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Implications for Library and Information Services: A Study of India's IT Revolution and Public Policies

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Abstract

The paper describes the role of information, information technology (IT) and discusses the infrastructure, human resources, telecommunication, research and development in IT in Indian context. It highlights the features of liberalization policy of the Indian government; software policy of 1986; development in networking and growth of IT industry in the country, and documents the proliferation and focuses on the relationship among policies and outcome in terms of its impact on various fields of life specially library and information services. It describes the limitation of Indian digital revolution in reaching out to the general masses and the various factors responsible for the lopsided character of information revolution.

Keyword: Information technology; Public policy telecommunication; Library and information services; Digital divide; India

1. Introduction

Information is a basic resource for all human beings, and it is as important to us as food, air and rest. It is the basis for all our decisions as all public policies are made on the basis of information only. Information policy thus provides the basis, or the support, for all other public policies. Therefore, policies concerning information, both public and private, profoundly affect the society.

Information technology has emerged as the most potent tool to collect, organise and disseminate information to the people on a large scale through communication networks. It is one of the fastest spreading technologies in the world in terms of use and production. It is diffusing rapidly into all industrial and service sectors and is seen as one of the most crucial technologies affecting economic growth in developing countries. Its use is ubiquitous in the industrialized countries to the extent that in United States investment in IT accounts for about 50% of total new capital investment by corporations. The production of IT products and services is a major industry in the US, Japan and Europe. Several newly industrialized countries, such as China, Korea, Taiwan, Singapore and Brazil have become significant producers and users of IT.

This evolution of IT has been marked by heavy government involvement in virtually all countries. Of all the newly industrializing countries, India stands out for the degree to which its governments has intervened in the IT sector and the complexity and nuance of that intervention.

2. Information Technology: Infrastructure

The assimilation of any new technology requires the presence of an infrastructure with which to acquire, learn and successfully apply the technology. This includes sufficiently available human resources, well developed telecommunication networks, research and development capabilities and capital for investments.

(a) Human Resources

India, a country of more than 1 billion people, turns out an estimated 400, 000 graduates with technical and engineering degrees per year constituting the third largest pool of engineering and scientific manpower in the world and second largest pool of English speaking manpower with IT qualifications. According to a recent survey of National Association of Software and Services Companies (NASSCOM, 2006) from a base of 6,800 IT software and services professional knowledge workers in 1985-86, the number is projected to increase to 522,000 shortly. But the NASSCOM projections also reveal a shortage of nearly 530,000 of IT professionals over the next 3 years, assuming optimistic growth in industry.

(b) Telecommunications

A good telecommunications network is another vital element of IT infrastructure. Since 1985 the government has initiated a new telecommunication policy to strengthen the telecommunications sector and from 7th five year plan onwards, the sector is identified as one of the top development priorities (India, 2002). The telecommunication sector has now been widely opened to private players and is attracting massive investment. The government is progressively moving from a structure where the incumbent operator was a part of the government to a structure where the incumbent operator is corporatized and subsequently privatized.

(c) Research and Development

India's R&D expenditures are well ahead of other developing countries in the Asia-Pacific region but the business R & D accounts for only 13% of the total and R&D is largely conducted by the public sector and universities where it is not that relevant to economic application. In an effort to remove this anomaly, the government is establishing "science cities" around research institutions to serve as centers for high tech industrial development.

(d) Capital

Initially capital for investment in information technology was scarce thus making the broad environment for IT diffusion very poor. However situation began to change drastically under the policy of economic restructuring and reforms initiated in the year 1991 to the extent that 70 percent FDI is now allowed in the telecommunication sector as per decision taken in the year 2006.

3. IT Policy: Historical Overview

The history of IT Policy in Indian can be divided into two distinct periods. From the mid-1960s through the early 1980s policies aimed at achieving technological self-sufficiency through state production, regulation of private production. The second period, from 1984 to early 1990s, saw a shift in focus to moderate liberalization of the industry and promotion of domestic IT production. Another era is now in the making as the government moves towards more extensive liberalization of the economy.

