Technology Convergence for Rural Development – Evidence from India

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Abstract- Usage and access to technology is not equi-distributed even within the same country. The studies show that, in India, overall access to technology (in terms of telephony, Internet connectivity and usage of computers) is low in rural and small towns than in their urban counterparts. Until recently the technology was benefiting and serving only the rich and urban populace of India. Technology was an urban phenomenon and the rural communities largely were deprived of its benefits. Today, however, the scenario is changing rapidly. There are many projects underway in India to demonstrate the concrete benefits of technology for rural development, and in a manner that is economically feasible too. Present study examines and comments on the initiatives being undertaken in this regard. The paper takes note of several technological initiatives and projects being implemented in rural India and highlights their coverage and basic approach.

Keywords- *Technology Convergence, Rural Development, Internet Penetration, ITU.*

I. INTRODUCTION: A PRESENT STUDY

The urban and rich populations are enjoying the rich fruits of the technological developments. On the other hand the rural and poor masses have remained completely uneducated and ignorant about these developments. Thus, the information and knowledge gap between the urban and poor is increasing day by day. The objective of the paper is to examine – What is being done to bridge this technology gap? What are the technological initiatives or projects being undertaken by the Governments/NGOs/private sector for rural masses? This paper examines and sheds light on the several technological initiatives and ongoing projects that aim to provide basic services to the rural population in various parts of India through technological means. The paper covers only e-initiatives that means, only those projects and programmes that are being run by web portals/PCs have been examined and highlighted.

The paper primarily relies on the published and on-line literature concerning the technological divide and IT initiatives for India's rural development. To achieve the objective of the examination of India's tech-initiatives for rural masses – a comprehensive survey of the web portals of various online initiatives was carried out. All the major working projects/portals' details including their functioning and offerings were searched, compiled and analysed with the help of a number of search engines.

II. BACKGROUND

The technology has a huge potential for a whole range of services for rural communities and that too without any barrier of their distance to the service providers. It also provides increased opportunity to work from any location, which has favoured rural areas with excess labour supply, lower wages and a lower cost-of-living. It is believed that development in the area of Information and Communication Technology will lead to the 'Death of Distance', consequently, individuals and businesses will be able to participate, irrespective of their locations, in the new knowledge-based society **[Cairncross (1997)].** In other words, the problem of distance and communication, felt primarily by those living in rural and remote India, can be overcome by usage of technology.

Today, the Internet is rapidly expanding in developing countries. In the last decade, Indians too have increasingly taken up use of the computers and the Internet. Researchers are optimistic about the potential the Internet has in enhancing the people's access to knowledge, information, work, culture, politics etc. In the near future, it is expected that Internet will gain penetration rate of 95 per cent and will be popular just like television **[Norris (2001)].** Thus, the information and communications technology (ICT) is bound to make deep impact, for the rural community as well, as it can bring people together, enhance individual's participation in the major decisions and importantly, it can increase access to information and education. In assessing the potential of ICT, new opportunities for poor people in terms of political empowerment (such as the global e-mail campaign that helped topple Philippine President Estrada in January); health networks (as in Gambia and Nepal); long distance learning (as in Turkey); and job creation (as in Costa Rica, India and South Africa) **[UNDP (2002)].** However, all the expansion and growth in technology is taking place, primarily, in urban areas and rural people are still deprived of the benefits offered by these services. Though the Pilot projects linked to rural and agro-based organizations can help rural communities to be a part of the Internet and other IT initiatives. In this regard, United Nations organized the World Summit on the

Information Society, during the years 2003 and 2005, to discuss the ways and means to reduce this digital divide **[Munyua, H. (2000)].** The digital divide, in simple words, is the unequal distribution of the benefits of the rapid technological advances between urban/rich and rural/poor sectors of a nation. It is surprising to note that rural inhabitants in India have only 3 telephones per 1000 persons and 65% of the population is illiterate and moreover, average income of an Indian is merely U$1 per day **[Delgado et al. (2002)].** Hence, India – emerging as an IT powerhouse having more than 70% of its population of one billion living in rural areas deprived of even basic necessities, is a very classic case of 'Digital Divide'.

