The Four Digital Divides

Kenneth Keniston and Deepak Kumar, editors

Introduction

by

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for M. N. Srinivas

mentor and model for us all

Preface and Acknowledgements

This book began with a Workshop on "Equity, Diversity, and Information Technology (EDIT)" held in Bangalore, Karnataka, India, in December of 1999. The goal of the workshop was to explore how, if at all, new technologies of information and communication could increase social equity and strengthen cultural diversity. Our primary focus was on India, but with many comparisons to the United States and other countries. The thirty invited participants were activists, academics, politicians, administrators and journalists. With three exceptions, all were from India. (Participants and auditors are listed in the Appendix.)

The EDIT Working Group was organized by Ashok Jhunjhunwala, Professor and Chair of the Department of Electrical Engineering at the Indian Institute of Technology, Chennai, Tamil Nadu, India, and Kenneth Keniston, Professor and Director of the MIT India Program at the Massachusetts Institute of Technology, Cambridge, Massachusetts, United States of America. From the start of planning until his death just before the meeting, we were guided by the wisdom and insight of Professor M.N. Srinivas, Tata Professor at NIAS and the father of Indian anthropology. The meeting was held at the National Institute of Advanced Studies (NIAS), Indian Institute of Science in Bangalore, in early December, 1999.

To facilitate discussion and to develop a "common culture", several hundred pages of background readings were circulated to the invited members of the Working Group before the meeting. All the Working Group members prepared papers or outlines which were circulated by

e-mail to the entire Working Group before the meeting. A set of questions for discussion was also circulated before the meeting. Papers were not formally read, and individual presentations were limited to about five minutes each. The result was a high degree of participation, discussion, and friendly controversy before, during and after the meeting.

The Working Group was made possible by a grant from the Ford Foundation in New Delhi to Professor Keniston, who was Sir Ashutosh Mukerjee Visiting Professor at NIAS at the time of the meeting. Special thanks are due to the officers of the Ford Foundation in New Delhi, to Professor Roddam Narasimha, Director of NIAS, and to Major General Paul, Comptroller of NIAS, for hospitality, a superbly organized meeting, excellent accommodations, and legendary South Indian food.

Deepak Kumar has subsequently brought to editing these papers his broad knowledge of information technology in India, his finely-honed skills as a writer, and his deep commitment to equity and diversity. My able assistant, Mahesh Kumar, D.P., did heroic service in single-handedly typing and sending the voluminous correspondence involved in organizing the meeting.

Many papers were presented to the Working Group; those published here were chosen to illustrate the diversity of views at the meeting and a variety of issues relevant to thinking about the Digital Divide. Given the time between the meeting and publication, all of the essays by original authors were returned to the authors for updating. In addition, because of the importance assigned to the issue of regulation, two essays on regulatory issues were commissioned: those by Dr. Chowdary and Professor Jhunjhunwala.

No attempt has been made to provide a comprehensive bibliography. At the end of the essays, however, a number of books and essays are listed which will provide an interested reader with additional insights into the issues raised here. The website www.bytesforall.org provides the best access to South Asian projects that use information and communication technologies for the common man: this site also provides access to its own archives. Finally, the interested reader with access to the Web browser, "Google", will find that entering the phrase "digital divide" into that browser will produce many hundred thousand "hits", almost all of which are relevant to the topic of this work.

Kenneth Keniston

Bangalore, Karnataka and Cambridge, Massachusetts, September 2002

The Four Digital Divides

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In the last decades, the world has begun to undergo a new technologically-driven revolution, allegedly leading toward what is commonly called "the Information Age." Impelled by the phenomenal proliferation of computers and information devices, closely linked to an explosion of processing and access speeds, ever-lowering costs of memory and other critical components, convergence of images, sounds and writing in one digital medium, and propagated by a worldwide network of satellites and broadband fiber optic cables, this Information Age already is a reality to millions in all countries of the world. To be sure, this revolution is part of the long-term development of electronic communication technologies that includes: in the nineteenth century, the telegraph and telephone; in the mid-twentieth, broadcast media like radio and television; more recently, networks like Ernet in India or Ethernet in the U.S. But the last two decades have seen an explosive and unprecedented growth in these commonly called 'information and communication technologies (ICTs).'

The revolution has been as dramatic, rapid, and far reaching as the agricultural revolution, the first industrial revolution (around factory production and the steam engine), and its sequel, based on the chemical and electrical industries. What is remarkable about the current 'information technology' revolution is the extraordinary rapidity of change it encapsulates. For example, it took at least a century before the printing press touched 50 million individuals. It took 38 years for radio to reach the same number, and thirteen years for television. But the

World Wide Web, in only four years, exceeded the 50,000,000 mark. Never before has a communications revolution spread so rapidly.