(a) 1960s and 1970s: Indigenization and Self Sufficiency

India was motivated to try to develop self sufficiency in computers and electronics largely by national security concerns related to border conflicts with China and Pakistan. The government created an Electronics Committee to devise a strategy for achieving self sufficiency in electronics. The main vehicle chosen to gain access to advanced computer technology was negotiation with multinationals, primarily IBM, which accounted for 70% of all computers installed in India from 1960-1972 (Heeks, 1996).

In an attempt of satisfying the government's interest in developing domestic production, both IBM and British owned ICL (International Computers Limited) began to refurbish the used computes in Indian plants and sell them to Indian customers. IBM felt that India should evolve technologically from one level of sophistication to the next.

A 1966 report by the Electronics Committee objected to step-by-step technological evolution and recommended that India should leap ahead to the latest technologies. Government however failed to impose its will on IBM due to its strong position with users and export earnings. The government's early attempts to regulate the IT sector worsened the degree of technological backwardness.

In 1966, the responsibility for implementing the Electronics Committee's report strategies was given to Department of Defense Supplies, with monitoring by a new agency, the Electric Committee of India. This was the general decision of the Indian government taken by the Union Cabinet. In 1971 the government announced the formation of Department of Electronics (DoE) and a new Electronics Commission, responsible for policy formulation and oversight for day-to-day implementation of policies. In 1975 the DoE was given power over the licensing of computer imports and the first step taken by it was the establishment of Santa Cruz Electronics Export Processing Zone (SEEPZ) near Bombay followed by the creation of state-owned ECIL (Electronics Corporation of India Ltd.) as a national champion in mini computer production.

In 1975, in a landmark development, the US computer maker, Burroughs, entered into a joint venture with Tata Consultancy Services to export software and printers from SEEPZ. In the same year governments established Computer Maintenance Corporation (CMC) with a legal monopoly on the maintenance of all foreign computer systems in the country, reducing the advantage which IBM had with the users.

In 1978, due to increasing political pressure IBM quit India which was a seminal event. Illustrating the extent of government's ability to exert its power over Multinational Corporations and direct the IT development in India. One effect of IBM's departure was to open the market to a number of competitors, including ECIL, ICL and Tata Borroughs.

(b) 1980s: Partial Liberalization and Industry Promotion

India's IT policies in 1980s were aimed at modernizing an industry that was estimated to be about 15 years behind the current frontiers of research and production. In a departure from the import substitution approach of the past, exports software and peripherals were now promoted and the import of mainframes and supercomputers were encouraged under certain conditions.

(c) The New Computer Policy of 1984

The new computer policy of 1984 announced by DoE (India. Dept of Electronics, 1988a) aimed at promoting the manufacturing of computers based on latest technology, at prices comparable to international levels and with progressively increased indegenization. An important policy change was the liberalization of imports to foster domestic hardware. Duty levels were lowered on components needed by computer manufacturers and companies producing CPUs, peripherals and subsystems were permitted liberal imports of "Know-how" with a low excise duty.

(d) 1986: Software Policy

Following up on the 1984 hardware policy, the Department of Electronics (DoE) announced the 1986 policy on Computer Software Export, Software Development and Training (India, Dept of Electronics, 1988b). The main objectives of the policy were to promote the integrated development of software in the country for domestic as well as

export markets and to promote the use of computes as a tool to decision making and to promote appropriate applications that will catalyze economic development software imports and the duty was reduced to 60% which was further reduced in 1992 to 25% for computes and software used software producers.

In 1990, a 100% income tax exemption was extended to profits from software exports and the double taxation of software imports was eliminated. It was also decided to develop twelve additional software technology parks.

Though India's IT policies have focused heavily on regulations of foreign as well domestic producers and on protection of domestic market and the 1984 and 1986 policies consisted mostly of loosening of existing regulations, still a number of programmers, initiatives and institutions have been established to implement policy and promote various aspects of IT. The DoE invests in IT and R&D through large multiyear programmes involving various research units. The Knowledge-Based Computer Systems (KBCS) programme involves the five IITs, The Indian Institute of Science in Bangalore and the National Centre for Software Technology (NCST) in Bombay. The Education and Research in Computer Networking (ERNET) experiments with new concepts in computer networking and promotes Integrated Services Digital Network (ISDN).