III. TECHNOLOGY AS A DEVELOPMENT TOOL

One may think how modern technological communication tools, like the Internet and telephone, can contribute to the local development of rural communities that are often disadvantaged by the lack of basic facilities, such as drinking water, roads or electricity? How technological investment in such a situation is useful and economically viable? The framework suggested by Marine and Blanchard (2004) (refer Fig.1) sets out ways in which information and communication technology can contribute to a lasting, integrated development process. This development model demonstrates how both local communities can profit economically, politically and socially, based on two converging circles.

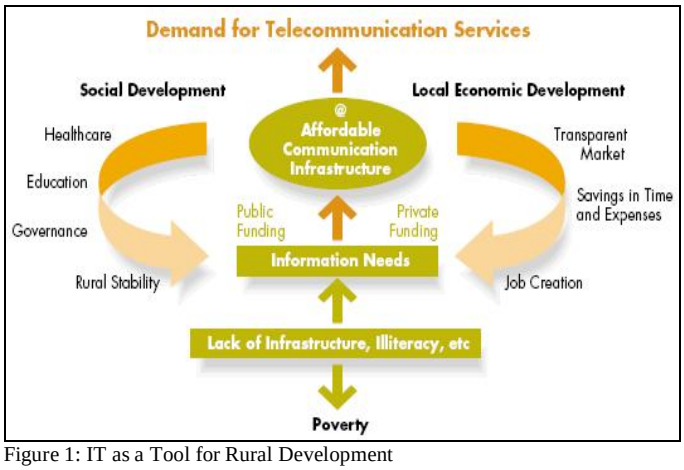

Figure 1: IT as a Tool for Rural Development
Source: S. Marine and J.M. Blanchard, Bridging the digital divide: An opportunity for growth for the 21st century, Alcatel Telecommunications Review - 3rd Quarter 2004, www.alcatel.com

The model suggests that a lack of infrastructure and illiteracy are the prime causes of sustained poverty. ICT (information and communication technology) is the most realistic investment in communication because of the quicker return on investment compared with alternative costly infrastructures. The Internet cannot take the place of roads, but Internet services can make better use of other few means of transport available. Economically, IT can help to create local, more transparent marketing channels, so limiting speculation and the risk of artificial shortages and improving the distribution of margins between the various links in the value chain of each sector, from producer to consumer. Time and money saved in this way can be ploughed back into productive new activities, helping to boost the local economy and leading to the creation of jobs. This will, in turn, justify more communication resources, and so on. Moreover, this model is of a social and political nature, in which IT can be used as a tool to support the implementation of health programs in which awareness campaigns are very important. The Internet has the potential to improve communication between public authorities and local people, as well as between central authorities and local authorities.

Based on international experiences in various countries it has been estimated that the penetration of telecom services enhances the productivity and wealth generating capabilities of the local population which in turn increases the GDP of the country. This is not a new hypothesis and it has already been proved at thousands of places that a self-sustainable business model can be created for these telecom services even in most backward areas **[TRAI, 2004]**. However, it is important to note that connectivity is not an end in itself. The usage of computers and connectivity should be directed towards the development of rural populace**.**

A. Technology for the Rural and Poor

The modern technology in the past has been mostly utilized by the urban who is usually educated and affluent. Today, the concept of Digital Divide is perceived in terms of Internet access and Broadband access. Internet access remains globally at a low level. More than 85% of the world's Internet users are in the developed countries, which account for only about 22% of the world's population. As per 2001 estimate of Global Internet Trends done by Nielson/Netratings, ITU there are an estimated 429 million people on-line globally, of whom 41% are in North America alone and only 4% in South America. Broadband, which is increasingly becoming a key requirement for reliable multi-media access, remains unavailable or unaffordable in most of the developing countries. Even in developed countries, as per ITU data, broadband penetration has not generally exceeded 10%, except in South Korea (21.3%), Hong Kong (14.6%) and Canada (11.4%) **[ITU (2006)].**

The developed nations alone have 80% the world's Internet users. Not only this, the unfortunate thing to note is that the much older technologies are even today beyond the reach of world's poor people. Electricity, invented around as early as 1870s, has still not reached to one-third of the world's population. In the same way, basic and essential medicines

such as penicillin developed decades ago are beyond the reach of world's two billion people. **[UNDP (2001a)].**

