d3

Digital Divide Doctoral Student Workshop

Alliance for Community Technology
University of Michigan
Ann Arbor, Michigan, USA
August 1 - 5, 2001

http://www.communitytechnology.org/d3

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Alliance for Community Technology

May 22, 2001

[addressee]

Dear *[name]*,

I am pleased to invite you to participate in an international gathering of doctoral students researching the digital divide.

d3: Digital Divide Doctoral Student Workshop
Wednesday, August 1 through Sunday, August 5, 2001
The University of Michigan School of Information, Ann Arbor, Michigan

You will be a guest of the Alliance for Community Technology (a unit at the University of Michigan), which will purchase your air ticket, food and lodging, and host the conference itself. For more information, please refer to the enclosed arrangements and agenda sheet.

We are planning a working seminar and have invited 20 doctoral students from more than a dozen countries to participate. Our hope is that this small working gathering will help create a virtual community where all digital divide doctoral students can convene and exchange information and ideas. With this in mind, our design for the conference aims at three outcomes:

- an edited volume of the reports of the workshop (also available online)
- a short consensus statement on digital divide research for all doctoral students to sign
- a means for all digital divide doctoral students to continue the discussion

Each workshop participant will provide a working paper on a relevant aspect of digital divide research and the group will discuss each paper. Your working paper should address the topic of *[topic]*. Communication over the coming weeks can further clarify the topics, which are also briefly described on a separate page.

Each working paper will be a critical review of the literature, and will include:

1) Research in this area to date
2) Research in this area by doctoral students
3) The future of research in this area: trends, gaps, priorities
4) A bibliography, including any URLs

We suggest that papers be no more than 15 pages (7,500 words), plus bibliography. The bibliography should be sent in by July 1. The paper should be sent in by July 15. Everything will then go on a secure website for participants to review in advance.

Accepting this invitation carries with it your commitment to provide a paper by the time requested for the group to learn from and discuss when we meet.

If you would like to participate, please respond as soon as possible. Natasha Arnold on our staff will then contact you to begin making your travel arrangements.

Thank you,

Kate Williams
Alliance for Community Technology
University of Michigan School of Information
katewill@umich.edu

Enclosures:
Arrangements and preliminary agenda
List of working paper topics

Arrangements and preliminary agenda

Arrangements/Accommodations

Your air ticket will be round trip between a city near your home or school and Detroit, Michigan, which is the closest major airport to Ann Arbor. In addition to the air ticket, your invitation includes your ground transport, lodging and food from dinner on Wednesday, August 1 through lunch on Sunday, August 5.

Each day breakfast will be available where everyone will stay, Oxford House. Lunch will be at or near the School of Information. Thursday, Friday and Saturday dinners will be at nearby faculty homes or restaurants.

Preliminary Agenda

Sessions will review and discuss each participants' working paper and determine plans for follow-on activity.

Wednesday, August 1

Participants arrive in Ann Arbor and check in. Dinner available at lodgings.

Thursday, August 2

Sessions all day

Friday, August 3

Sessions all day

Saturday, August 4

Sessions all day

Dinner and music at nearby jazz club

Sunday, August 5

Morning session

Lunch and depart

Working paper topics
What do we know? What do we need to know?

1. **Introduction:** What is the digital divide? What is digital divide research? Why does it matter?
2. **The computer:** What is it about the past and future evolution of the machine that separates the technology haves from the have nots?
3. **Open source:** What is the open source software movement and how does it or might it impact the digital divide?
4. **Method:** What research methods are in use, and what are needed?
5. **Digital divide policy (US):** Digital divide policy in the United States
6. **Digital divide policy (G7/EU):** Digital divide policy in the G7 countries and the European Union
7. **Digital divide policy (Third World):** Digital divide policy in Asia, Africa, Latin America
8. **Education and learning:** Efforts to bridge the digital divide in education
9. **Community networks:** Community networks impact on the digital divide
10. **CTCs:** The impact of community technology centers or telecenters
11. **Economic development:** The digital divide and economic development—jobs, small business development, entrepreneurial activity
12. **Gender:** Gender and the digital divide
13. **African Americans:** As an example of a technology-poor cultural group within a technology-rich country, what about African Americans and the digital divide?

Considering the above topics and any others, what does the digital divide look like in these parts of the world?

14. **China**
15. **Australia**
16. **India**
17. **Southern Africa**
18. **West Africa**
19. **Germany**
20. **Canada**
21. **Mexico**
22. **El Salvador**
23. **Trinidad and Tobago**
24. **Cuba**

What is the digital divide?

