Challenging the Digital Divide

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Recent developments in computer and communication technologies have revolutionized the society. The world is in a transition phase from an industrial to a knowledge society. The credit for it goes to multiple factors including scientific and technological developments. These technological developments impact different economies and cultures in different ways and have propelled the great divide of haves and haves not, popularly known as "digital divide." This divide is evident in different countries from the state of diffusion of various technologies such as telephones, Internet and computers. This digital divide has expanded slightly in some cases. This widening gap may have serious social consequences in future. Currently it is a topic of hot debate among informed people such as intellectuals, scientists, technologists, politicians and academics. However, most of the debates are not supported by scientific research and analysis. Assuming that an understanding of the nature and origin of the digital divide will be helpful in addressing the problems identified with it, the issue of digital divide has been examined from both theoretical and empirical angles in this paper. In the theory section an attempt has been made to examine the nature and origin of digital divide and empirical study deals with the mapping of the digital divide in a few countries.

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What Is "Digital Divide"?

The present information revolution, which is propelled by the Internet, mobile phones and powerful computers, has now reached a critical juncture, where countries left behind are in danger of being disadvantaged. The transfer of large amount of information between people and places within no time characterizes this revolution. Information has become the most important resource in this age. Countries lacking in access to information and information and communication technologies (ICTs) are facing the danger of "digital divide," which may be seen as the difference in economic powers being created between the IT— haves and the IT have-nots. It is ubiquitous between various economies, countries, societies, and individuals. It is an offshoot of the ongoing information revolution and is reflected in the usage of ICTs such as PCs, mobile phones and Internet. For instance, in the year 2000, there were 555 PCs per 1000 people in the US as against 5 in India. Similarly the number of Internet-users was 100 million-plus in the US and 3 million in India.

The reasons for such varying adoption rates and the birth of the digital divide are most often economic as the purchasing power of people in different societies and economies is different. Even today telephones and personal computers are prohibitivly expensive in the developing world. For example, in the US the ratio between the per capita annual income and the cost of a PC is 30:1 whereas in India it is 1:1. It implies that a year's income in India and 12 days' income in the US go into a PC purchase. Hence to understand the nature and to trace the origin of the digital divide, an understanding of the changes taking place in technology, economy and society is required. These issues are briefly discussed in the following sections.

Economic Divide

Before we discuss the economic divide, it will be appropriate to understand the present information economy, its newness, its important features and the difference between old and new economy. The present information economy may be defined as an economy which revolves around creating, sharing and using knowledge and information to create wealth and improve the quality of life. In the new economic structure, companies are becoming information driven and workers are becoming infor-

mation workers. New economy is also being seen as an appendage to the primary industrial economy, where sectors like communications and media will continue to be secondary activities. Its real picture has yet to emerge, however many see it dominating the industrial economy the way industrial economy dominated agricultural economy. In many developed economies, the service sector has already left behind the agriculture and industrial sectors in their contribution to GDP.[1]

The transformation from an industrial to an information economy started in different countries at different times and is still an on-going process in many countries. In the US it started in early sixties, whereas in India as late as the late eighties. This transformation will bring great opportunities and challenges for diverse economies of the world as its benefits have neither spread widely through the developing world nor are available equally to developed and developing countries. As a result poor countries account for a small fraction of the global digital economy and are left behind. Economic growth in this information age is the creation of knowledge and information, which is often available unfortunately only in unstructured and unauthenticated form. To make it useful and meaningful resource for decision-making, it has to be organized and authenticated. Besides information, the world economy depends on information technologies and services to a large extent. It is reflected in their contribution to the national GDP, where a major portion comes from the service sector (Table-1). The actual, enormous economic disparity between developed and developing countries is the main cause of the current digital divide, and instead of narrowing down, this divide is unfortunately further expanding.