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

Our purpose of this volume is to ask how, if at all, modern ICTs can fulfil this promise, especially for the eighty percent of the world's people in developing nations.

For despite all utopian dreams, the Information Age has so far touched only a tiny minority of the world's population. If we define household access to the World Wide Web as a criterion for joining the Information Age, less than 5% of the world's population of six billion had gained access by the year 2002 (doubtless, virtually every reader of this book belongs to that group). The question is how and whether the Information Age can improve the condition of life for the other 95%.

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

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

The Four Digital Divides

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

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

versus 8% and the Internet access percentages are 49% versus 3%. Similar results were found in a survey in Australia.

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

Assuming three computer and Internet users per household, we arrive at a figure of six million Indians who have computer access at home and perhaps three million who have Internet access. (This compares with well over 70% household computer saturation and 60 % household Internet connection in the U.S. in 2002.) In India, then, in mid-2002, with a billion population, less than 1 % has home access to computers, and at most 0.5% of the population has home access to the Internet.

Who are the 'connected' in India? Obviously, as a group, they are a small, rich, successful and English-speaking minority. For all of its ancient cultural wealth, despite the persistence of old elites and the emergence of new elites, India remains one of the world's poorest societies. Details are known to all Indians and are available in any almanac: hundreds of millions go to bed hungry; more than 40% of the population are illiterate; tens of millions of

children are not in school; as many as 50% of all Indian newborns are born below ideal birth weight; preventable diseases cause millions of deaths; and in many regions, corruption is widespread and stands in the way of well intentioned programs reaching their intended beneficiaries. Telephone connectivity in India is about 3% and will not rise much above that level unless the cost of connections (the so called 'last mile' cost) can be lowered. The obstacles are economic, as Ashok Jhunjhunwala notes in this volume: not much more than 3% of the Indian population can afford to pay the real costs of a new telephone line. This group is, by definition, the most affluent group in India, concentrated in the major cities where connections are most widely available. Despite the success of PCO/STD/ISD booths (manned pay phones) in cities and villages, and despite repeated government promises to provide telephone connections to all of India's 700,000 villages, many Indian villages remain without any. As a result, most rural Indians have never made a telephone call. In short, there can be no doubt of a massive digital divide in India based on income, related to education and urban residence, and correlated with economic, political and cultural power.

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

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

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

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

manufacturers can argue – not incorrectly – that 'there is no market' for Indian language software.

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

To linguistic inaccessibility in India is added the absence of culturally relevant content. The number of Web sites in 2000 in India is small in any case, but the number of sites in Indian languages is miniscule. To be sure, a few gifted programmers are attempting to change this, and sites are beginning to appear in languages with vast populations of mother tongue speakers like Hindi, Bengali or Tamil. But to all intents and purposes, the many, ancient, rich, and sophisticated cultures that make up India remain almost invisible on the Web. And absent good, low-cost Indian language software, the technical challenges of producing a Website in Telegu, Tamil or Hindi guarantee that these cultures will remain almost invisible. What is remarkable is that a handful of dedicated Indian programmers have actually begun to overcome these challenges.

In short, related to the digital divide that springs from wealth and power is a second divide related to the dominance of the English language and of what is loosely called 'Anglo-

Saxon culture.' Most Web sites in the world originate in the United States, in predominantly English-speaking nations like Great Britain, Canada, Australia and New Zealand, or in the English-speaking populations of nations and city-states like India, South Africa, Singapore, and Hong Kong. A few writers have spoken of "American cultural imperialism" on the Internet; a less tendentious phrase would be "Anglo-Saxon linguistic and cultural hegemony."

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

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

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

Unlike older Indian elites, the privileges of the new digerati are based not on caste, inherited wealth, family connections or access to traditional rulers, but on a combination of education, brainpower, special entrepreneurial skills and ability to stay on the "cutting edge" of knowledge. The lifestyle of the digerati tends to be cosmopolitan: they provide the clientele for the boutiques, the coffeehouses, the travel agencies, the pubs, and the international airways that whisk them to vacations or assignments in Singapore, London, Zurich, Mauritius, San Jose or Kathmandhu. On the outskirts of Chennai, Poona, Bangalore, Mumbai, Delhi, and Hyderabad luxury apartments are rising to house this new group. Although initially concentrated in information technology, this new digerati are also found, to varying degrees, in the biotech, pharmaceutical and other high-tech areas. In India, their salaries are still relatively low by Western standards, but, with annual salary growth rates of over 20% for the last five or ten years, far above those of their otherwise equally educated classmates in India.