A working paper for the d3 workshop, Ann Arbor, MI, August 2001

by Kate Williams (katewill@umich.edu http://www.umich.edu/~katewill)

draft – please cite only with permission

Our goal at this workshop is to contribute to building a scholarly community around research on the digital divide. This means two things: evaluating the body of research to date and proposing a research agenda that places our work into a common framework and enables us to collaborate. If we are successful, then specific activities—reading and using each other's work, being in communication online and at conferences and such, doing research together, and drawing in other people with us, will follow.

This paper, which also serves as an introduction to the rest of the papers, examines a set of widely varied research on the digital divide and proposes a framework that can organize and interrelate this research. The researchers we'll review have been working in different disciplines. They use different vocabularies and different definitions of the term "digital divide," each of them useful. We are picking up many colorful puzzle pieces strewn across a landscape, and laying them on a table to fit them together.

The puzzle pieces here are mainly products of the U.S. scholarly literature and this is part of why it is not a comprehensive set. They are primarily the strongest theoretical concepts and the established quantitative datasets.

First, we'll consider the digital divide itself. Where did it originate? We will see that the concept is rich, that it has both a history and a future. We will see that the concept is not punditry or policy talk. It is an intellectual concept that is part of information science and part of the multidisciplinary study of the information society.

Next, we turn to the extant data. What do we know empirically about the digital divide? What patterns does the data reveal? What theoretical frameworks does it suggest?

Then, what other concepts—themes—emerge from conceptual work relating to the digital divide? These will help us build around our theoretical scaffolding.

Finally, where are the gaps where the data is missing or the concepts unexplored -- or at least undiscovered by this writer? What do we need to know?

Origin of the term "digital divide"

How it happened

In a series of January 2001 emails[1] on the U.S.-based listserv digitaldividenetwork[2], list moderator Andy Carvin and others presented their research and recollections of how and when the expression "digital divide" arose. During 1995-1997, both the

[1] Irving 2000

[2] Benton Foundation, Washington, D.C. http://www.digitaldividenetwork.org

U.S. administration and U.S. journalists used the term to describe the social gap between those involved with technology, particularly between children and their schools. Speaking of a mobile computer lab in a truck, Al Gore said, "It's rolling into communities, connecting schools in our poorest neighborhoods and paving over the digital divide."

Larry Irving was the original head of the National Telecommunications Infrastructure Administration at the Department of Commerce, to which we will return later for their national survey data. In the email exchange, Irving affirms that the four NTIA household surveys were "the catalysts for the popularity, ubiquity, and redefinition" of the term. As those surveys defined it, the digital divide is the social gap between those who have access to and use computers and the Internet. The surveys examined telephone penetration and uncovered demographic patterns of information and communications technology (ICT) access and use. Among other things, the studies revealed a "racial ravine"[3]—a persistent and widening disparity between rates of ICT access and use by white Americans and African Americans.

In the email exchange, Larry Irving defends the term from recent attacks, most prominently by the Republican appointee to the Federal Communications Commission chairmanship, and notes

> the wrongheadedness of trying to take a phrase that has near universal acceptance (expect for a few K Street and Tysons Corner lobbyists) and understanding and turn it into typical Washington style Orwellian Newspeak, (i.e. Digital Opportunity, a truly meaningless and worthless term.)

Elsewhere, Irving roots U.S. concern about the digital divide in "our nation's almost century long commitment to universal service,"[4] which in the 1934 Communications Act referred to telephone service.

As Irving understands, names are important. The French are also divided over whether to call the digital divide a "fossé numérique" (digital ditch) or a "fracture numérique" (digital fracture).[5] These debates are rooted in a deeper history of the term, which we will now explore. This involves acknowledging the information technology revolution and the social polarities associated with it.

The information technology revolution

Without the digital, there could be no digital divide. What is the origin of digital, of the electronic and binary form of information? Claude Shannon, then at Bell Labs in New Jersey, first postulated the bit in a thought experiment published in 1948. The information technology revolution has in many ways been the result of implementing Shannon's "engineering theory of communications," which was that information translated into 0s and 1s could be sent from source to destination via a channel.

By most accounts, the information technology revolution has been underway for roughly 50 years. Table 1[6] shows just a few of the many names and sources for conceptions of this phenomenon.

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[3] Falling through the Net 1999, p 8.
[4] Irving 2001
[5] Garrett 2001
[6] Beniger 1986 p 4-5, and others as given.