As referred earlier, Digital Divide refers to the disparity that exists with respect to the use of Information and Communication Technologies. However, many researchers opine that, it is not the matter of who has direct access to technology, but who is actually helped by technology. Studies have suggested that the key factor in bridging this technology gap is not 'Access'. Now, with the maturity of the concept, their attention has moved away from 'who is connected' to the question of 'who is served'. And the actual scenario is – upper and middle classes are having high access to technology because technologists are creating IT-solutions just for them. There are no tech-solutions for the poor **[World Development Report (2004)].**

B. Developments in the Indian Rural Sector

India has emerged as one of the powerhouses of the 21st century. India is home to 1.210 billion people who speak 18 official languages apart from 1,600 minor languages and dialects **[Indian Market Demographics Report (2013)]**. It has the geographical area of about 3.3 Million square kilometers, which is 7th largest in the world. India's population of 1.210 billion stands next only to China and is five times that of Brazil, lives on a land mass that is only 34 percent of China's landmass and 38 percent of Brazil's area. Of an estimated 191.9 million households, a whopping 72 percent or 138.2 million live in rural areas **[India Census (2011)]**. Around 3,700 cities and towns that constitute urban India are occupied by just 28% of Indian population. India's service sector due to Government's wise policies and programmes has developed remarkably. However, the fruits of this huge growth are mainly enjoyed by urban people. This has resulted into the migration of the rural populace to urban areas increasing the urban population from 26.6 percent in 1996 to 28.1 percent in 2002 [**FICCI].**

Now, as per Planning Commission of India, the Rural Area has been redefined **[Business Line (2002)].** According to this, the rural area shall mean any place where: (i) population is less than 5,000 (ii) density of population is less than 400 per sq km and (iii) more than 25 per cent of the male working population is engaged in agricultural pursuits.

World Bank's Report **[World Bank (2002)]** highlights that more than a quarter of the world's poor live in India, its economic and social performance are critical to achieve the Millennium Development Goal of halving world poverty by 2015. Table 1 throws light on India's major socio-economic indicators which unfortunately give a very sad picture. Out of the total population, 72 percent lives in villages and 27.1 percent of total population lives below the poverty line. Not only has this, the data for the literacy rate, housing, electricity and other essential conditions also showed no hope (Refer Table 1).

TABLE 1: INDIA'S SOCIO-ECONOMIC INDICATORS

Sr. No.	India's Socio-Economic Indicators	Percentage/Number
1.	Total population	1.210 billion
2.	Rural population as a percentage of total population	72%
3.	People below poverty line	27.1%
4.	Literacy rate (Rural/Urban)	59.21%
5.	Houses with electricity in rural areas	43.52%
6.	Ratio of urban PCI to Rural PCI (1999-2000)	2.05
7.	Working rural population	42%
8.	Agricultural Labourers of working rural population	33%
9.	Household Industry workers of working rural population	4%
10.	Male workers possessing marketable Skills	10%
11.	Female worker possessing marketable Skills	6.3%
12.	Households having banking services	30%

Source: Compiled from the data published by Planning Commission, Indian Census 2011, Indian Market Demographics, NCAER 2002, National Human Development Report, (UNDP) 2001, Economic Survey 2002-03, Govt. of India.

Apart from this, the income distribution of Indian population is pretty skewed. Disparity in income distribution is very high with 73 percent of the households languishing with annual household incomes below US$ 3,000. Only 11 Percent of the households are having high incomes i.e. above US$ 6,000 (Refer Table 2).

TABLE 2: INCOME DISTRIBUTION AMONG RURAL AND URBAN HOUSEHOLDS IN INDIA

Annual household income range (US$)	Percentage of households	Number of households (millions)
Less than 1000	5	10
1000 - 2000	45	86
2000 - 3000	23	44
3000 - 4000	6.5	12
4000 - 5000	5	10
5000 - 6000	4.5	9
More than 6000	11	21
Total	100	192

Source: Human Development Report 2004, published by the UNDP

Probably, this is the major reason that India has been ranked at 127 number among the 177 countries studied in the Human Development Index (HDI) published by the United Nations Development Program (UNDP) in July 2004. As per the report **[Human Development Report (2004)],** India fares far worse than other developing countries like China (94) and Brazil (72). The economic growth seen since 2001 has not made much of an impact in improving India's position in the HDI with India's rank stagnating even now at the 2001 levels (127).