Table -1: Contribution of information workers in the national GDP

Items	Country							
	India	Pakistan	China	S-Lanka	US	Japan	Australia	Brazil
Information workers (%)	20	30	11	30	71	59	68	54
GDP* (%)	43	50	29	52	64	60	68	50

Source: Information workers; World Development Report, 1997 GDP; World Development Report, 1998/99

*GDP: Contribution of information sector in Gross Domestic Products (%)

Technological Divide

Caused by the globalisation and information revolution, a more harmful and dangerous form of digital divide has recently emerged by dividing society in two groups: the producers and the consumers of information and technology. Globalisation a process in which manufacturing units have shifted to poor and developing countries due to cheap labor availability, has divided the labor class into "information producers" and "information consumers." Some of the developed countries will produce and manage the knowledge, while poor and developing countries will be the users. This inequality between creators and users of technology will further increase with time. These changes have the potential for dramatic consequences in society, where the poor and functionally illiterate will be doubly disadvantaged. The poor community of have-nots will be forced to imbibe an alien culture. This will create tremendous inequalities between creators and users of technology. Ultimately the knowledge producers will manage and use the knowledge to control others. Future technological developments and the pattern of their usage would determine the shape of the rapidly emerging, information-based, global digital economy. Countries harnessing the ICT potentials for knowledge generation and wealth creation would benefit from the digital divide.

The ongoing information revolution will alter life on this planet even more dramatically than in the past. This revolution is triggered by the Information and Communication Technologies (ICTs), which are the driving force behind economic growth. The present day ICTs are different from traditional technologies in many respects as they transcend the barriers of distance and time. Further, new technologies are rapidly replacing the old technologies and the way they are used is also changing very fast. There are many factors that help in their rapid diffusion, notably technological upgrade and decreasing production costs. Government policy also plays a major role in quick technological diffusion. In such an uncertain atmosphere, where the life cycle of a specific technologies is very short, the choice of an appropriate technology becomes very difficult. Nevertheless, poor and developing countries cannot escape the threats of technological change as they would only miss most of the opportunities associated with new technological advances.

Every advance in technology changes our behavior, which in turn creates a gap defined by the terms of access to the latest technology. The gap

between developed and developing nations in terms of their access to ICTs is further widening. According to WTDR 2002, "new gaps are emerging notably in terms of access to the Internet. These are harder to measure because they are not just about access, but also about the quality of the experience."[2] In developing countries, technological distance or the lack of supporting technologies hinders the technological adoptability. Affordability and lack of infrastructure facilities are the other reasons for poor physical access. These constraints and similar factors prevent wider adoption of ICT in developing countries. Also, rapid technological changes generate great uncertainties about the future of business prospects in developing countries.

The penetration of Information and Communication Technologies (ICTs), which is an indicator of the state of informatization in different countries, is presented below in Table-2. These figures[3] reflect the extent of digital divide between the information—rich and the information— poor countries. The technological divide between developed countries like the US, Japan, and Australia, and developing countries like India, Pakistan, and Sri-Lanka, is dangerous and requires urgent radical solutions.

Table -2: Diffusion of ICTs in different countries

ICTs	Country							
	India	Pakistan	China	S-Lanka	US	Japan	Australia	Brazil
TV	64	24	252	82	806	700	666	289
Telephone	15	18	45	14	640	489	519	96
PC	1.5	1.2	3	3.3	326	128	311	18
Internet	5	7	21	33	442	76	382	4

Source: World Development Report, 1998-99.

TV: Television/1000 Telephone: Telephone/1000
PC: Personal Computers/1000 Internet: Internet / million

Social Divide

The digital divide, besides being economic and technological, is social as well. The diffusion of a technology in any social system depends to a large extent on the behavioral characteristics of the adopters,[4] who are

generally categorized either as "innovators" or "imitators". In technology adoption, innovators take their own decisions and are influenced only by external influences or mass media. Imitators are influenced by internal influences or previous adopters,[5] which makes some of the innovations diffuse faster as compared to others in any social system. For example the diffusion of the the Net in our society had been much faster in comparison to other technologies. Radio took 38 years to reach 50 million people, television took 13 and the PC no less than 16 years, but within four years the Net could reach 50 million people.