In 1988, the National Informatics Center set up NICNET, a satellite-based computer communication network connecting 439 cities and towns to support computerization of governments at the central, state and districts level. A Computer Aided Design project was set up with links to five centers, and a Computer Aided Management Infrastructure has been established with feeder centers in four cities. A number of projects have been under taken to promote IT use in public and private sectors and to mobilize a favorable bias towards its use.

Government's attempts to spur the development of an indigenous IT industry have been quite successful and after the 1984 Computer Policy announcement production shot up by 100% while prices declined by 50%. A boom in minicomputer sales began when HCL dropped its prices dramatically, starting in a price war that greatly increased the affordability of PCs.

(e) 1991 to 1996: Impact of Economic Liberalization

During this period, the IT policy was affected by general changes in industrial policy. Early in 1991 its import became more difficult thanks to the devaluation of the rupee, raising the software import duty to 112 percent, Simultaneously there was an effort to encourage exports by streamlining the process for exports incentive payments and for creation of export-only units. There were several software related promotional measures during this period, including reduction in telecommunication charges for satellite links, duty-free import of telecommunication equipment into excise duty exemptions.

At the end of 1992, the DoE was reorganized to emphasize its promotional rather than regulatory role. It amended and updated interventions in areas such as training and research and development. The copyright Act was also amended, confirming that raids, fines and prison sentence could be used against software pirates. Import rules were also changed and liberalization gathered pace for software.

Duty for software import was reduced to 110 per cent in 1992, 85 per cent in 1993, split in 1994 to 20 per cent for applications software and 65 per cent for system software and then reduced to 10 percent for both categories in 1995 (India, Ministry of Commerce and Industry, 2000). In April 1993, duplication of software in India was permitted for the first time.

The beginning of 1990s also witnessed emergence of Software Technology Parks of India (STPI) under the state initiative. STPI was created as autonomous organization under the Department of Electronics, to provide facilities such as duty-free import of capital goods, income tax holiday for 10 years, and high-speed data communication links.

The year 1996 can be described as landmark year in the history of information technology as Internet service started in India by Videsh Sanchar Nigam Limited, a public sector company with a great promise. The policy makers recognized the potential of the Net for a quantum group in the knowledge-based economy. The subsequent Internet Service Providers (ISP) policies of the Department of Telecommunications (DOT) were very pragmatic with free licensing to ISPs. Setting up of gateways for Internet, laying of fibers and cables was freely permitted to the ISPs. Tax incentives were showered on the industry, infrastructure status given and mergers and acquisitions facilitated.

4. New Millennium-New Century: New Ideas

The dawn of new century brought tremendous improvement in India's regulatory environment. India was one of the few countries to enact the Information Technology Act in year 2000 to enable digital signatures. It aims to provide the legal infrastructure for e-commerce in India (India. Ministry of Information and Broadcasting, 2000).

(a) Cyber Laws

In May 2000, both the houses of the Indian Parliament passed the Information Technology Bill. The Bill received the assent of the President in August 2000 and came to be known as the Information Technology Act, 2000. Cyber laws are contained in the IT Act, 2000. Passed in August 2000 as a part of the information technology bill, cyber laws aim, to provide the legal infrastructure for e-commerce in India.

Additionally, the Information Technology Act, 2000 aims to provide legal framework so that legal sanctity is accorded to all electronic records and other activities carried out by electronic means. The Act states that unless otherwise agreed, an acceptance of contract may be expressed by electronic means of communication and the same shall have legal validity and enforceability. Some highlights of the Act are listed below:

- Recognition of e-mail as a valid and legal form of communication in the country that can be duly produced and approved in a court of law.
- Companies can carry out electronic commerce using the legal infrastructure provided by the Act.
- Digital signatures have been given legal validity and sanction in the Act.
- The Act throws open the doors for the entry of corporate companies in the business of being certifying authorities for issuing Digital Signatures Certificates.
- The Act now allows Government to issue notification on the web thus heralding e governance.
- The Act enables companies to electronically file form, applications and other documents with any office, authority, body or agency owned or controlled by the appropriate Government
- That act addresses important issues of security, which are critical to the success of electronic transactions. The Act has also given a legal definition to the concept of secure digital signatures.