C. 3.2 Developments in the IT Sector

After analyzing pathetic indicators of Indian rural sector, India's IT sector gives us quite opposite picture – almost impossible to believe. Internet subscribers in India are expected to cross 35 million by 2007 from the previous level of 4 million. The IT industry is expected to provide 7 million jobs by 2008 and the hardware sector to generate employment for 4.8 million persons while the software sector and IT enabled services would account for the remaining 2.2 million jobs. PC penetration is also projected to be 20 per 1000 by 2008 against 5.8 in 2006 **[Planning Commission (2006)].** In the same way, India's call centre services market in Asia Pacific is expected to cross US$4 billion mark by 2005 from US$1.2 billion in 2000. The call centre services market in India is valued around US$200 million p.a. and is expected to cross US$1 billion in around five years **[UNDP (2006)].** The same is also predicted by a McKinsey study undertaken for NASSCOM **[NASSCOM (2000)].** The turnover of IT-enabled services is expected to be around $140 billion by 2008 (Refer Table 3).

TABLE 3: ESTIMATED TURNOVER OF TOP FIVE IT-ENABLED SERVICES IN INDIA BY 2008

Sr. No.	Services	Amount in billions
1.	Human Resource services	$44
2.	Customer interaction services	$33
3.	Finance and accounting	$15
4.	Data search, integration and analysis	$18
5.	Remote education	$15

Source: NASSCOM-McKinsey Study Report 1999, www.nasscom.org.

The outcome of these opportunities in the area of IT sector is quite apparent. They promise a new set of employment avenues for a surplus labour economy like India where employment in the traditional sectors like agriculture and manufacturing is declining every year. Moreover, the industry and government expectations for output, exports and employment in these areas are also lucrative. As per a study by McKinsey for NASSCOM, India can increase its export revenues from software and IT-enabled services from $4 billion mark in 1999-00 to $50 billion in 2008 **[NASSCOM (2000)].** This would take the size of the industry from $3.3 billion in 1998 to $87 billion in 2008, with a compound annual rate of growth of 40 per cent. The software and IT-enabled services exports are also projected to cross the current level of $8 billion to $87 billion by 2008. Also, the export of hardware is also expected to be around $10 billion by 2008. This way, India's share in the global software market will increase from the 2% at present to 6% at the end of the Tenth Plan. This trend will yield a share of 35% for IT exports in India's total exports by 2008 against the present level of 14% and the software and IT services industry will, as per projections, contribute 7.7% of India's gross domestic product (GDP) in 2008 against the present level of 1.7 % **[Planning Commission (2006)].**

D. 3.3 India's Technology Gap

India, a vast economy, is full of contradictions. It entered the new millennium with almost one-third of the world's software engineers and one-fourth of the world's poor people. Out of more than a billion population, only 2% people in India have personal computers and there are only 12 phones and 10 TV sets per 100 citizens **[Asia Times (2006)].** The number of computers per 1000 persons is 6 and Internet cafés/tele-centres per 10,000 inhabitants are 0.1. Refer Table 4 which displays the small numbers of India's Internet and telecommunication performance. It is hard to believe that the impressive and rapid IT growth in India is so meager when matched on the national level.