Human resource development plays a very important role in facing the challenges of digital divide, where only highly skilled persons will be able to participate.[6] In the present information society, every worker being trained as an information worker, whether an eminent scientist, skilled craftsman or even a receptionist provides economic value by generating, sharing and applying ideas of all kinds. Today literacy not only involves the ability to handle the data but also the capability to interpret it. It includes basic skills (reading, writing and arithmetic); computer skills; visual skills; technical skills; mathematics and logic skills; cross-language and cross-cultural skills. Other employability knowledge and skills include: listening; speaking; gathering and analyzing information; analyzing and solving problems; making decisions and judgments; organizing and planning; using social skills; adaptability; working in teams; leading others; building consensus; and self and career development.[7]

Further, stretching the issue of literacy, it is being argued that the world is experiencing information illiteracy on a large scale. "Many people do not know how to find information they need," and this problem will remain, "until both the providers of information and the seekers of information themselves become information literate,"[8] i.e., until either they have the information, or they know its source. A recent definition of information literacy is: "Knowing how to find information, evaluate it and use it effectively... When you are information literate you know where to find the information you need for greater knowledge and understanding of any subject you choose."[9] Thus we notice that workforce development and its proper deployment may help in tackling the issue of digital divide in its present form.

Why to Bridge the Digital Divide?

Various groups and organisations have assessed the consequences of digital divide on different economies. To assess the impact of digital divide on the developing world economies, let us first consider the views expressed by others on its favorable and unfavorable impacts on different societies. Their views differ and are most of the time either contradictory or biased to suit their agenda. People who are against bridging the digital divide argue that the income gap between developed countries and developing countries is striking. Twenty percent of the world population lives on a dollar a day and for them food and water become the first priorities, not ICTs. This is evident as the Internet charges itself are significantly high in poor countries. According to Yoshihiro Iwasaki, Director, Programs Department (West) of the Asian Development Bank,[10] Internet access charges amount to only 1.2% of average monthly income in the USA compared to 60% in Sri Lanka, 191% in Bangladesh, 278% in Nepal and 614% in Madagascar. One third of the world population has never made a phone call and have little access to information and communication technologies. In such circumstances how logical it would be to think of Internet services? The above factors certainly do not advocate for a policy of infrastructure development for information technologies. On the other hand people in favor of reducing the digital divide argue that existing technological distance and huge differences in technology penetration will further accelerate economic differences at even much faster rates. Those who miss the current information revolution would lag behind forever and the society may witness the creation of yet another class.

Before taking a decision one has to consider a range of factors including affordability and socio-cultural factors. Some of the people consider the "digital divide" as an American agenda. They argue that technologically advanced countries engineer rapid technological changes to retain a controlling power. To govern the world, these countries devise means to control, direct, shape or regulate the use of new technologies. It empowers them to control the new technologies to protect and favor their interests and values. Developed countries in general and Americans in particular have selfish motives in spreading the information revolution around the world as they stand to benefit economically. "The world information industry is dominated by American companies, which help American media to disseminate their cultural products globally. American media will also foster American values, both political and cultural, as the world becomes more electronically connected."[11] The availability of bandwidth is another

indicator often quoted against reducing the digital divide. While a corporate campus in the US has a 2.6 Gbps backbone, the nation of India is still relying upon one of 34 Mbps, droping to 8 Mbps at places.

The World Economic Forum(WEF)[12] sees the digital divide as an opportunity, from which developing countries and economically poor societies may benefit in many ways and enjoy the fruits of globalisation. Hence, the widespread diffusion of ICTs is seen as the democratization of the information revolution, allowing individual entrepreneurs and small communities to sell their local produce at home and abroad. Further, according to the WEF, technology will help in promoting national cultures across the world by way of local production and global distribution. It may be used to tackle social challenges in fields such as education, public health, transportation, environment and natural resource management. The WEF exhorts governments in the industrialized world, multilateral institutions, and the international business community to, "help to accelerate developing countries' transition into the information age."[13] From the above discussions, it is apparent that "digital divide" or "no digital divide," information rich countries in general, and Americans in particular, stand to gain. If there exists a digital divide, they gain more by bridging it as it generates demand and also helps in pushing the agenda. Hence, the real issue is not why close the digital divide, but how?

How to Bridge the Digital Divide?