In America a similar phenomenon is visible in areas like Silicon Valley, Austin TX, the Research Triangle of North Carolina, and a dozen other "high-tech" areas. Before the market

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

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

The point is that "the digital divide" is really at least four divides, all closely related. The first is internal, between the digitally empowered rich and the poor. This gap exists in both the

North as well as the South, although the baselines differ. The second linguistic-cultural gap is largely between English and other languages, or more generally, between "Anglo-Saxon culture" and other world cultures. The third is the gap exacerbated by disparities in access to information technology between rich and poor nations. Finally, there is the emergent intra-national phenomenon of the "digerati", an affluent elite characterized by skills appropriate to information-based industries and technologies, by growing affluence and influence unrelated to the traditional sources of elite status, and by obsessive focus, especially among young people, on cutting edge technologies, disregard for convention and authority, and indifference to the values of traditional hierarchies.

Can ICTs Help Bridge the Digital Divide?

Several years ago, when I mentioned to the great scholar of India, the late Myron Weiner, my interest in information technology in India, he asked whether I meant the use of computers in Indian schools. I allowed that this was indeed an interest. He burst out, "Are you insane? Don't you realize that there are 60 million Indian children who are not in school at all? For the cost of a computer, you can have a school."

Weiner's response underlines the most important question for India, for America, and for the world about information and communication technologies and the digital divide. When hundreds of millions of people lack basic education, essential health care, adequate nutrition, or simple justice, how can investment in ICTs be justified? When resources are limited (as in fact they always are) should they not be allocated to meeting more "fundamental" needs like

nutrition, health care, education, and the effort to provide a non-corrupt system of governance and law?

This question is well stated in the introduction to the "Workshop on Information and Communication Technology for Rural Development in India," led by Professor Subhash Bhatnagar and held at the Indian Institute of Management–Ahmedabad in March 1999:

> The value of IT for rural development is accompanied by this dilemma for decision makers and multilateral funding agencies: should the very limited resources for rural development be applied to developing IT capacities, or are they best used for other high priorities such as schools, hospitals, and dispensaries? Truly, there is a grave concern about possible wasted, poorly utilized, or otherwise unspent resources in IT applications…

In developed countries like the United States as in developing countries like India, there are huge reservoirs of unmet basic human needs. In America, tens of millions lack basic health insurance and almost 20% of all children live in officially defined "poverty"; in India, hundreds of millions go to bed hungry every night. In every nation, energy and resources committed to the deployment of ICTs among the poor and/or non-English speaking might alternately (and perhaps more constructively) be used for food, health, housing, literacy, and other more critical needs.

Admittedly, in the first years of the twenty-first century, ICTs have become glamorous, interesting, and fashionable. The "digital divide" is the subject of almost daily reports and conferences by international agencies, national and local governments, NGO's, and private foundations. But since when have desperately poor people had an urgent 'need' for a computer

or an Internet connection? How can we reconcile major commitments of energy and funds to ICTs when more basic human needs remain unfulfilled?

The conventional, even formulaic, answer to the alleged conflict between investment in ICTs and investment in meeting basic human needs is, "We need to do both. There is no contradiction between ICTs and other critical human and social goals."

But this formula, however frequently invoked, needs to be examined critically. A beginning is to rephrase the question. Many discussions appear to assume that extending ICTs to larger segments of the population is good in itself. They speak of "digital empowerment", of a "computer savvy" generation, or of a "Web-enabled" society. But further questioning almost always reveals that ICTs are invariably seen as instrumental in meeting other human needs: needs for food and a job, business needs, medical needs, needs for export earnings, needs for useful information, needs for transparency of government, and so on. A beginning of wisdom thus requires recognizing that ICTs are rarely goods in themselves but rather instruments in the pursuit of other goals. People have lived well, wisely, healthily, hopefully, happily, and generously for millennia without ICTs; they still do. If ICTs are useful at all, it is as a potential instrument in meeting *other* human, social, cultural, economic or political purposes.

If the problem is thus re-defined, the question, 'How can ICTs being extended to larger segments of the population?' is transformed into, 'How, *if at all*, can ICTs be used to ensure the fulfillment of essential human needs and to further basic human rights?' In this formulation, the qualifier 'if at all' is essential. It allows the possibility, for example, that the answer to Professor Weiner's and Professor Bhatnagar's question may be that available resources should better be used to build schools and hire teachers rather than supply a limited number of urban or rural

schools with computers and Internet connections. Or, to be more precise, it suggests that ICTs should be deployed in education if and only if they are the most effective way of extending quality education to larger segments of children and adults.

Lessons from India

The Workshop on "Equity, Diversity, and Information Technology", held at the National Institute of Advanced Studies at the Indian Institute of Science in Bangalore, was an effort to address the several digital divides. Bringing together thirty activists, professionals, and scholars, largely from India, the two-day meeting was preceded by the distribution of almost one thousand pages of materials on the digital divide and Indian ICT projects, and by papers or outlines by the participants. No attempt was made to reach an explicit consensus or to produce a manifesto: the papers collected in this volume reflect the range of perspectives and views represented at the meeting.