(b) IPR Laws

In India, the Intellectual Property Rights (IPR) of computer software is covered under the Copyright Law. Accordingly, the copyright of computer software is protected under the

provisions of Indian Copyright Act 1957. Major changes to Indian Copyright Law were introduced in 1994 and came into effect from 10 May 1995. These changes or amendments made the Indian Copyright law, one of the toughest in the world. The amendments to the Copyright Act introduced in June 1994 were in themselves, a landmark in the India.s copyright arena. For the first time in India, the Copyright Law clearly explained:

- The rights of a copyright holder
- Position on rentals of software
- The rights of the user to make backup copies
- The imposition of heavy punishment and fines for infringement of copyright of software. (NASSCOM, 2003).

(c) Broadband Policy, 2004

Recognising 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 Indian government have finalised a policy to accelerate the growth of Broadband services.

Demand for Broadband is primarily conditioned and driven by Internet and PC penetration. It is recognised that the current level of Internet and Broadband access in the country is low as compared to many Asian countries. Penetration of Broadband, Internet and Personal Computer (PC) in the country was 0.02%, 0.4% and 0.8% respectively at the end of December, 2003. Currently, high speed Internet access is available at various speeds from 64 kilobits per second (kbps) onwards and presently an always-on high speed Internet access at 128 kbps is considered as 'Broadband'. There are no uniform standards for Broadband connectivity and various countries follow various standards.

The government envision an accelerated growth in Internet penetration and PC as the success of Broadband would largely be dependent on their spread. It has been decided that following shall be the framework of the policy. The Broadband Policy Framework visualises creation of infrastructure through various access technologies like optical fibre technologies, digital subscriber line on copper loop, cable TV network, satellite media like VSAT, DTH, and Terrestrial wireless WI-FI system. which can contribute to growth and can mutually coexist. Spread of infrastructure is a must for healthy competition and therefore it would be the endeavour of the Government that the telecommunication infrastructure growth in the country is not compromised in any manner

5. IT: Proliferation and Application

(a) Economics

In a very short time, India has risen to considerable eminence in the world of information technology, enlarging from $1.73 billion in 1994-95 to a $13.5 billion industry in 2001-02. In terms of share of GDP, the IT industry figures have risen from 0.59 percent to 2.87 percent in 2001-02. According to the NASSCOM report revenues from hardware, peripherals and networking are estimated to touch $ 2,983 millions during 2001-02, India's software and services exports are expected to account for $7,678 millions of revenues. Revenue from IT enabled services sector grew from US$554 million in 1999-2000 to US$897 million in 2000-2001 Customer Interaction Services, which included call centers and customer support centers were the prime areas of growth. In 1999-2000, the volume of e-commerce transactions in India was only US$104 million whereas this is a growing segment in the international market (NASSCOM, 2002).

The Indian domestic IT market has been spurred by various developments including a growth in PC penetration, increased usage of networking and peripheral equipment and proliferation of software application.The Internet revolution is sweeping across the country, coupled with lowering hardware prices and cheaper bandwidth availability. McKinsey & Co. and the NASSCOM predict that within eight years India's annual IT exports could hit $50 billion, that is about 33 per cent of global software exports. Such a surge is expected to generate 2.2 million jobs and push growth rate near the double digits that many East Asian Tigers enjoyed before the 1997 crash (Heeks, 1996)

The policy framework governing the ICT sector has catalyzed the growth of the industry, boosting its prospects for exports. Policy liberalization initiatives in key areas such as taxation and infrastructure (particularly telecommunication) have had a direct fallout on the IT software and services industry. A series of initiatives including the IT Act 2000, special tax sops for the ICT industry and a new Copyright Law, among others have enabled the IT industry in India to globalize. Today, India ranks among handful of nations across the world that boast cyber laws. These policies have also helped the country position itself as a key destination for investment, especially in segments such as IT services, IT-enabled services, Business Process Outsourcing (BPO), and research and development. Owing to the continuous policy changes, it is now easy for potential players to enter the ICT Market through Special Economic Zones (SEZs), a new scheme announced by the Government of India. SEZs are areas where export production can take place free from the plethora of rules and regulations governing imports and exports (http://en.wikipedia.org/wiki/Special_Economic_Zone). Units operating in these zones have full flexibility of operations and can import duty free capital goods and raw material. The movement of goods to and fro between ports and SEZ are unrestricted. The units in SEZ have to export the entire production.

