	56.20	128.23	45.02
West Bengal	56.85	46.21	62.09
Delhi	220.21	42.48	5.10

Source: (a) Department of Telecommunication, Annual Report ,2012-13  
(b)CMIE report on infrastructure

It is evident from the Table 4 that the level of ICT diffusion is more in states like Maharashtra, Kerala, Tamil Nadu, Gujarat, and Punjab. Among all the indicators the mobile phone diffusion is higher in all the states than other indicators, what is immediately discernible from the above table that urban dominated states like Maharashtra, Tamil Nadu, and Karnataka lead in subscription of internet. However PC penetration is less in all the states. Therefore, the table revealed that diffusion of telecommunication is more in comparison to the diffusion of internet and computers. It is because investment in such technology requires huge expenditure. Moreover, a large chunk of population in India is not educated enough to use computers .Hence, education at the grassroots level is a pre-requisite for the penetration and use of internet and computer

#### **Determinants of Digital Divide in India**

From the above analysis it is clear that there is a huge rural-urban and inter-state digital divide in India. Rural India is

significantly lagging behind urban India in the use of ICTs. Similarly many states like north-eastern states, Uttar Pradesh, Bihar, Jharkhand, Orissa, Chhattisgarh and Assam lag behind other states in the use and development of ICTs. India is a multi-cultural, multi-language and multi-religion country with complex socio-economic conditions. The use of computers and internet technology correlates with poverty (family income), educational qualification, and level of electrification.

**Poverty:** Most of the poor in rural areas are self-employed households and landless labourers. In rural areas people are facing the problem of vicious circle of poverty. They are not able to meet their both ends properly ,how can they think about the use of technology .More appropriately ,when people have low income they cannot afford technology even if they have access of mobiles and internet The data shows inter-state differences in urban-rural people below poverty line.

Table 5

**People Below Poverty Line (BPL) in Rural-Urban India (2011-12)**

State	Rural(% of people BPL)	Urban(% of people BPL)	Combined(% of people BPL)
Andhra Pradesh	10.96	5.81	9.20
Assam	33.89	20.40	31.98
Bihar	34.06	31.23	33.74
Gujarat	21.54	10.14	16.63
Haryana	11.64	10.28	17.16
Himachal Pradesh	8.48	4.33	8.06
J&K	11.54	7.02	10.35
Karnataka	24.53	15.25	20.41
Kerala	9.14	4.97	7.05
Madhya Pradesh	35.74	21.00	31.65
Maharashtra	24.22	9.12	17.35
Orissa	35.69	17.29	32.59
Punjab	7.66	9.24	8.26
Rajasthan	16.05	10.69	14.71
Tamil Nadu	15.83	6.54	11.25
Uttar Pradesh	30.40	26.26	29.43
West Bengal	22.52	7.71	19.98
Delhi	12.92	9.84	16.96

Source: [www.planingcomission.com](http://www.planingcomission.com)

Education: The Education is strong compliment to the use of technologies like internet and the relevant education levels are secondary and tertiary levels as they are expected to upgrade the national capacity for adaptation and

innovation. Like many other developing countries, the main emphasis of the Indian government is to boost the primary education. However to bridge digital divide higher education has a more significant role to play.

**Table 6**  
**State-wise Rural-Urban and Total Literacy Rates in India, 2011**

States	Rural(%)	Urban(%)	Literacy(%)
Andhra Pradesh	61.14	80.54	61.11
Assam	70.44	88.88	64.28
Bihar	61.83	78.75	47.73
Gujarat	73.00	87.58	69.75
Haryana	72.74	83.83	68.59
Himachal Pradesh	82.91	91.39	77.13
Jammu & Kashmir	64.97	78.19	67.76
Kerala	92.92	94.99	90.92

Kerala	92.92	94.99	90.92
Karnataka	68.86	86.21	75.60
Madhya Pradesh	62.29	84.09	64.11
Maharashtra	77.09	89.84	77.27
Orissa	70.78	86.45	73.45
Punjab	72.45	83.70	69.75
Rajasthan	62.34	80.73	61.03
Tamil Nadu	73.80	87.24	73.47
Uttar Pradesh	67.55	77.01	57.36
West Bengal	72.97	85.54	69.25
Delhi	82.87	86.43	81.82