But from the preparations for the Workshop, from two days of intensive presentations, debate, and discussion, and from correspondence following the Workshop, a number of lessons can be drawn. Taken together, they reflect what I take to be an unstated consensus among the participants as to the ways in which ICT's might be used to increase equity and promote diversity. (Obviously, others would state these points differently; while still others might disagree with them.)

1. *Information technologies should be introduced when (and only when) they constitute the most effective available way of meeting basic human needs and fulfilling fundamental human rights.* ICT's can have a positive role in development. But ICT's are neither a panacea nor

necessarily the first line of attack in combating poverty, misery, and injustice. The utility of ICT's must always be judged against the role they can play in meeting core human needs.

Implicit in this principle is a critique of the frequent assumption -- whether by international agencies, national governments, or non-governmental organizations - that the most creative use of ICT's is to "put a computer in every village", "wire urban slums", or "introduce computer-based education." Commenting on the claim that the introduction of the Internet had enabled villagers who lived 30 miles from the port where their produce was traded to learn about the latest prices at that port and thus to bargain more effectively, one of the participants in the Workshop queried, "What was wrong with a bicycle?" In other words, introducing complex, expensive ICT equipment and infrastructure solely to achieve a result that could be obtained in a four-hour bicycle ride merely reflects the irrational bias that ICT's possess some magic not otherwise available.

2. *The most creative uses of ICT's in development may not entail computers, e-mail, or Internet access, but rather the use of other computer-based technologies, including embedded chips, satellite based information, etc. in order better to meet local needs.* Modern information technologies should not be simply equated with text manipulation, Web page construction, sending e-mail, e-commerce, or surfing the Net. Increasingly, ICTs have a variety of other uses and embodiments.

Several examples illustrate the point. India is the world's largest producer of milk and dairy products. The cooperative movement of dairy producers in Gujurat is well organized and effective. Traditionally, individual milk producers brought their milk to a central collection point where payment was based on volume and butterfat content. Volume was easily ascertained, but assessing butterfat content was a complex process, opaque to the producer and

requiring lengthy delays before payment. Complaints and charges of fraudulent assessment were frequent.

The solution involved the use of partially automated equipment. Initially, expensive imported, totally automated butterfat assessment machinery was introduced into collection centers. The equipment, of European manufacture, functioned poorly in Indian conditions. A second round involved local design of computer-based assessing equipment less sophisticated, less expensive, partially automated and requiring some human intervention, which nonetheless produced accurate butterfat readings in a few minutes. This computer-based equipment produces a final output that automatically combines the volume of milk with butterfat content to yield a payment chit immediately cashable by the farmer. The new process was transparent; delays and complaints diminished; satisfaction increased.

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

Other examples were discussed in the workshop: for example, the “Honeybee” project in Gujurat, with its original concept of ‘knowledge rich, economically poor’ rural people and its use

of Internet to disseminate local knowledge and enable local communities to profit from this dissemination. Another prime example was the use of cell phones, both in Gujurat and in the much-publicized Grameen Bank cell phone work in Bangladesh. In all of these cases, ICT's were used to promote *other* activities -- to speed payment, provide information about fishing, disseminate local technologies and reward their inventors, connect rural villagers to the world and, in Bangladesh, improve the status of local women. Moreover, technologies were chosen not because of their sophistication or cutting edge quality, but because of their practical utility in meeting the needs of local people.

3. *ICT projects must build on an assessment of local needs, as locally defined by local people*. There is a frequent tendency of well-wishing government officials, officers of international aid agencies, and workers in NGOs to assume that they know what is needed at the grassroots. Given the widespread enthusiasm for computers, Internet, Web, e-commerce, etc., the promise is often made to place "a computer in every village", scatter "info kiosks" throughout the state or nation, or establish "universal computer-based education." Often, however, these projects are not based on any real assessment of local needs. Furthermore, they assume a uniformity of needs in distinct localities with different populations, economic bases, cultures, social organization, and levels of need. Finally, they take for granted that providing computers and/or Web connections will (without additional efforts) provide increased social justice, enable local peoples to sell their products in the world market, feed the hungry, meet unmet medical needs, and so on.

The projects of the Swaminathan Foundation, reported in this volume, illustrate a commendable responsiveness to local needs. Before introducing new technologies of communication and information in Pondicherry, Dr. Balaji and his co-workers spent countless

hours ascertaining whether there were in fact kinds of information the villagers needed. They found, for example that women wanted information about childcare, health, child rearing, education, and reproductive control; men were interested in information on crops, prices, and economic life. Armed with this knowledge, the Swaminathan group was able to craft Internet uses that were responsive to the questions asked by the villagers. Nor did they assume that sophisticated Web sites or even ICTs were invariably the best way to provide needed information. For example, information about reproductive control was better provided to women in small group discussions with nurses than by clicking on a Web site.