Table 1. Selected names for the information technology revolution, with sources

computer revolution	Berkeley 1962, in Beniger 1986
knowledge economy	Machlup 1962, in Beniger 1986
global village based on new mass media and telecommunications	McLuhan 1964, in Beniger 1986
scientific-technological revolution	Prague Academy 1973, in Beniger 1986
third wave	Toffler 1980
post-industrial/post-service revolution, information revolution	Jones 1982
informationalism	Castells 1989
network society	Castells 1996

Beniger provides a much larger collection of conceptualizations of what Jones calls the "economic paradigm shifts" of the last 20th century. But even the few sources includes here indicate how scholars have seen that the computer, telecommunications, knowledge, and information are at the heart of the social revolution. Beniger also demonstrates that the then-Soviet Bloc recognized and was studying these same developments. Toffler and Castells are just two who also include biotechnology, itself based on computers used in biology research and on a definition of information (the four nucleotide pairs that make up genetic material) borrowing from Claude Shannon.

Toffler's Third Wave was the popularization of the concepts of a third technological revolution following the agricultural and the industrial, a revolution based on developing and linking new technologies—computers and electronics, materials from outer space and the oceans, genetic engineering, and new energy sources. Jones wrote from his position as Australia's minister of science.

Castells presents the concept of the network society: A network of information and communications networks, organizations and people forms the backbone of knowledge generation and information flow, including financial and commercial transactions, marketing, culture. Just as the early builders of electricity systems and telephone systems understood, value arose from the number of customers or nodes on the network. And we return to the concept of the binary digital divide: one can be on or off the network.

Social polarization

Castells and Jones are among those who describe a social polarization within the information technology revolution, within the new society. Castells, in a paper titled, "The informational city is a dual city: Can it be reversed?" writes:

> [T]he two processes, informationalization and dualization, are intertwined under the current social, political, and economic conditions in most of the world, certainly including American cities. New information technologies are certainly not the cause of this association between informationalization and sociospatial exclusion. The roots of social exclusion are in the politics of capitalist restructuring that have prevailed in most societies since the 1980s. The power of new information technologies, however, enhances and deepens

> features present in the social structure and in power relationships. … A real possibility exists of evolving toward systemic urban schizophrenia, that is, toward the dissolution of urban civilization in an undifferentiated exurban sprawl through telecommunicated/freeway-connected, discontinuous spaces, leaving behind "black holes" of poverty, dereliction, and ignorance, abandoned to their fate.[7]

After examining the African American communities of Chicago, William Julius Wilson presented the concept of the underclass, living in communities recently abandoned by the Black middle class and working class and now inhabited only by unemployed or only briefly employed people and thus isolated from the "job network system that permeates other neighborhoods".[8]

Table 2. Conceptions of social polarity within the information technology revolution

Underclass/truly disadvantaged	Wilson 1987
Class society	Attali 1991, McChesney 1996, Perelman 1998, Dyer-Witheford 1999, Hodges 2000
Public sphere/counterpublic sphere (proletarian, Black, feminist)	Habermas 1989, Fraser 1992, Negt and Kluge 1993, Dawson 1994, Alkalimat and Williams 2000
Racial ravine	Falling through the Net 1999

Table 2 includes the concepts and sources relating to the social polarity which precedes and is contemporaneous with the digital divide. One set of writers explicitly connect the concept of class society to the information technology revolution. McChesney[9] documents the concentration of wealth and power in just five to eight global media companies making use of ICT and deregulation for cross selling that puts other media organizations at a disadvantage. Perelman describes the social fractures and the "panopticism" (worker surveillance) involved in what he calls the "mirage of the classless information society". Dyer-Witheford sees the information age as the latest battleground in the encounter between capital and labor, while Hodges asserts that the expertise of the knowledge worker has overtaken the capital of the corporate owner so that today's class struggle is in fact post-capitalist, between the professional and the ordinary worker. Among the most vivid and nonchalant of these descriptions of class in the information age comes from the then-president of the European Bank for Reconstruction and Development, Jacques Attali:

> Severed from any national allegiance or family ties by microchip-based gadgets that will enable individuals to carry out for themselves many of the functions of health, education, and security, the consumer-citizens of the world's privileged regions will be "rich nomads." Able to participate in the liberal market culture of political and economic choice, they will roam the planet seeking ways to use their free time, shopping for information, sensations, and goods only they can afford, while yearning for human fellowship, and the certitudes of home and community that no longer exist