TABLE 4: INDIA'S INTERNET AND TELECOMMUNICATION PERFORMANCE

Sr. No.	Indicators	Number
1.	Computer ownership per 1000 inhabitants	6
2.	Telephone lines per 1000 inhabitants	42
3.	Internet hosts per 10,000 inhabitants	0.35
4.	Internet cafés/telecentres per 10,000 inhabitants	0.1
5.	Internet users per 100 inhabitants	0.33 subscribers, 1.65 users
6.	Cell phone subscribers per 100 inhabitants (2001)	1.73
7.	Number of websites in the national language(s)	20,000
8.	Number of websites in English and other language(s)	30,000
9.	National bandwidth to and from the country	1,670.3 Mbps

Source: Compiled from the data published by Indian Market Demographics, NCAER 2002, Digital Review for Asia Pacific, UNDP (2006), National Human Development Report, (UNDP) 2001, Economic Survey 2002-03, Govt. of India

As per the report by United Nations Development Program (UNDP), India's rural populace is living on a different planet than from other class of populace. Bangalore is at par with the US cities of San Francisco and Austin, Texas, and the Taiwanese capital Taipei. In terms of IT development, it is even ahead of New York, Montreal, Cambridge, Dublin, Tokyo, Paris, Melbourne, Chicago, Hong Kong, Kuala Lumpur and Singapore. Interestingly, out of India's 1.4 million Internet connections, more than 1.3 million connections are secured by Delhi, southern Karnataka, Tamil Nadu and western Maharashtra **[Human Development Report (2001)].** The report clearly highlights India's

technology gap between a few urban and IT developed centers and the vast and under-privileged rural sectors. The size of the IT sector which currently accounts for 1% of India's gross domestic product can rise to 10% of GDP by 2008. At the same time, the benefits of IT have reached only a very small portion of the country's population, which has resulted in a wide digital divide. Although the number of Internet users is growing by 40-50% a year, the total number of Indians who have accessed the Internet is less than 5% of the total population **[Asia Times (2006)].**

TABLE 5: INTERNET USAGE AND POPULATION STATISTICS

Year	Internet Users	Population	% age
1998	1,400,000	1,094,870,677	0.1
1999	2,800,000	1,094,870,677	0.3
2000	5,500,000	1,094,870,677	0.5
2001	7,000,000	1,094,870,677	0.7
2002	16,500,000	1,094,870,677	1.6
2003	22,500,000	1,094,870,677	2.1
2004	39,200,000	1,094,870,677	3.6
2005	50,600,000	1,112,225,812	4.5
2006	40,000,000	1,112,225,812	3.6
2012	137,000,000	1,205,073,612	11.4

Source: www.internetworldstat.com

As clear from the Table 5 the Internet penetration in India was just 0.1% in 1998 which has increased to 11.4% in the year 2012. Though there is a visible upward growth trend, the penetration is still quite low when compared to other nations (refer Table 6). Thus, just being a world-class technology hub is not sufficient to ensure the diffusion of technology across the entire country. India, an IT powerhouse, still ranks only 63rd in UNDP's Technology Achievement Index (TAI) behind Zimbabwe, Syria and Paraguay. This is because Bangalore, where much of India's new technology is concentrated, is a small enclave in a country where the average adult receives only about five years of education. More than 40 percent of adults in India are illiterate, electricity consumption is half that in China, and there are just 29 telephones per 1,000 persons **[UNDP (2001b)].**

TABLE 6: STATUS OF INTERNET PENETRATION

Sr. No.	Country	Internet Users	Population	Internet Penetration	% Users of World
1	United States	209,024,921	299,093,237	69.9 %	19.4 %
2	China	123,000,000	1,306,724,067	9.4 %	11.4 %
3	Japan	86,300,000	128,389,000	67.2 %	8.0 %
4	Germany	50,616,207	82,515,988	61.3 %	4.7 %
5	India	40,000,000	1,112,225,812	3.6 %	3.7 %

Source: www.internetworldstat.com

As clear from Table 6, India's Internet penetration is quite low but has increased significantly from 0.1% in 1998 to 4.5% in 2005 (Table 5) . The growth and popularity of cybercafes has also fueled the Internet development in India. The decreasing cost of broadband services has also increased Internet usage. The number of Internet users is expected to be around 100 millions by 2007. The number of mobile telephones in India has doubled over the last two years, crossing the 100 million mark in July 2006 **[TRAI (2004)].** Nonetheless, the technology gap is quite conspicuous. The cities such as Delhi, Mumbai and Chennai enjoys more than 4 phones for every 10 citizens as against less than 2 phones per 100 residents in the areas of Bihar, Jharkhand, Chhattisgarh, Orissa and Assam **[MCIT (2006)] [ESCAP (2006)]**. Not only this, at least one out of four Indians live below the internationally defined poverty line, spending less than $1 a day and one out of three cannot read or write their own names **[Asia Times (2006)].** Bridging the technology gap in such a polarized country is a daunting task.