Similarly, the transparency of government discussed by Dr. Chandrashekar in Andhra Pradesh, like the positive role envisioned for ICTs in governance in Uttar Pradesh by Dr. Kaushik, start from the wish of rural Indians to understand their basic rights, privileges, and opportunities. The massive scheme at one time proposed by World Tel, Reliance and the government of the state of Tamil Nadu planned constructing not only a state-wide infrastructure of fiber optic cable but -- more important --libraries of local content in the Tamil language that build on the work of the Swaminathan Foundation, addressing such issues as crops, pests, literacy, and health needs. Access to information is defined as an instrument to increase economic prosperity and to improve health.

4. *Local language and local content are essential*. The interventions discussed above underline another point often neglected in schemes that propose "wiring the masses" -- namely, the critical importance of local language and local content. When Dr. Chandru commented that Indians are too smart to waste money on computers, he was referring in part to the lack of local language software and local culture content. Absent the kind of content that could be created in Telugu, Hindi, Marathi or Tamil, even villagers wired with broadband connections to the Internet

will find virtually the entire content of the Internet incomprehensible or (if comprehensible) irrelevant. Patrick Hall sees India as a major potential contributor to worldwide needs for software localization. The dream that people in the bottom economic half of any society today could eventually learn from the web and communicate with friends, family, and intimates using e-mail is illusory unless they are literate, unless accessible software is available in the languages they speak, or unless a means is devised for the illiterate to use e-mail in their own languages.

The papers by Harsh Kumar and Dr. Sanyal in this volume describe ongoing efforts to provide precisely the kind of affordable local language software essential if computers and computer-based communication is to be effective. Elsewhere, I have written about some of the factors that stand in the way of developing accessible local language software for the almost 25% of the world's population that lives in South Asia. The year 2000 survey of the market for local language software, jointly sponsored by the Manufacturer's Association of Information Technology and the Indian Institute of Information Technology-Bangalore, highlights both the potentials of local language software and the many obstacles that stand in the way of its widespread development and use.

Even less often discussed than local language software is the fact that if ICT's are to be effective instruments in development, local language software is only a means to the end of creating local content. To be sure, a gifted Indian elite speaks impeccable English and provides the highly skilled professionals on which the thriving Indian information technology industry depends. But the remaining 95% of the population of South Asia, if they are ever to benefit from, let us say, e-commerce and the Internet, require not only content in their own languages, but content premised on the assumptions and achievements of their cultures, at best deepening and broadening exposure to their cultures' present and past wealth. As Mohan Tambe and his

group in Bangalore showed in developing local content for cable-TV-based Internet, it is imminently possible for India's engineers, writers, musicians, artisans, and designers to create lively sites in local languages, reflecting local culture. Such work needs to be multiplied in every state and nation of South Asia, and in all other cultures where the prevailing "Anglo-Saxon" cast of the Web may be alien, incomprehensible, or even perceived as threatening.

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

Illustrative here is a project funded several years ago by Apple Computers in Rajastan involving the computerization of record keeping by local health care workers. A year's devoted effort on the part of three computer experts went into adapting the (now defunct) Newton hand-held computer to the record-keeping requirements of Rajastani health survey takers. A thoughtful report describes the obstacles and successes of the project, after which the three computer experts left. After its initial year of funding the project disappeared, to be taken up again only in 2002, by CMC in Andhra Pradesh.

Many American projects appear to have suffered, or to be bound to suffer, a similar fate. For example, several years ago a front-page report appeared in The New York Times about the 'success' of a project using computers to assist the education of children of migrant crop

harvesters in the United States. It was illustrated with a photograph of a happy young woman, apparently of Latin American origin, seated smiling at her computer. Only at the end of this positive account was it noted that critics questioned the per capita cost of the project, which was USD $7,000 per pupil. Unstated was the fact that for about the same per pupil cost, one full-time teacher could be provided for every seven students. Once the initial support for this project disappears, its survival seems in doubt. A similar fate may have befallen efforts reported informally by a high official in the Department of Education in Delhi. In the late 1980's, he said, his department experimented actively with the use of computers in Indian schools. Asked what had happened to this intriguing work, he said that the results had been turned over to NGOs. Asked whether there were any internal reports, he said probably there were, but they were official documents and not publicly available. Asked which NGOs had continued the work, he did not know.

