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The human development report 2001 and information technology for developing countries: an evaluation

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Abstract: The Human Development Report 2001 rightly focuses on the role that information technology can play in overcoming the digital divide between rich and poor countries. It also emphasises the role that some of the latter countries are themselves contributing to this end by producing low-cost and appropriate technologies. The problem, however, is that the Report neglects all the efforts currently being made in the developed countries to overcome the digital divide and in so doing leaves the policy maker with only a partial view of what technologies are actually available.

Keywords: Information technology; digital divide; human development.

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1 Introduction

The major theme of the 2001 version of the Human Development Report [1] is that new technologies can and should be enlisted in the pursuit of growth and poverty alleviation in the Third World. Since innovations in information technology comprise one of the most important of these new technologies, the contents of the Report fit in well with and make a valuable contribution to the ongoing debate on how the digital divide between rich and poor countries can best be overcome. One major prerequisite, which is rightly emphasised in various parts of the Report, is that many of the new technologies (in microelectronics as indeed in other areas of innovation) will need to be adapted specifically to the needs of the latter rather than the former countries. On page 33, for example, one finds the general argument that:

"...in 2000 the government of Brazil commissioned a team of computer scientists at the Federal University of Minas Gerais to do the reverse: produce a basic computer for around \$300. – In just over a month a prototype was made, with a modem, colour monitor, speakers, mouse, internet software and options for adding printers, disk drives and CD-ROM drives. – Plans include installing the device in public schools to reach 7 million children and selling it on credit to low-wage earners." [1,p.98]

An even cheaper computer, expected to cost only \$200, has been developed by a group of professors and engineers in Bangalore, India, with the goal of extending the benefits of the information technology revolution in that country (where only some two million personal computers exist among a population of almost a billion). The so-called 'Simputer' is receiving much attention from those concerned with bridging the digital divide between rich and poor countries, not only because of its exceptionally low price, but also because it "features a gif-image touch screen, e-mail and Net access when connected to a working telephone line. *And most importantly, it has a smartcard reader that enables the machine to be used on a shared basis*" [3]. The last-mentioned attribute of the 'Simputer' bears particular emphasis in a country as poor as India, where individual ownership may be impossible for many, if not most, families even at a price as low as \$200. Armed with a smartcard (costing between one and two dollars), however, each individual villager "will be able to store all his information on the card and rent the machine for 20 cents an hour. Once he inserts his card, the Simputer will give him access to private information such as his checking account balance" [3].

The 'Simputer' is not however, the only low-cost form of information technology that has emerged from India's highly qualified cadre of scientists and engineers. For, as the Human Development Report correctly points out, there has also been a major innovation of this kind in the area of wireless telecommunications. And unlike the case of the low-cost computer, which has yet to be launched, the indigenously designed wireless local loop (WLL) system is already in use in India and elsewhere. As a means of enhancing the extent of access to the internet in low-income societies, the advantages of this system emerge most strikingly when it is contrasted with the limitations of the traditional mode of telecommunications in such societies. In particular,

"Internet access is typically provided through telephone lines, but the cost of installing telephones in India means that only 2-3% of the population can afford them. To increase access from the current 15 million to, say, 150-200 million, costs would need to fall 50-65%. *The technologies being offered by multinational companies cannot meet that challenge – but a home-grown alternative can.*

In 1999 the Indian Institute of Technology in Madras created a low-cost internet access system that needs no modem and eliminates expensive copper lines. At its core is a wireless local system .... The result is faster and cheaper access: ideal for providing access to low-income communities throughout India and beyond." [1, p.98]

Apart from demonstrating that the two countries concerned have acquired the capacity to design major innovations, as distinct from 'minor' adaptations of imported products, these examples also clearly illustrate that there are no inherent technical rigidities or scientific imperatives standing in the way of developing alternatives to designs emanating from the industrialised market economies (at least in those areas of information technology that are embraced by the three examples in question). Put another way, these examples lend support to those who criticise the notion of technological determinism i.e.