[7] Castells, in Schön 1999, page 28.
[8] Wilson 1987 p 57.
[9] McChesney 1996

> because their functions have become obsolete. Like New Yorkers who every day face homeless beggars who loiter around automated teller machines pleading for spare change, these wealthy wanderers will everywhere be confronted by roving masses of "poor nomads"—boat people on a planetary scale—seeking to escape from the destitute periphery, where most of the earth's population will continue to live. These impoverished migrants will ply the planet, searching for sustenance and shelter, their desires inflamed by the ubiquitous and seductive images of consumerism they will se on satellite TV broadcasts from Paris, Los Angeles or Toyko.[10]

Distinct from the discussions of class society in the information technology revolution is a another theoretical debate concerning social polarity. This is the discussion of the public sphere and the counterpublic sphere. The public sphere is the site of public discourse, a discourse which shapes intellectual and cultural life, policy and public opinion and, along with the economy, the state, and the family sphere, constitutes a society, serving as a space from which to critique the three other spheres. Various scholars have answered this concept, with descriptions of a counterpublic sphere or spheres, created and used by those who have been excluded from the public sphere in order to make their critiques and bring about transformation. Fraser describes the late 20th century feminist subaltern counterpublic, with its … journals, bookstores, publishing companies, film and video distribution" creating new vocabulary such as the word sexism.[11] Negt and Kluge examine a proletarian counterpublic sphere in dynamic opposition to the bourgeois public sphere as technologies and media evolve. Dawson relates: "An independent Black press, the production and circulation of socially and politically sharp popular Black music and the Black church have provided institutional bases for the Black counterpublic since the Civil War."[12], Alkalimat and Williams[13] document how a community technology center in the African American inner city can be a new institutional base for a counterpublic sphere by means of social cyberpower, the effective use of ICT by groups of people.

In sum, then, the term digital divide has an etymological history which has a strong basis in quantitative data in the United States as well as actual roots in the evolution of the information technology revolution and the social polarities it inherited, enhanced, and deepened.

Empirical data

Having identified the digital divide as a social phenomenon rather than merely a technological one, we can now proceed to evaluate how social science has mobilized to measure and understand it.

Table 3 summarizes a collection of 31 social surveys or reports of surveys concerning the digital divide, 30 from the U.S. and one from the U.K. These surveys are coded according to whether they are national or local, whether the unit of analysis is some type of individual/household or some type of community institution, and who collected the data.

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[10] Attali 1991 p 5.
[11] Fraser 1992 p 123.
[12] Dawson 1994 p 206.
[13] Alkalimat and Williams 2000 p 25.

Table 3. Selected digital divide surveys					
Citation (note that year of citation may not equal year of data collection)	**N**	**Unit of Analysis**	**National or Local**	**Individual or Community Institution**	**Dataset**
Kominski 1999	50,000	Households	N	I	government
McConnaughey 1995	54,000	Households	N	I	government
Birdsell 1998	15,000 in 15 different surveys	Individuals	N	I	commercial
McConnaughey 1998	48,000	Households	N	I	government
Chow 1998	817	Users of community technology centers	N	I	non-profit
Falling through the Net 1999	48,000	Households	N	I	government
John J. Heldrich Center for Workforce Development 2000	1,005	Adults in the workforce	N	I	academic
UCLA 2000	2,096	Households (panel study)	N	I	academic
Turow 2000	1,001 parents and 304 children	Parents and their children	N	I	academic
Lenhart 2000, also Spooner 2000	12,751 (some Qs smaller)	Households	N	I	commercial
Falling through the Net 2000	48,000	Households	N	I	government
Simms 2000	1,606 (1998) and 1,678 (1999)	Adults	N	I	non-profit
Czerwinski 2001	1,135	Internet users	N	I	commercial
Novak 1997, 1998	6,487	Individuals	N	I	commercial
Hoffman 1999, 2000	5,813 (1996-97), 7,157 (1997), and 4,042 (1998)	Individuals	N	I	commercial
Hawkins 1997	570	Undergraduates at a northeastern university	L	I	academic
Wilhelm 1997	72	Middle income Hispanic Californians	L	I	academic
Ervin 1999	247	Students at a Pacific northwest university	L	I	academic
Lentz 2000	830	Users of libraries and community technology centers	L	I	academic
City of Seattle 2000	1,011	Seattle residents	L	I	commercial
U. S. Department of Education 2001	1,000 each year since 1994	K-12 schools	N	CI	government
Bertot 1996	1,059	Public library systems	N	CI	academic
Bertot 1997	1,426	Public library systems	N	CI	academic
Melchior 1998	100	Youth serving organizations	N	CI	academic
U. S. National Commission on Libraries and Information Science 1999	1,888	Public library outlets	N	CI	academic
Policy Action Team 15 (U.K.) 2000	200+	Public computing sites	N	CI	government
U. S. Department of Commerce 2000	80	HBCUs and other equal opportunity educational institutions	N	CI	government
Hecht	68	Community networks	N	CI	non-profit
Stoecker 1997	189	Ohio neighborhood based organizations	L	CI	academic
Bertot 1997	188	Pennsylvania public library outlets	L	CI	academic
Wyden 2000	100	Oregon senior centers	L	CI	government
Williams 2000	18	Toledo public library outlets	L	CI	academic