There is no unique procedure for bridging the digital divide and, in any case, it would not be possible to close this gap completely. At the most, attempts may be made to reduce this divide and, if possible, stop it from further expanding. To address this problem in a comprehensive way, public and private participation is required. Governments, NGOs and international organisations should collaborate to help developing countries in getting informatized. This will necessitate the development of socio-economic sectors besides the computer and communications sectors. Using the indicators of information revolution,[14] sectors lagging in development may be identified, and once the priorities are set, appropriate measures should be taken to rectify the problems in those priority areas. The whole process will require radical and country specific solutions. Focusing on just computers and connections, we are bound to fail in our aim at tackling the digital divide. Viable solutions for reducing the digital divide in an effective manner should focus on: (i) access to information technology; (ii) affordable devices; and (iii) partnership programs. This

section discusses these initiatives, which may play a key role in decreasing the gap between the information-rich and the information-poor.

A. Access

An appropriate approach towards resolving the digital divide would be to increase the supply of ICTs to developing countries from developed countries. This would ensure better access to ICTs in poor countries. However, this program would require continuous updating of the technologies supplied. The next target should be affordable and reliable bandwidth, which will further improve the access. Inadequate Internet and telephone connectivity in developing countries is a key challenge in reducing the digital divide. Development of infrastructure in poor countries which requires long-term commitment, may be considered a second priority. In some cases, technological adoptability is constrained because of the developing countries ill-preparedness, for the coupling of technology. Equipment may, as a result, lay idle in rooms where only a few people have access. Many times even an access to the Internet does not guarantee effective use and learning.

For unconstrained diffusion of ICTs in developing countries, constraints preventing wider diffusion of ICTs in developing countries should be critically analyzed. These constraints may vary from country to country and may be diverse in nature. Effect of price and supply constraints on the diffusion of ICTs should also be examined in detail. At present diffusion of information technologies in developing countries is very poor and most of them are without information technologies. On the other hand developed countries have IT to dispose of. This anomaly may provide a solution and help in speedy diffusion of information technologies in poor countries. To benefit from this, these countries would have to develop requisite infrastructure base, harness their human resource potential and use and expand the knowledge base.

B. Cost

Many developing countries simply cannot afford to buy IT equipment, given their spending constraints. These countries not only lag behind in the development of Information and Communication Technologies, they also cannot create the requisite infrastructure, as this would require a huge mobilization of resources mobilization. In such circumstances, besides increased access to ICTs, aiming at reducing the costs for delivery of public services in poor countries will help in narrowing the divide. Information-rich affluent countries may participate in this program by donating information technologies to information-poor countries, which may have a synergistic effect in the beginning but

will certainly establish a symbiotic relationship at a later stage between poor and rich countries. This will remove many hurdles in bridging the digital divide.