Several experiments, however, suggest that some grassroots projects can indeed sustain themselves financially. The Grameen Bank work with cell phones in Bangladesh, like the parallel work reported by Rekha Jain in Gujurat, indicates that cell phones may be an economically viable form of communication for some users in rural areas. As Jain points out, prosperous Indian villagers are willing to pay additional modest sums for the convenience of communication access through cell phones. Initial reports of the Grameen Bank cell phone works in Bangladesh reach a similar conclusion, although researchers have suggested that the financial sustainability of the Bangladeshi project is dependent on the particular telecom regulatory structure of that nation, and thus not be universally generalizable.

None of the participants in the workshop objected to projects with high initial costs, to experimental projects, or to projects with a subsidized developmental phase. No one insisted that

ICT projects must break even or be profitable at the very beginning. On the contrary, especially when so little is known about how to use ICT's effectively, start-up funds, subsidies, and experimentation paid for by governments, NGOs, or private foundations are probably essential. The real lesson is different: a critical part of all ICT projects must be planning for long-range economic sustainability (or long range financial support) – once the experimental phase of the project is over.

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

These proposals are obviously to the good. But the experience of the last decade suggests that only a few of the projects elegantly outlined, carefully conceptualized, and disseminated in glossy booklets have so far made much difference on the ground. Like promises to achieve "total literacy within five years" or to "wire every village" -- promises repeated with each Five-Year Plan -- many projects by international agencies, government agencies, and international or national NGOs so far have more reality in the realm of bureaucratic documentation than in the lives of their intended beneficiaries. The Clinton Administration, for

example, boasts that tax credits and direct benefits of USD $2.6 billion have been aimed at closing the "digital divide". New efforts to 'computerize every school' or to close the 'ethnic gap' (e.g., between blacks and whites) are constantly publicized. These projects have benefits, many in the intended direction. But despite rhetoric and funding, the digital gap in the United States between rich and poor, black and white, remains.

The obvious danger, then, is the creation of a national, international and/or private bureaucracy of high-minded "digital divide" planners, most of whose energies and funds go to attending international conferences or designing projects. The critical observer must learn to distinguish between promises on the one hand and on-the-ground achievements on the other. Unfortunately, the former threaten to be more numerous than the latter.

7. *Do not simply assume that a flourishing IT sector will trickle down to the rest of the people.* The connection between a flourishing IT industry and bridging the digital divide is complex and problematic. As Annalee Saxenian notes, the successful software business in India, centered in cities like Bangalore, Chennai, Hyderabad, and Mumbai has brought prosperity to some of the residents of those cities, added to India's export earnings and increased the traffic of gifted Indians between India and the U.S. A McKinsey report on the potential of software in India suggested that the total size of the industry could reach 20 billion USD per year in the year 2008 if certain preconditions were met. As India's most rapidly growing industry, with annual growth rates of over 50% sustained over almost ten years, the IT industry is clearly a boon to India's balance of payments and to the many talented engineers, entrepreneurs, and ancillary professionals employed by that industry. The rise of the "digerati" is one result. So is the growing prosperity of those who immediately serve this group.

But the boom in Bangalore is related only in very complex and indirect ways, if at all, to the conditions of life of the average Indian. For example, a recent economic survey of the state of Karnataka, whose capital is Bangalore, found Karnataka as a whole still among the poorer of Indian states, with an annual growth rate apparently untouched so far by the success of the Bangalore IT industry. Similarly, the flourishing of Silicon Valley (and a dozen other sites of concentrated electronic development) does little, at least in a direct way, to diminish income inequalities in the United States or to provide medical care for those currently uncovered by insurance.

Yet in popular discussions, concern over the "digital divide" often turns quickly toward proposals for increasing the growth of the IT business, or toward providing new opportunities for education in programming for young Indians and Americans. The unstated assumption is that the software export earnings of India translate into improved conditions for the average Indian; that successful IPOs in Austin Texas improve the lot of the poor in the United States; that there is a transfer of prosperity from the buzz of Bangalore to the itinerate laborer in Bihari; that the wealth of the entrepreneurs in Silicon Valley benefits the migrant workers who harvest lettuce a few miles away.

In fact, however, the opposite could be true. The experience of developing nations like Brazil suggests that without active steps to prevent a widening gap between the rich and poor, rapid development of technology sectors may increase that gap. Training software engineers and programmers is of course desirable, and is done well in India by the IITs, by many engineering colleges, and on a massive scale by firms like NIIT and Aptech. But it bears no necessary relationship to bridging the digital divide within India. The only certain fact is that such steps

increase the numbers of individuals on the top of the divide, growing the ranks of the digerati but without necessarily affecting the mass of the population.

In general, the relation of increasing prosperity for the affluent sectors of society to the economic conditions of the less privileged sectors is complex, over-determined, and varies from nation to nation. In the United States, more than twenty years of national economic policies based on the "trickle down theory" ("the rising tide raises all ships") were accompanied, until very recently, by stagnant or declining real wages for those in the bottom economic quarter of the population and by rapidly rising incomes for those in the top: the income gap widened for almost a quarter of a decade.