Despite several attempts over the last decade, telecom infrastructure in rural areas is lagging behind the expected levels. At the end of 2003, the average urban tele-density was 15.2 per 100 citizens whereas it was 1.5 in the case of rural India **[MCIT (2006)]**. Mobile network coverage in India is only 20 per cent of the population (Refer Table 7).

TABLE 7: COVERAGE OF MOBILE NETWORKS (POPULATION COVERAGE 20%)

	By Area	Population Coverage
Towns	1700 out of 5200	200 Million
Rural Areas	Negligible	Negligible

Source: Growth of Telecom Services in Rural India- The Way Forward, Consultation Paper No 16/2004, Telecom Regulatory Authority of India (TRAI), October 2004.

The position of Internet, broadband, fixed and mobile telephones services in India as compared to other countries is shown in Table 8.

TABLE 8: STATUS OF INTERNET, BROADBAND, FIXED AND MOBILE TELEPHONES SERVICES

Parameters	Korea	Malaysia	China	India
Number of fixed telephone lines per 100 persons	51	18.5	18	3.9
Number of mobile phones per 100 persons	75	43.9	18.3	2.6
Number of internet connections per 100 persons	26	12	2.5	0.4
Number of broadband connections per 100 persons	25	0.4	1.4	0.019
Charges per 100 kbps per month (US$)	0.25	7.61	3.07	15.63

Source: Growth of Telecom Services in Rural India- The Way Forward, Consultation Paper No 16/2004, Telecom Regulatory Authority of India (TRAI), October 2004 (Data as on 31 Dec, 2003).

As clear from Table 8, overall IT usage and penetration in India has still lagged behind international average. On the other hand, Indians are expected to pay 60 times more than subscribers in Korea for the same throughput. In 1996, Korea

had Internet subscriber penetration under 2%, and broadband was close to 1% penetration only in 1999. Today, almost 80% of Korean households have broadband connections. China has also launched a major broadband expansion programme. India is almost five years behind China in terms of the number of PCs, Internet users, cable TV subscribers, fixed telephones etc. **[Planning Commission (2006)].**

IV. TECHNOLOGY CONVERGENCE FOR RURAL INDIA

Today, there are many projects underway in India to demonstrate the concrete benefits of technology for rural development and in a manner that is also economically viable. There are a number of companies and institutions in India that are seeking to link their own growth and survival to the social cause they try to promote. For example: Cement maker Lafarge India, which took over Tata Steel's cement division, is trying to tie up with NGOs for providing low-cost houses on a large scale. India's largest private sector bank, ICICI Bank, in partnership with n-Logue Communications has set up stand-alone ATM kiosks in rural areas of Tamil Nadu. Infosys Technologies has initiated a 'Computers@Classrooms' program through which old and used PCs are donated to schools along with software donated by Microsoft. Local language interfaces have been created using specialized software to make the learning experience more meaningful **[IBEF Report (2004)].**

In the same way, state governments and many NGOs are developing and experimenting with various business models, all over the country, with the objective of providing IT means and solutions to the rural masses and at the same time taking care of revenue generation. The cyber kiosks are being set up to provide various services such as E-Governance, entertainments, e-horoscope, computer education, health and agriculture related information, market rates, weather information etc. to poor and rural people. Table 9 provides an illustrative list with details of major e-initiatives/projects implemented in India.