C. Partnerships

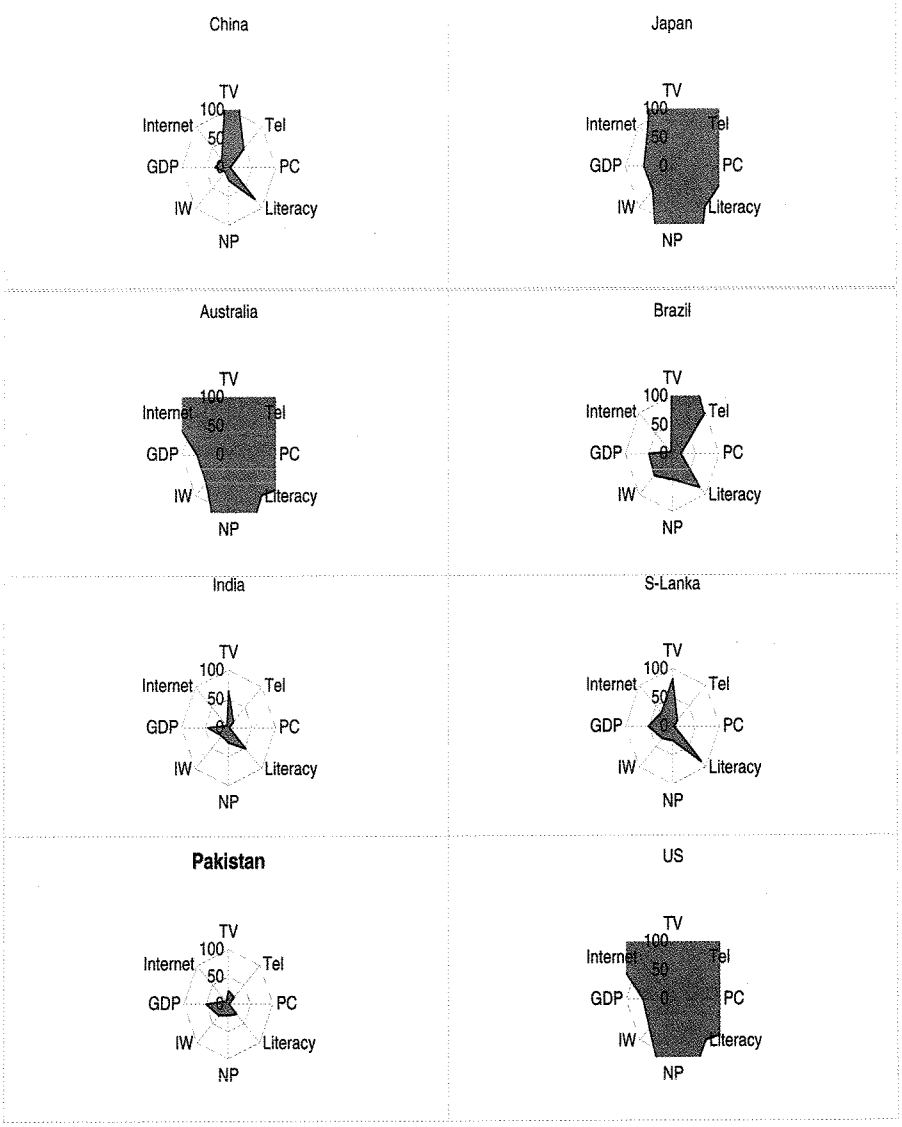
Advanced countries may collaborate and pool their resources to bridge the gap. Their partnership in providing viable solutions may help in narrowing down the knowledge gap between developed and developing countries. In many advanced countries, PCs are being decommissioned. These PCs are worth something to poorer counties. International organizations, financial institutions, the private sector, governments, and civil society organizations may participate in bridging the digital divide by creating a global multi-donor grant facility to poor countries. Partnerships may help in networking arrangements with other institutions and thereby facilitate the pooling of relevant experience of both developed and developing countries to reduce the digital divide.

The penetration of ICTs in different social systems may be used to represent the state of its being informatized and also to map the digital divide among countries. Information maps presenting the real picture of a country with regard to its state of informatization may be used to identify bottlenecks and to arrive viable solutions. A comparison of the information maps of two different countries would allow one to assess the existing digital divide among them.

Mapping of Digital Divide

Indicators of information revolution may be used to measure the progress of any country as an information society. These indicators have been used here to empirically examine the current state of digital divide in India and a few developed and developing countries. Out of the various indicators of the information revolution(cf. note 14), only three main areas (viz. telecommunications, information workers and information economy) are discussed in this section. However, to compare the existing digital divide among India, China, Sri-Lanka, Pakistan, Brazil, Australia, Japan and the US, other indicators have also been used. The prevailing situation as regards digital divide in the above-mentioned countries is pictorially presented in Fig.-1. The shaded area in each figure indicates the extent of informatization in that country. The larger the area covered, the better is the state of informatization. We may notice that India is close to only Pakistan, and countries like China and Sri Lanka are farther on the information map.

Figure. 1: Informatization in Different Countries



Information and communication technologies play a major role in getting digitalized. Telephones in particular are the lifeline of an information society. The diffusion of telephones in any country is reflected by telephone density. Among the various countries included in this study, telephone density in India is very poor as compared to others. Telephone

density in India in the year 1996 was about 1.5 telephones per 100 inhabitants, whereas in China it was 4.5 per 100 inhabitants and in Pakistan 1.8 per 100 inhabitants.[3] Low telephone density is a major obstacle for a country to move into the information society. Most of the countries on the information society map have telephone densities in the range of 7.8 for middle-income countries and 54 for high-income countries per 100 people. Hence, it is very important for any country willing to join the information society to increase the number of telephone connections.