(b) Governance

In a recent policy initiative the government has recommended each ministry to allocate 2-3 per cent of its budget on IT promotion. Central Government has taken various steps, legislative, regulatory and promotional measures to facilitate IT use in corporate, financing and taxation matters. Different projects have been initiated to come up with IT based solutions for development purposes. Different ministries and departments have come out with their web sites. Major areas of computerization include railway reservation, allocation of Permanent Account Number (PAN) for Income Tax payers, processing of passport, results of public examination, Regional Transport Offices, custom clearance, schemes under implementation by the NGOs, vigilance information, single counter services and VSAT based money order under the Department of Post, computerization of Supreme Court cases, land records, Parliament questions, debates and deliberations.

Central and State government and their field organizations, financial institutions, insurance companies, educational institutions are proceeding ahead with the introduction of computerization and use of IT in the sphere of work. It is reported that 12,000 out of 45, 000 bank branches have implemented major computerization.

Many state governments have declared IT policies. State effort to promote IT is through development of IT infrastructure, e-governance, IT education and providing enabling environment for IT proliferation. Substantial growth in demand for Internet and PCs has been experienced in the recent past. There are 1.6 million estimated Internet connections in India in August 2000 as against 0.14 million in March 1998. The number of Internet subscribers in the year 2004 – 2005 are likely to reach 7.7 million, with the user base increasing to 50 millions. The PC base in India, according to a survey of the NASSCOM, numbered 5 million, that is, 5 per 1000 people in August 2001 as against 3 per 1000 in

1999. The NASSCOM forecasts PC prices to decline to by nearly 40 percent and PC penetration to reach 13 per 1000 persons (NASSCOM, 2002).

In the area of job creation, according to a survey conducted by the NASSCOM, software industry including user organizations have employed 340,000 professionals as of 31st March 2000 as compared to 160,000 professionals in 1996. It has been reported that cyber kiosks in India have generated 600,000 jobs under private initiative.

6. ICTs: Impact on Libraries

Libraries, museums and archives are digitizing their resources and services on large scales. Libraries with computerized catalogues are now becoming part of networks. Scores of premier institutions like Indian Institute of Technology (s), (IIT) Indian Institute of Management (s) (IIM) and laboratories under the Council for Scientific and Industrial Research (CSIR) are spending huge amounts on digital collections. At the national library in Calcutta nearly 750,000 pages have been scanned and stored in CDs under the ongoing schemes for digitizing selected books and old documents. In the Central Secretariat Library, New Delhi, the bibliography of rare books in CD-ROM format linking images of the title and content pages is in progress.

Recently, the government has decided to create a Traditional Knowledge Digital Library (TKDL). The purpose is to integrate the widely scattered knowledge in the Indian system of medicine. TKDL will comprise of 35,000 formulations collected from 35 texts available in public domain (www.infinityfoundation.com/mandala/t_es/t_es_TKDL.htm)

University Grants Commission, the apex regulating body for Indian Universities has launched its UGC-INFONET programme under which all central universities are being provided access to scores of electronic databases covering all areas of higher education and research. The University Grants Commission has set up an autonomous Inter-University Centre in 1991 called INFLIBNET. It is involved in modernizing university libraries in India and connects them through a nation-wide high-speed data network. It promotes automation of libraries, develops standards, creates union catalogues of serials, theses, books, monographs and non-book materials; provides access to bibliographic information sources; creates database of projects, institutions, specialists; provides training, etc. Almost all academic libraries, especially university libraries, are members of INFLIBNET (www.inflibnet.ac.in)

Digital Library of India, part of the online services of the Indian Institute of Science, Bangalore and partner in the Million Book Project, provides free access to many books in English and Indian languages. The scanning of Indian language books has created an opportunity for developing Indian language optical character recognition (OCR) software. The publications are mainly in PDF or QuickTime format. As of November 10, 2006, DLI had scanned 84,895 titles (Balakrishnan, n.d)