TABLE 9: DETAILS OF SOME OF THE SUCCESSFUL E-INITIATIVES IN INDIA

Sr. No.	Project Name	Project Coverage	Project Initiator
1.	Bhoomi	Karnataka	Government Initiative
2.	Rural e-Seva	Andhra Pradesh	Government Initiative
3.	VidyaVahini	Nation wide coverage	Government and NGO
4.	FRIENDS	Kerala	Government Initiative
5.	Gyandoot	Madhya Pradesh	Government Initiative
6.	CERT-IN	Nation wide coverage	Government Initiative
7.	CARD	Andhra Pradesh	Government Initiative
8.	Drishtee	Haryana,Punjab,Madhya Pradesh, Gujarat, Orissa	Private
9.	Lok Mitra	Rajasthan	Government Initiative
10.	Jan Mitra	Rajasthan	Government Initiative
11.	WebCITI and DialCITI	Punjab (Fatehgarh Sahib)	Government Initiative
12.	VOICE	Andhra Pradesh	Government Initiative
13.	OLTP	Andhra Pradesh	Government Initiative
14.	TARAhaat	Madhya Pradesh, Uttar Pradesh, Punjab and Haryana	NGO
15.	Lokmitra	Himachal Pradesh	Government Initiative
16.	Warana	Maharashtra	Government Initiative
17.	Mahiti Shakti	Gujarat	Government Initiative
18.	Community Information Center	Arunachal Pradesh, Assa Manipur,Meghalaya,Mizoram, Nagaland, Sikkim and Tripura.	Government Initiative
19.	DISK	Gujarat	Government Initiative
20.	E-Chaupal	Madhya Pradesh, Uttar Pradesh, Karnataka and Andhra Pradesh	Private
21.	GramSampark	Madhya Pradesh	Government Initiative
22.	Akshaya	Kerala	Government Initiative
23.	Headstart	Madhya Pradesh	Government Initiative
24.	Information Village Research Project	Pondicherry	NGO and Government Initiative
25.	n-Logue	Tamil Nadu	Private

Source: Compiled from the respective web sites of the projects.

V. ANALYSIS AND CONCLUSIONS

It is clear that usage and access to technology is not equally distributed, not even within the same country. The studies show that overall household Internet connectivity and use of computers are lower in rural and small town communities than in their urban counterparts. The major

reason for this is the difference in educational attainment between rural and urban areas. The success story of the Indian IT industry has benefited only urban populace whereas the overall scenario for rural India is pathetic because of the problems of power shortage, poor connectivity, inadequate transport, conventional and old business practices and an unskilled workforce. Also, the gap in access to education and other opportunities between urban and rural masses is also very wide.

It is clear that the Internet or PC based applications are not widely available in Indian rural areas. This is primarily due to the lack of relevant content in local languages needed by the rural populace thus restricting the growth of IT based means such as e-mail and other Internet based services. Providing the villages Internet connectivity may seem like an unusual way to help rural people with their problems. However, the studies show that IT based services have a huge potential for rural development especially for a country whose more than 70% of the population lives in villages. The important thing to take care is that the rural sectors should be provided with the right kind of services specifically designed for them and with affordable costs. Most of the Indian population in rural areas are poor, illiterate and lacks basic amenities. Thus, educating a large number of people in rural areas is crucial for bridging this technological gap. In India, a number of organisations have undertaken a variety of initiatives which provides Internet and PC based applications for the development of the rural sector. It is quite evident from the analysis that most of the e-initiatives have limited and narrow objectives and are not broad in coverage. Therefore, they will attract limited population.

The content of e-initiatives/projects primarily focuses on essential services like education, health, e-governance and agriculture, market and price related information etc. For example, Bhoomi, Warana and Gyandoot are examples of successful e-governance initiatives while the MSSRF's Information Village Research Project and ITC's e-Choupals have focussed on activities related to agriculture. Whereas, projects like n-Logue concentrates on building the infrastructure for providing internet connectivity while creating IT based applications to attract more users.

To ensure the success and effective implementation of these projects some independent agencies – Govt. or NGO – are required that can design, implement, monitor and continuously upgrade the projects. At the same time, appropriate regulatory environment and policies need to be established. The governments and NGOs must collaborate on initiatives that use technology to extend employment, health care and quality education to the rural. Technology has to be used meaningfully and effectively, whereby it can generate relevant opportunities for the rural masses. IT based solutions have to be holistically designed, after inputting the objectives and needs of the users. The system so devised should be simple and user friendly in terms of content and language. More awareness should be created about information and communication technologies and its usages. This way the rural populace can reap the same benefits from technology that are now enjoyed by the urban people.

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