The second indicator is linked to human resource development. Information workers are the backbone of an information society. A country's position in the information society is determined by the extent to which it utilizes and capitalizes on its knowledge-based information workers. A proportionally—dominant share of information, as compared to industrial and agricultural, workers shows a tilt toward an information society. In 1997, twenty percent of workers were engaged in the information sector in India, while Pakistan and Sri Lanka each had 30% of the workforce employed as information workers. China had only 11% information workers. In the U.S., 50% of the total workforce is employed in information-related work, with Japan following close behind. However, these information workers contribute differently in different economies, as illustrated below.

In advanced industrial countries the information sector is a major contributor to GDP. For higher GDP growth through the service sector, information workers should be placed in productive activities. For example, the contribution of India's information sector to GDP was 43% in 1997, whereas in Pakistan and Sri Lanka it is approximately 50%. China's information sector contributed 29% to GDP, much less in comparison to Pakistan and Sri-Lanka.[14] Even with a smaller number of information workers, Pakistan and Sri Lanka have been able to muster a 50% contribution to their respective national GDP. Clearly, participation itself is not the decisive factor:efficacy and efficiency must be accounted for as well.

Alternative Futures

The ongoing information revolution has momentous implications for the current and future social and economic situation of all countries of the world. This revolution presents visions of our futures from many perspectives. The digital divide in particular may be an opportunity both

to foster harmony within humankind and for the poorest of the poor to participate and share in the benefits of information revolution. It is also full of inherent challenges, as technological progress brings its own successes, failures, and frustrations. The way we dream and monitor technological advances may touch the very core of our culture.

The first scenario takes into account advancements in information and communication technologies that produce an impact on digital evolution and ripple effects into many other technological fields. In this scenario, the accelerating pace of ICT technological evolution is likely to assume a state that is self-propelling and where all other technological sectors shall be forced to adapt to the momentum of change dictated by the ICT evolution. As the rate of development for different branches of information technology varies as much as their directions , this may push many technologies to excel and others to crash. In this age of technological convergence and combination, ICTs may associate or dissociate with many old or new players in the arena. These developments shall in turn influence the issues of the digital divide as discussed above and create alternative futures for the transition to a post-information society.

The to be deduced from the alternative futures depend upon the abilit to integrate their social, economic, ethical and moral dimensions and adapt to changes being brought about by ICTs. Even the "haves" may not be fully equipped to do so even though the technological change is taking place within their socio-cultural milieu. More difficult shall be the scenario in which "haves-not" would be called upon to respond and adapt to the technological changes as well as orient them to their socio-economic-cultural needs, which are indeed quite different to those of the "haves."

At another level, steps taken to bridge the gap will lead to prosperity and the digital technology will be put to the well being of the mankind. It may help in minimizing several serious divides such as economic, demographic, political, cultural, gender and genetic. An informatized society will help to promote social synergy, where one country's/individual's economic advancement is not at the cost of another's opportunity. It will help in ensuring that information relevant to local needs reach the unreached at the right time and place. On the other hand if the divide further increases it will create and enhance the inequalities in the world and may lead to catastrophic results for a vast section of the human population, i.e. the have-nots. In these countries, absence of information, wrong information, or poor information can lead to wrong decisions and wasteful resources needed for development purposes.

Conclusion

Today developing countries are in the most disadvantageous position as the danger of digital divide for them is both economic and social. These countries have a low level of literacy and cannot afford computers and other accessories. Attempts should be made to ensure that they have unhindered access to expanded opportunities and are able to participate in the process of development. This requires the deployment of vast resources in poor countries to develop infrastructure facilities and formulation of suitable ICT policies for sustainable development. The arguments that by bridging the digital divide they will lose their own culture and traditions and miss technological independence is unfounded and unjustified. Contrary to these views, it helps diverse native cultures and traditions coexist. Further, it will enable them to globally market their traditional crafts and goods while staying at home. Thus we find that the initiatives in this direction should focus on infrastructure policy development in developing countries so that digital divide is reduced before the gap between information-poor and information-rich countries grows even wider.

Notes

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Abbreviations

GDP: Gross Domestic Product; TV: Television; Tel: Telephone; PC: Personal computer; NP: News paper; IW: Information worker