Vidyanidhi (which means 'Treasure of Knowledge' in Sanskrit) is India's yet another premier Digital library initiative to facilitate the creation, archiving and accessing of doctoral theses. Vidyanidhi is an information infrastructure, a digital library, a portal of resources, tools and facilities for doctoral research in India. Vidyanidhi is envisioned to evolve as a national repository and a consortium for e-theses through participation and partnership with universities, academic institutions and other stake holders. Vidyanidhi enhances access to Indian theses and enlarges the reach and audience for Indian doctoral research works (http://vidyanidhi.com/)

ICT is being harnessed extensively to digitize rare and fragile material all over the country. Similarly research output by faculty is now being made available through open source solutions like DSpace and Greenstone. The Prime Minister of India recently launched the National Mission for Manuscripts (NMM) on February 7, 2003, in New Delhi. This Mission with an initial outlay of Rs.350 million aims at surveying, identifying, collecting, copying, cataloguing and publishing of manuscripts that are lying scattered all over the country in the custody of various sources.

6. Information for All: Equitable Information Order vs. Digital Deprivation

The big question is, will ICT do an encore for India as a nation, and not just for a wafer thin percentage of IT-literate Indians, mostly the poster boys of the IITs? (Das, 2004). The answer is that economic life in rural India, for that matter of the poor in particular, is yet to evolve around IT. IT has not yet touched the lives of the average citizen and India is nowhere close to being much hyped up "knowledge economy or society". The above cited initiatives and projects, if not selective, can largely be described as peripheral in nature. A large section of Indian society is still living in a state of digital deprivation. Despite the urban wealth of hi-tech cities like Bangalore, three quarters of the population still live in villages and deeply entrenched poverty makes the daily struggle to survive a more immediate priority than computer literacy.

As per the International Data Corporation (IDC), survey of 55 countries, India ranks 54th on its Information Society Index. The 2000 World Times/IDC index measures the global impact of IT and Internet adoption and establishes a standard by which all nations are measured according to their ability to assess and absorb information and IT (http://www.idc.com/)

India's growing digital divide separates a narrow upper crust of "bandwidth-hungry urbanites" from the vast majority of their malnourished, illiterate countrymen, who may have to walk days just to get to the nearest working telephone. The major metropolises are at par with some of the developed countries, but rural areas in states like eastern Bihar and Orissa are worse off than several of the least developed countries. Online banking, online transactions and e-commerce and many other IT related applications are still alien to this rural economy.

Groaning under basic problems such as illiteracy, malnutrition and sheer poverty, India's rural populace may as well be living on a planet different from, say, Bangalore, which, according to the United Nations Development Program (United Nations, 2001) human development report for 2001, is better off than many cities in the United States, Europe and Japan when it comes to technological innovation. The report clearly brought out India's digital divide between a few urban centers and the vast rural hinterland. Among India's 1.4 million Internet connections, more than 1.3 million are cornered by the states of Delhi, southern Karnataka (of which Bangalore is capital), Tamil Nadu and western Maharashtra.

The situation is worse in India's vast rural hinterland. Barely 25 km from New Delhi is India's most populous state Uttar Pradesh which according to U.N. Development Programme estimates will take all of this century to make all its 170 million people literate.

7. Digital Divide: Causes, Constraints and Solutions

India being one of the poorest countries in the world with extremely low literacy rates in rural areas, 25 percent without health services, 71 percent without access to sanitation, nearly 30 percent living below the poverty line has extremely powerful inbuilt constraints towards establishing an equitable information order. Huge linguistic diversity, deeply ingrained ideologies of caste-hierarchy, gender inequality and communal divisions further hinder the developmental efforts

Access to technology is further constrained by infrastructure parameters like electricity, the number of personal computers (PCs) and telephone lines. Per capita electricity consumption in India remains around 363 kW, far below the 4,959 kW in Hong Kong, one of the region's technology powerhouses, the 5,421 kW in Britain and the 11,822 kW in the U.S. India has 22 telephone lines per 1,000 people compared with 70 in neighbouring China and three PCs per 1,000 compared with nine in China. The installed base of PCs in the country is five million, which means only five out of every 1,000 people have a PC. When it comes to bringing computers to the masses, it's hard to make progress without government systems. There's limited use for example in giving free computers to village schools if there's no electricity. Internet programmes are not much use without phone connections

Despite government initiative in promoting rural telephony, tele-density in the rural area is low. By the end of December 2001, there were 7.6 million Direct Exchange Line (DEL) in rural areas which means an availability of 7 phones per 1000 people. The cost of access network is still very high and is not affordable for the population in the low-income group (ICTs', 2000).