“Tapping the potential of these new technologies will depend on adaptations to the conditions in developing countries, especially for poor users. Much will depend on innovations – technological, institutional and entrepreneurial – to create low-cost, easy to use devices and to set up access through public or market centres with affordable products.” [1,p.33]

And with specific regard to the cost of internet access via information technologies, the same point is emphasised in the Report’s view that:

“The World Wide Web is too expensive for millions of people in developing countries, partly because of the cost of computers that are the standard entry point to the Web: in January 2001 the cheapest Pentium III computer was \$700– hardly affordable for low-income community access points. Further, the text-based interface of the internet puts it out of reach for illiterate people.” [1, p.35]

On the basis of this and other statements of the need for low-cost (and in other ways suitable) forms of information technology, the Report then focuses on a number of innovations that already fall into this category (innovations that are either already in use or about to be launched). The problem with this focus, as we see it, is not that the examples cited are unimportant (quite the opposite in fact), but rather that they represent only one specific source of low-cost information technology for Third World countries. Indeed, the main contention of this paper is that by focusing almost entirely on innovations originating in and for a small group of developing countries, the Report neglects the wide range of alternatives that emanate instead from the developed countries. Such neglect, we feel, provides policy makers in the Third World with only a very partial set of options for using low-cost information technology as a means of overcoming the digital divide. Before examining this larger set of alternatives, however, let us first describe the focus of the Human Development Report and consider its limitations.

2 The focus of the report and its limitations

Perhaps partly because of a deeply-felt view that multinational corporations have generally failed to create new technologies that are suitable for low-income countries, the authors of the Report look to these countries themselves as an alternative source of such technology. In particular, it is argued that:

“With the emergence of world-class research capacity in some developing countries comes new sources of technological excellence. Research in developing countries focuses on problems specific to their contexts, whether local diseases or low incomes.” [1, p.98]

Though more examples could have been cited [2], the Report illustrates this point mainly with reference to three innovations in information technology, one from Brazil and the other two from India. Each case, it seems, was motivated primarily by the recognition that widespread access to this technology necessitates a sharp reduction in price, an event thought unlikely to emerge from the activities of multinational corporations or the global market place more generally. In the case of computers, for example, the vast majority of those living in poor countries cannot gain access to the internet without major cost reductions in these products, yet, “In the global market multinational computer companies focus on doubling computing power, not halving costs” [1, p.98]). Thus it was that:

the notion that the direction of innovation is dictated by intrinsic scientific factors, which circumscribe the possibilities for those which originate in the developed countries. In each case described above, the direction of the innovation turned rather on the *type* of technology that the scientists and engineers in the two countries were seeking to develop (though it is worth emphasising that the results of R&D in these and other developing countries are not invariably 'appropriate' to local circumstances. On the contrary, many of the indigenous innovations that emerge from such countries seem to contribute more to the direction of research being pursued in the advanced countries than to the type of research that local needs would dictate) [4].

If the goal of the Report was merely to demonstrate that there is thus much that (some of) the developing countries themselves can do in order to benefit from the advantages afforded by information technology, then its focus can readily be justified. If, however, the Report has a wider purpose (as suggested, for example, by the statement found on page 27 that "This Report is about how people can create and use technology to improve human lives, especially to reduce global poverty"), of informing policy makers about as many available options as possible, its focus must be considered far too narrow. For, what are then neglected are all the efforts made by institutions in the *developed* countries that help in one way or another to spread the benefits of information technology to poor people living in poor countries. For one thing, one needs to consider the often overlooked fact that the developed countries suffer, to a greater or lesser extent, from their own *internal* digital divides [5] and that efforts to overcome these may often be relevant to the Third World as well. What also needs to be emphasised in this regard is that the Report focuses almost entirely on multinationals as the agents of new technology transfer to developing countries (a task that they are said, in the citations above, to perform without much regard to the needs of those countries). Yet, there are a host of other developed country institutions, such as NGOs and universities that are not only concerned to bridge the digital divide between rich and poor countries, but in some cases have already begun to do so (in other cases there are innovations on the point of application in the latter countries). Taken together, these two recognitions yield a host of possibilities that are neglected by the Human Development Report. It is convenient to group them under the following headings: telecommunications, computer hardware and software and non-computer modes of access to the internet.