Source; Census of India, 2011

Knowledge divide: Another important factor contributing towards reason of digital divide in India is knowledge divide. The concept of knowledge divide is used to describe the gap in living conditions between those who can find manage and process information and knowledge and those who are impaired in this process. Knowledge divide is directly related to digital divide. More educated people with computer knowledge and English language proficiency are able to access new technologies. Given the high levels of literacy in rural India and very low levels of English speaking and computer savvy population, there is a dire need to develop softwares in local languages in order to ensure higher and faster adoption of internet in rural areas. (Singh: 2010). In current scenario an understanding and command over English language is an important determinant of access to higher education. employment possibilities and social opportunities .National Knowledge

commission(NKC), recommended that the teaching of English as a language should be introduced along with first language of child .Further, in a multilingual country translation should play a critical role in making knowledge available to different linguistic groups, NKC has recommended developing translation as an industry and setting up of National Translation Mission with a focus on promoting translation activities(National Knowledge Commission report :2006-2009)

**Electrification:** Electricity is the most basic condition for using information and communication technologies. There is close relationship between the level of electrification and digital divide. Rural India has low electricity coverage in comparison to urban India as shown in the table 7. Further the cost of electricity is very high .In such condition; one cannot afford the use of computers and internet.

**Table 7**

**State-wise Reported Status of Rural Electrification**

States	Village Electrification (%) 2012	Per capita Electricity consumption(KWh)
Andhra Pradesh	100	650.5
Assam	96.1	-
Bihar	89.9	117.48
Gujarat	99.8	1558.58
Haryana	100	1491.37
Himachal Pradesh	99.8	1144.94

J&K	98.2	968.47
Kerala	100	536.78
Karnataka	100	873.05
Madhya Pradesh	97.2	618.1
Maharashtra	99.9	1054.1
Punjab	100	1663.01
Orissa	78.9	837.55
Rajasthan	96.2	811.12
Tamil Nadu	100	1210.81
Uttar Pradesh	88.3	386.93
West Bengal	99.7	515.08
Delhi	100	1447.72

Sources: 1. Government of India (2013-14), Statistical Year Book of India, Ministry of Statistics Programme Implementation, New Delhi

2. Government of India (2013), Infrastructure Statistics 2013, Ministry of Statistics Programme Implementation, New Delhi

### Conclusions and Policy Implications

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. Despite fast growth of ICT industry in India, the country is increasingly getting divided between the people who have access to technology and those who do not. India has around half a million software developers and is second only to US, but 70 percent of the Indian population have no access to any form of technology.

The divide between technology's haves and have-nots threatens to exacerbate the gaps between rich and poor, within and among countries. ICT infrastructure in India has penetrated in all parts of country but its usage is more in case of urban areas and among educated class. A large number of people especially from the rural areas do not have abilities to use ICTs in a proper way and, therefore cannot draw the advantages from its usage. The issues of 'digital divide' are posing a herculean task before the government of India to provide the maximum benefits to the stake holders. Therefore, obstacles such as illiteracy, lack of skills, and infrastructure in the rural areas must be tackled if India is to diminish the gap of digital divide. The government should put thrust towards: connectivity provision, content creation, and 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 the digital divide. Impact and Implications of the study are as follows:

- There is a need to promote technologies which are best suited to rural india. For example, to bridge of

digital divide in its real sense there is a need to increase PC penetration. As mobile cannot do everything as a PC can. But mobiles are cheaper, more portable and their extended battery life is suited to the 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 and there are no literacy barrier and no technical – support challenges to overcome.

- Linguistic barriers are of major importance in India. There is 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. There is a need to promote the use of national language and local languages at least in government websites so as to make computers and internet more users friendly.
- Promotion of telecommunication infrastructure in rural India is the most important condition for bridging the rural-urban digital divide and Indian government can play a significant role in creating the IT infrastructure in rural India. A special expenditure should be marked for bridging the digital divide in rural India. Government should come up with innovative schemes for giving technology access to rural areas. PC with internet facility should be provided in panchayat office of each village. PRIs should be actively involved in bridging rural-urban digital divide.

- 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 ICTs. In order to bring 'passive people' to the internet and ICTs, there is a need to overcome social and motivational barriers. It will be possible only if people are provided services which are useful in their professional lives.
- Results of the study indicate decline in inter-state digital divide in India, as the number of states with low diffusion index value has declined from thirteen in 2004-05 to eight in 2009-10. The lagging states including Uttar Pradesh, Orissa, West Bengal, Jharkhand, Bihar, Andhra Pradesh, Assam need to develop their socio-economic infrastructure so as to reap the benefits of digital technologies

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