Perhaps a more plausible theory than "trickle down" might be "pour down": namely, that rising prosperity for privileged groups can benefit the disadvantaged if -- and only if -- public and private policy effectively redistributes at least some of the growing wealth of the already wealthy. Here, the efforts of Timothy Gonsalves in Ooty provide an Indian example of a successful effort to move the prosperity associated with the software capitals of India to a small town in a more remote region.

8. *Be sure that ICT programs actually really reach and benefit their intended beneficiaries.* A central problem for many projects is actually reaching their intended beneficiaries.

Like all the others, this problem is transnational. Senator Daniel Moynihan, for a time a cabinet member in the administration of U.S. President Richard Nixon, once described the American "War on Poverty" of the 1960's as a "welfare scheme for the professional classes". His point was that the poor benefited relatively little but their "helpers" -- middle-class professionals, academics, professional members of NGOs, social workers, and so on -- benefited

greatly. Dr. Kauskik's observations in this volume of the failure of efforts to democratize the panchayats in northern India points to a parallel process in a very different context. The work of P. Sainath and others documents how often well intentioned efforts to help the needy in India are appropriated by those who already possess the most power, privilege and influence: e.g., funds appropriated to build new roads for the poorest members of society end up being used to improve the roads that serve the upper castes.

The failures of well-intentioned programs are at times, of course, the result of deliberate and criminal diversions of funds and projects away from their intended beneficiaries. But at other times, as in the case of the American "War on Poverty", the ground plan of the project itself ends up allocating maximum resources to intermediaries and few to the most needy. A similar case in India is irrigation projects involving water that can be accessed only by large land owners with extensive holding in flat lands, but that offer no benefits to poorer farmers occupying less fertile ground on higher terrains. The cited MAIT report on the market for Indian local language software notes dust-covered computers sitting unused in district offices, even though equipped with local language software. The reason for their disuse is not criminal corruption, but the fact that possession of a computer is in many district offices seen not as a utility but as a mark of prestige. And in any event, typing one's own mail on a computer is commonly taken as a token of low status. Such projects obviously failed to provide local district officers with the technical education necessary to enable and persuade them to use computers to decrease their work-load and improve the quality of their work.

In short, it is not enough simply to ensure that a village has electricity and telephone connections, or a computer for the use of the poor. Equally important are efforts to empower the poor so they can in fact utilize the computer to improve their lives. The effectiveness of projects

involving ICTs to bridge the digital divide is inseparable from parallel efforts to increase justice, legality, transparency, and equity.

9. *ICT for development efforts need to share experiences within and between nations, especially about actual successes and failures at the grass roots level.* The Working Group found little communication between ICT projects, both within India and in other nations, which have similar goals. With a few notable exceptions (like Noronha et al's "Bytesforall" newsletter and Web site), ICT projects in South Asia involving efforts to reach larger numbers of disempowered citizens are uncoordinated and, in many cases, unknown to each other. Parallel projects in other regions, e.g., East Africa, Latin America, and South Pacific Asia, go mostly unnoted. In the absence of a central clearing house, wisdom gained by successful projects passes unnoticed, lessons learned from unsuccessful projects are not disseminated, and projects that could be coordinated remain isolated. Moreover, evaluations of ongoing projects (when they exist) remain hidden away in inaccessible journals or Web sites where they are of no use to others. As a result, the wheel must be constantly reinvented.

Admittedly, setting up a clearinghouse or network of inter-communicating projects is less dramatic than going to the field and using electronic technologies to help people meet vital human needs. But given the prevailing absence of successful models, and given the great difficulty in devising projects in which ICTs demonstrably enhance the quality of life for ordinary people, establishing networks of communication and evaluation among ICT projects with parallel goals should be among the highest priorities.

10. *The voices and interests of the disadvantaged need to be represented in bodies that make ICT policy concerning regulation and infrastructure.* Another key conclusion was the almost

complete absence of the voices of the digitally unempowered in the councils of state defining IT infrastructure regulatory and policy. In the United States, for example, Mitch Kapoor resigned in protest from an American government advisory committee that was nominally intended to increase access to ICTs through community centers, on the grounds that the covert agenda of this group was protecting the copyright privileges of Hollywood. In India, too, the voice of the poor, of the non-English-speaking, of tribals, backward and scheduled castes is almost completely absent from the task forces and advisory groups convened by the Government of India and by the governments of the Indian states. Major software producers, assemblers, designers, manufacturers, and producers of content, together with government officials and civil servants, are the loudest voices heard in circles where policy is defined. Yet, as Ashok Jhunjhunwala has pointed out, infrastructural decisions -- be they about legal requirements, rates, standardization of codes, organization and financing of media, or the creation and location of basic hardware backbones -- importantly determine whether or not the less advantaged sectors of the population are served.