3 Developed country sources of low-cost information technology

3.1 Telecommunications

In this area I can do no better than begin with the work of the USA-based NGO, VITA (Volunteers in Technical Assistance), which, after a long period of research and development with its strategic partners (also based in the developed countries),

"...has developed a unique, low-cost, communication and information service, VITA-Connect, to meet the needs of development and environmental organisations and the communities they serve. .... At the heart of VITA-Connect is VITAsat, a satellite-based, data-only communications network through which participating organisations in remote locations can access email and a broad range of targeted information and training services. Participants will share operational costs for an annual *cost share per site of less than \$1.50 per day - a fraction of the cost of other communication systems for remote sites.*

.... VITAsat is currently the only truly low-cost option for email connectivity in remote rural areas of the developing countries.” [6] (emphasis in original)

Also noteworthy in this regard are the efforts being made by one of VITA’s strategic partners, the World Space Foundation, an NGO, which like the former, is based in the USA. World Space employs a satellite with three beams to cover the entire African continent as well as the Middle East. In order to capture the signals that are emitted by the satellite, special radio receivers are needed. These

“run on batteries or an external power source, and can be adapted to run on solar energy. They have data ports, that when connected to a computer via multimedia adapter cards, enable users to download web-based text and images.... Both text and images .... are transmitted via the satellite to the computer hard drive without phone lines.” [7]

Both forms of information transmission underlie the World Space Foundation’s flagship project, known as the Africa Learning Channel, which began broadcasting information on a wide variety of important topics (such as health, education and literacy) to the entire continent in late 1999 (and which, through its policy of requiring recipient groups to organise coordinated listening groups around the radio receivers, also seeks to reach as many individuals as possible in the countries concerned). Unlike many other endeavours to bridge the global digital divide, this particular initiative thus has the merit of focusing directly on the region that is currently most deprived of the benefits of information technology. For this reason it warrants especially close scrutiny by policy makers and other institutions that are concerned to spread information technology more widely across the developing world.

3.2 Computer hardware and software

Under this heading what needs to be emphasised is that the costs of computing in developing countries can be reduced not only by designing entirely new products but also by extending the lives of existing or older models. Whereas both mechanisms can be shown to contain important examples that emanate from the developed countries, the Human Development Report tends to focus mainly on entirely new products that originate instead in the developing countries (such as the low-cost computers from Brazil and India described above). Let us then first examine how developed country institutions contribute to extending the lives of existing or older types of computers.

4 Extending the lives of existing or older computers [8]

In the developed countries, what one observer has appropriately called the ‘perpetual-upgrade treadmill’[9], continual changes in computer software demand ever more expensive and sophisticated hardware, a process that is all too familiar to most computer users. The result, of course, is that in those countries computer hardware rapidly becomes obsolete (in the specific sense of being unable to keep up with changes in software, even though it is perfectly sound from a purely functional point of view). According to one recent estimate, for example, at least 20 million personal computers became obsolete in just one developed country (the USA) in 1998 (of which only a small fraction were recycled) [10].

Imagine, however, that the functionality of these discarded computers could be *increased* by a different type of software product, then the entire cumulative spiral (or upgrade treadmill) would potentially be reversed, with potentially massive cost savings to institutions such as schools and administrative offices in the public sector. Indeed, it was precisely this recognition that led a USA base corporation called New Deal Inc. to develop software capable of running on any computer from the earliest 286 to the latest Pentium [11]. "More specifically, this program was created 'to meet the needs of K-12 grade students and teachers' in the USA, who, "For as little as \$25 per station.... Can use New Deal software to cost effectively upgrade millions of older PC's into internet 'surf stations', greatly extending their technology budgets and planning options" [12]. In other words, schools are now able to upgrade their computers much more economically via new software than via the replacement of existing hardware.

Described thus, New Deal software was designed for and presumably has had the effect of diminishing the digital divide in the USA. It also has an obvious relevance, moreover, to schools and other institutions in developing countries, which, to a far greater extent, are unable to use ever more expensive computer hardware as a means of gaining access to the internet (a further attraction of this type of software to developing countries is that it is designed not only for the complete novice, but also for more advanced users who can choose higher skill levels). How far these advantages have actually been exploited in the Third World is not known at this point, although initiatives are already said to be in place in Southern Africa, Brazil and India.

The lives of computers discarded so readily in many of the rich countries can also be extended by transferring them (in refurbished form) to users in developing countries whose needs (in terms of computer sophistication and extra characteristics) are often much less stringent (as is the case perhaps most obviously in resource-poor schools teaching basic computer literacy). And in this area as well, developed country institutions are heavily involved in helping to bridge the global digital divide. Rather than seeking to provide a comprehensive list of such institutions, however, I will focus on just a few of the more important examples. Consider, to begin with, the activities of Computer Aid International, a not-for-profit organisation based in the UK [13]. Essentially, this organisation relies on groups of volunteers to refurbish donated computers which are then recycled to needy institutions in the Third World such as schools and community groups. Computer Aid International has already used this approach to send some 6,000 refurbished computers to a wide range of institutions in different parts of the developing world. The World Computer Exchange is also a non-government-organisation based in the developed world (the USA in this case) that is involved in the recycling of second-hand computers (donated mainly by large US companies) to the developing countries. With the specific goal of bridging the international digital divide, this educational NGO works with partner institutions in the developing countries whose tasks among other things, are to install, maintain and connect the recycled computers in their local schools. For 2001 alone, the World Computer Exchange has scheduled ten shipments containing 3,800 computers to 500 schools, serving over 200,000 students in a wide variety of different developing countries (with the expectation that even more shipments will occur during the year) [14].