(a) Public Policy: Constraints and Limitations

Privatization of telecommunications pursued since 1994 had brought in investments. But these were concentrated in the profitable urban centers because private players were unwilling to invest in the non-profitable rural areas, where 70 percent of India's 1 billion people lived. This was a pity because investment in the rural areas could transform the lives of millions of farmers – not only in terms of freeing them from the stranglehold of middleman traders with reliable, real-time market information, but also by getting to them and their families virtually non-existent health care and educational facilities.

This could largely be attributed to India's slow telecommunications expansion to a number of factors, including tight bureaucratic control, poor policies and inadequate investment by private companies and lack of funds of the government, which until recently held monopoly control. Cost in installing backbone communication lines throughout the country is an awesome task. Even if they can somehow manage to buy PCs, maintenance, supplying parts, and training people how to use them are more difficult.

Unfortunately nowhere is the digital divide more glaring then in IT education. India's 'obsession' with the software industry and its export orientation is leading to the churning out of unemployable students on one hand and bright whiz kids on the other. While the latter are lured away by overseas employers, the former remain unemployable. Experts ask for cautions against the 'hype' associated with the phenomenal growth of India's software industry, defying rational explanations and built up into a 'mystique of sort' which breeds false hopes.

This situation itself is a product of the skewed priorities: spending 60 per cent of the education budget to subsidize the Indian Institute of Management, Indian Institute of Technology, while spending the rest on secondary and primary education. "The revolution

in information technology (IT), far from helping India to leapfrog to a post-industrial society, threatens to rupture the social fabric by enriching a few at the cost of many" (Das, 2004).

(b) New Possibilities

For bridging digital divide with effective practical applications of technology, three elements are crucial, entreprenuership, government policy encouraging and supporting equity and ground level programmes with local community participation. A significant proportion of India's population belongs to the traditionally backward communities and a process of computer education, particularly focused on these groups is required. This can be done by developing appropriate software for interaction in regional languages and through pictures and icons to enable illiterates acquire information.

There is a need for establishing rural information networks which will allow knowledge, services, money, and certain kinds of information products to flow easily across long distances, from one public access information center to another. Each village node might have multiple institutional identities, serving as a virtual community center, bank, medical resource, government counter, matrimonial bureau, public library and educational resource center all at once.

An urgent requirement in this direction is to break the barrier of language so as to provide content in local languages. In a country where nearly 70 percent of the population is working in agriculture sector it is very important that contents are relevant to the agricultural economy. By enhancing access to education and health care through distance learning and tele-medicine, IT can improve the quality of life for poor rural communities who do not have access to these facilities. The Indian fishing village of Veerampatinam in Tamil Nadu is a case in point, where weather forecasts downloaded from the Internet and broadcast by loud speakers at the beach enabled the poor fishermen to know better when to venture into the sea in their boats for fishing.

Similarly the public call booths dotting the countryside in Bangladesh only go to show how the poor rural communities in developing countries can access the state-of-the-art telecommunications without owning any equipment, per se.

8. Conclusion

Tremendous gains have been made by the computerization of the government functioning, not only in strengthening the delivery of existing services but also by improving policy planning and implementation through more effective provision of information to policy makers. The direct and immediate benefits of use of ICT in Government are improvements in service quality, efficiency and government-people relationships by providing quick, easy and transparent access to information.

There is an urgent need to target basic needs such as primary education, basic health services, water and sanitation requirements particularly in rural and backward areas. The new ICT applications and content relevant to the demand in rural areas, can drastically improve the delivery of information related services to people in general and agriculture extension services and provision of health and social services in rural areas in particular.

The policymakers must take into consideration the broader picture when designing IT policy and treat it as a part of an overall economic strategy in which sound economic policies will benefit IT sector and diffusion of IT will have positive effects on economic development and social welfare. Formation of partnerships between local bodies, the local

administration and NGOs appears to hold the key. Development of applications, such as an online system for community banking, will contribute to the economic sustainability of the operations. It will also go a long way to humanize and sensitize Indian information revolution.

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