To cite one example, decision makers in national capitals may decide to mandate the use of proprietary codes imported from overseas for wireless communication. If these codes are closely held or very expensive, the promise of local wireless communication engineered by indigenous engineers will remain unfulfilled. Either the mandated code is unavailable or, if it is available, using it requires paying exorbitant licensing fees. Another example mentioned in the Working Group is making available for communication purposes existing unused copper cables, which link thousands of villages and are owned by Indian Railways, for purposes of telephone and Internet connection. Doing so could extend the availability of ICTs to millions of Indians at

low cost. But the decision to allow access to these copper lines is a political and economic decision which can only be made at the Centre, not by local communities.

A third example of the importance of regulatory decisions in determining access to modern ICT's was discussed at the Workshop by Ashok Jhunjhunwala. He noted that at that time the policy of the Indian Government was to license Internet Service Providers if they agreed to provide services to an entire state. But recalling the success of local satellite television cable providers who serve limited areas, usually within walking distance of their satellite dishes, Jhunjhunwala imagined locally-based ISP providers funded by local capital, serving small numbers (100 – 500) of users and providing personal services and bill collection. This model, however, would be made impossible by government regulations that require the massive capital investments necessary to cover an entire state. Changing these regulations could open the ISP market to tens of thousands of energetic young entrepreneurs in Indian small towns and cities.

The close connection between regulatory decisions and increasing access to low-income users is rarely noticed by policy makers. Eager to promote the IT industry, influenced by the major trade associations of software, hardware, and content providers, often dependent on large government bureaucracies, policy making committees (like parliamentary committees and government ministries) rarely consider how regulatory decisions will affect the poor, the disempowered, and minority groups.

Giving voice to the digitally disempowered in the high councils of state that make ICT policy is no easy task, partly because of the power of the groups currently involved in decision making and because of the understandable governmental interest in promoting the IT industry. Required is technical and regulatory expertise along with understanding of how regulatory and

infrastructural decisions affect the poor, together with a commitment to the interests of the currently unserved. The difficulty is further compounded because the recommendations of such groups (like the policies that result) are typically presented as "technical" matters which only lawyers, economists, government officials, electrical engineers, and/or computer scientists are competent to discuss. Challenging that view, recognizing the social, human, cultural and political implications of apparently "technical" decisions, and devising means whereby the interests of the currently unheard can be represented in the high councils of 'technological' decision making is a critical task -- perhaps the most critical task -- if the digital divide is to be bridged. Without this, the IT industry may flourish, but the gap between its beneficiaries and the rest of the people will remain.

Conclusion

Despite the cautions identified by the members of the Workshop, the tenor of the meeting was optimistic. Despite failures, overblown rhetoric and projects that succeeded only to vanish, many reports from South Asia were reports of success and commitment to the needs of the underserved. Despite evidence of the widening of digital divides, projects in India give promise that ICT's can be used to help close these fissures. As Jairam Ramesh pointed out, ICT's in India have revolutionized two major sectors of Indian life, the railway reservation system and the public banking system. That experience provides hope for other applications of ICTs in Indian life. Despite doubts about the impact of the immensely successful Indian information technology industry on average Indians, experiences like those of Dr. Gonsalves in Ooty show that, with a will, its successes can benefit not only the metropolitan digerati but the inhabitants of a remote hill station. And in the end, despite the many differences between the United States and India,

most of the problems in South Asia were revealed to be American problems as well, while the experiments and solutions of South Asia provide lessons for America and the rest of the world.

The central consensus of the Working Group should by now be so obvious that it need not be repeated at length. With the new and fashionable attention to the "digital divide", the embeddedness of digital inequities in other inequities, of digital injustice in other injustices, of information deprivation in other deprivations constantly needs to be recalled. "Information poverty" is rarely the cause of human suffering. Rather it is the consequence of other forms of poverty, social inequalities, inadequacy of resources, illiteracy, corruption, injustice, poor health, and lack of basic public services. Information technologies have a potential for assisting people of whatever rank and place in society, in whatever society of the world, in meeting their basic human needs. It is illusory, however, to believe that information technologies, properly applied, could somehow eliminate all the many injustices with which the world abounds.

Information and communication technologies, then, are to be understood as potential instruments for addressing the unmet needs of the six billion men, women, and children of the world. At present, the digital divide exacerbates existing inequities. But as the distinguished computer scientist, the late Michael Dertouzos once noted, after describing the failure of an overly optimistic effort to improve the lives of Nepalis by using digital technologies, ICTs can be of use in reducing the digital divide if only we commit to that goal the same intelligence and imagination that has gone into creating the technologies themselves.

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