5 Creating new computers

The Human Development Report pays particular attention to the new low-cost computers designed in Brazil and India, as noted above. Yet, even in this area, innovations have emerged in the developed countries which also have considerable relevance to potential users in poor countries. Prominent among these is the 'New Internet Computer' produced by The New Internet Company, a spin-off of the well-known US firm Oracle Corporation [15]. Essentially a personal computer lacking a hard disk drive and using open-source Linux software, this device targets users requiring only e-mail and internet access and costs only \$199.99. At this price, the New Internet Computer is said not only to cost less than the cheapest personal computer but also to be the lowest-cost mode of access to the internet.

From within developed countries one can point also to innovations that allow individual computers to network with one another so as to spread internet access within certain institutions (such as schools). This technology is based on a simple device, which, within a limited radius, permits internet access to multiple users via wireless (that is, via wireless local area networks). There are at least two such devices, one of which is called 'AirPort' and the other is known as the 'Residential Gateway', manufactured respectively by Apple Computer Inc. and Lucent Technologies (and costing in each case a few hundred dollars). "Wireless networking, even over such short ranges, is attractive for several reasons. Because a single base station can support several machines, all the machines in a house or small office can be connected without having to run cables everywhere, and they can be moved around easily" [16].

If, therefore, the private sector in developed countries has contributed innovations that lower the cost of internet access, so too is this quest being pursued by at least one prestigious university in those countries. Probably some of the best known of those efforts are occurring in the MIT Media Lab, which among other things, is establishing a new research consortium, known as 'Digital Nations' which will seek,

"...to develop ultra-low-cost technologies so that computing and communications become accessible to everyone on the planet. We expect to develop computers that cost just a fraction of the price of today's machines and that open up new opportunities of interaction away from the traditional desktop. New wireless technologies will enable communities to leapfrog to the digital world, avoiding the high expense of traditional telecommunications infrastructures." [17]

Among the specific projects that the Media Lab is considering in this regard is the opening of a media laboratory in India that will focus on developing information technologies for the rural poor.

6 Non-computer modes of internet access

In the previous section we dealt with computer-based modes of diffusing internet access more widely in developing countries. This last section, by contrast, examines modes of internet access that do not rely on computers and which have originated in the developed countries (and in some cases have already been applied in the Third World).

Worldgate, for example, is a leading USA based corporation which offers internet access via a cable set top box rather than a computer or modem. At a price of below \$100 the set top box uses a common household television and a special keyboard [18]. As such this device would appear to be particularly well-suited to developing countries in which the ownership of televisions is markedly higher than the ownership of computers, since it is the former rather than the latter, which determines the potential for the use of set-top boxes as a means of gaining access to the internet. India is a country that clearly falls into this category since,

"According to India's National Association of Software and Service Companies approximately 75 million people in [that country] have television sets compared to 4.3 million with PCs and 26 million with telephones. In a country with a population of more than 1 billion people, this represents a huge potential for non-PC based internet access." [19]

A similar story can be told for China, where, one assumes, set-top boxes will also grow rapidly in the future. Indeed, by 1999, a contract between the "MyWeb business unit of New York-based Asia Media Communications .... [led to an outcome where] Beijing Telecom and MyWeb will jointly deploy 200,000 units of MyWeb set top boxes" [20]. In fact, one observer has gone so far as to forecast that "Because of their low cost compared to a personal computer, set top boxes ....could become the dominant means of internet access [in China] in a few years" [21].

Looking somewhat further into the future, a combination of Western and Asian business leaders, operating under the aegis of the World Economic forum, is working on a project (aimed specifically to bridge the digital divide) which is based on "modified Linux game consoles equipped with satellite links". Those involved with the project (including major corporations such as Cisco systems and Hewlett-Packard) are said to be considering a number of ways of connecting the modified consoles to the internet [22].

7 Conclusions

The most recent Human Development Report [1] rightly stresses the potential of information technology and other new technologies for developing countries. Again rightly, the Report argues that these innovations will need to be adapted specifically to the needs of such countries if they are to help bridge the digital divide with the rich, industrialised countries.

In its search for low-cost (and in other ways appropriate) innovations, however, the Report focuses almost entirely on a small set of such technologies that originate in the developing countries themselves. The problem with this focus, in our view, is not that these innovations are unimportant. On the contrary, they show that at least some developing countries can themselves do much to benefit from the multiple advantages afforded by information technology. Our problem with the Report is rather that this focus is far too narrow in the sense that it neglects all the efforts currently being made in the *developed* countries to overcome the enormity of the global digital divide. Some of these derive from the efforts made by the developed countries to bridge their own internal digital divides, efforts which may also be relevant to the Third World. What also needs to be recognised in this regard are the host of institutions in the developed world (such as private firms, NGOs and universities) that are specifically concerned to diffuse low-cost

information technologies throughout the developing world. In combination, these two recognitions give rise to a host of options that are neglected by the Human Development Report. We considered these possibilities under the headings of telecommunications, computer hardware and software, and non-computer modes of access to the internet, in the hope that they will prove helpful to policy makers who are concerned to overcome the global digital divide.

References and Notes

- 1 United Nations Development Program (2001) *Human Development Report*, Oxford University Press.
- 2 One of which is the small-scale, low-cost digital switching technology developed in India during the 1980s. See Pitroda, S. (1993) 'Development, democracy and the village telephone', *Harvard Business Review*, Vol. 71, No. 6.
- 3 For a more extensive discussion of the 'Simputer' see Iyengar, S. (2001) 'India to compute on the cheap', 28 June, available at www.Wired.com.
- 4 This point is argued in relation to R&D in India by Reddy, P. (1997) 'New trends in globalization of corporate R&D and implications for innovation capability in host countries: a survey from India', *World Development*, Vol. 25, No. 11.
- 5 See, for example, US Department of Commerce (2000) *Falling Through the Net: Toward Digital Inclusion*.
- 6 For a full discussion see VITA, *Information Services and Low-Cost Remote Area Connectivity for Humanitarian and Development Organizations and the Communities They Serve*, available at www.vita.org.
- 7 WorldSpace Foundation, available at www.worldspace.org.
- 8 This section draws on James, J. (2001) 'Low-cost computing and related ways of overcoming the global digital divide', *Journal of Information Science*, forthcoming.
- 9 Frauenfelder, M. (2000) 'Never say die', March, available at www.wired.com.
- 10 Metcalfe, B. 'New deal seeks to recycle across digital divide with bloatless ease for just \$99', available at www.infoworld.com.
- 11 For details of the activities of this corporation, see www.newdealinc.com.
- 12 'Software breakthrough brings internet to legacy computers: browsing the web on a 286 PC', available at www.newdealinc.com.
- 13 For more details see 'Recycling unwanted computers to needy users in Africa', available at www.cddc.vt.edu.
- 14 Details about the Exchange are available in (2001) *Balancing Act*, 22 Jan..
- 15 Streitfeld, D. (2000) 'For a dead idea, the 'network computer' is downright sprightly', *Washington Post*, 12 June.
- 16 (2000) 'The wireless internet: a LAN line', *The Economist*, 11 Jan., available at www.economist.com. Note in this regard that in the developed countries, some individuals have begun using the technology developed initially for indoor use, outside. Indeed, in one such 'outdoor' form, WLAN technology has grown into what might be called a 'free-network' movement, the members of which supply free wireless access to the Internet in their own particular neighbourhoods. This is a movement that may in the future have enormous implications for developing countries. For details of what is involved, see www.wlan.org.uk.
- 17 See 'Digital nations: a new research consortium at the MIT media laboratory', Digital Nations Prospectus, available at www.media.mit.edu.
- 18 See www.wgate.com.
- 19 (2000) 'WorldGate brings interactive TV to India', 28 August, available at www.wgate.com.

- 20 'Set-top boxes for cheap internet access in China', available at www.hkbu.edu.
- 21 Williams, M. (1999) 'TCL to bring Venus set top box on China market', Aug., available at <http://news.cnet.com>.
- 22 (2001) 'Modified game consoles to narrow digital divide', 6 July, available at <http://edition.cnn.com>.