The baseline research questions across many of the individual or household studies are the same:

Do you have a computer at home?
Do you use a computer at work?
Do you use a computer elsewhere?

These questions correspond to three different settings for computer/Internet use, and allow us to organize the field of digital divide research by three types of computing as in Table 4 on the next page:

personal computing,
private computing, and
public computing.

Chow 1998, Stoecker 1997 and Williams 2002 (forthcoming) identify 29 settings for public computing. To date, judging from our 32 surveys, only a few of these have been either the subject of a digital divide survey or the location for a digital divide survey of individuals.

There are also country studies and global studies of the digital divide (for example Barnard 2001, Courrier 1997, Understanding the Digital Divide 2001). But none of those obtained for this paper were surveys.

Table 5 suggests where the focus of research has been. National surveys outnumber (and generally have preceded) local surveys (23 to 8). Surveys of individuals outnumber surveys of community institutions (20 to 11). Only one survey of individuals focused on workers and therefore was located in the realm of private computing. Table 5 does not indicate this, but returning to table 3, just one survey of community institutions was of a virtual institution: the community network. (See van den Besselaar 2000 for a case study of two European digital cities, also virtual).

Table 5. Typology of the 32 digital divide surveys in table 3.

	Individual: Personal Computing	Individual: Private Computing	Community Institution or Users: Public Computing	Grand Total
National	14	1	8	23
Local	5	0	4	9
Grand Total	19	1	12	32

The extensive social informatics literature on workplace transformations in the digital age largely relies on case studies, ethnographies, interviews, participant observation. For business organization surveys, we need to further explore the U.S. Census Bureau and other agencies, which might fill what appears here as a gap.

With respect to the type of institution that built the dataset: the government began surveys on this issue 1984; academics in 1994, commercial survey organizations in

Table 4. Where to find the digital divide

Type of computing	Baseline research question	Setting
1. Personal	Do you have a computer at home?	Home
2. Private	Do you use a computer at work?	Work
3. Public	Do you use a computer elsewhere?	In the community: adult education center assistive center cable access center church college or university community network center community technology center copy shop cybercafe day care center government office hospital housing development center job training agency laundromat library literacy center mental health agency multiservice agency museum national urban league neighborhood based organization rehabilitation/drug abuse center school senior center settlement house standalone computer center youth organization other

4. National or country studies of the digital divide sum up one or more of the above three settings for a given nation.

5. Global studies of the digital divide compare one or more of the above three settings across countries.

Sources: Public settings from Chow et al 1998, Stoecker and Stuber 1997, and Williams and Alkalimat, 2002 forthcoming.

1996, and non-profits in 1998. Figure 1 points up some possible data issues. One of the prominent commercial datasets used by Novak 1997, 1998 and Hoffman 1999, 2000 is from Nielsen/CommerceNet. Only their percentages for white and African American households with computers is available, but as figure 1 indicates, that data appears to overestimate computer ownership compared to rates from the U.S. Census/Falling through the Net studies, which are of much larger populations.

In general, the largest and longest running surveys are the government surveys, particularly the U.S. Census (reported in Kominski 1999) and the Falling through the Net studies, which have been carried out in partnership with the U.S. Census.

The 32 quantitative surveys of the digital divide shows that the digital divide has been quantified in different ways across three domains of social life (home, workplace, and public spaces) and three corresponding types of computing. For the United States, chief among the public spaces are the nation's public schools and libraries.

Making use of the 16 year span of data collection by the U.S. Census Bureau and their Falling through the Net partners, we can operationalize the three types of computing as shown in Table 6. Figures 2, 3, and 4 (on pages 8, 9, and 10) present the data.

Table 6. One way to operationalize three key concepts in digital divide research

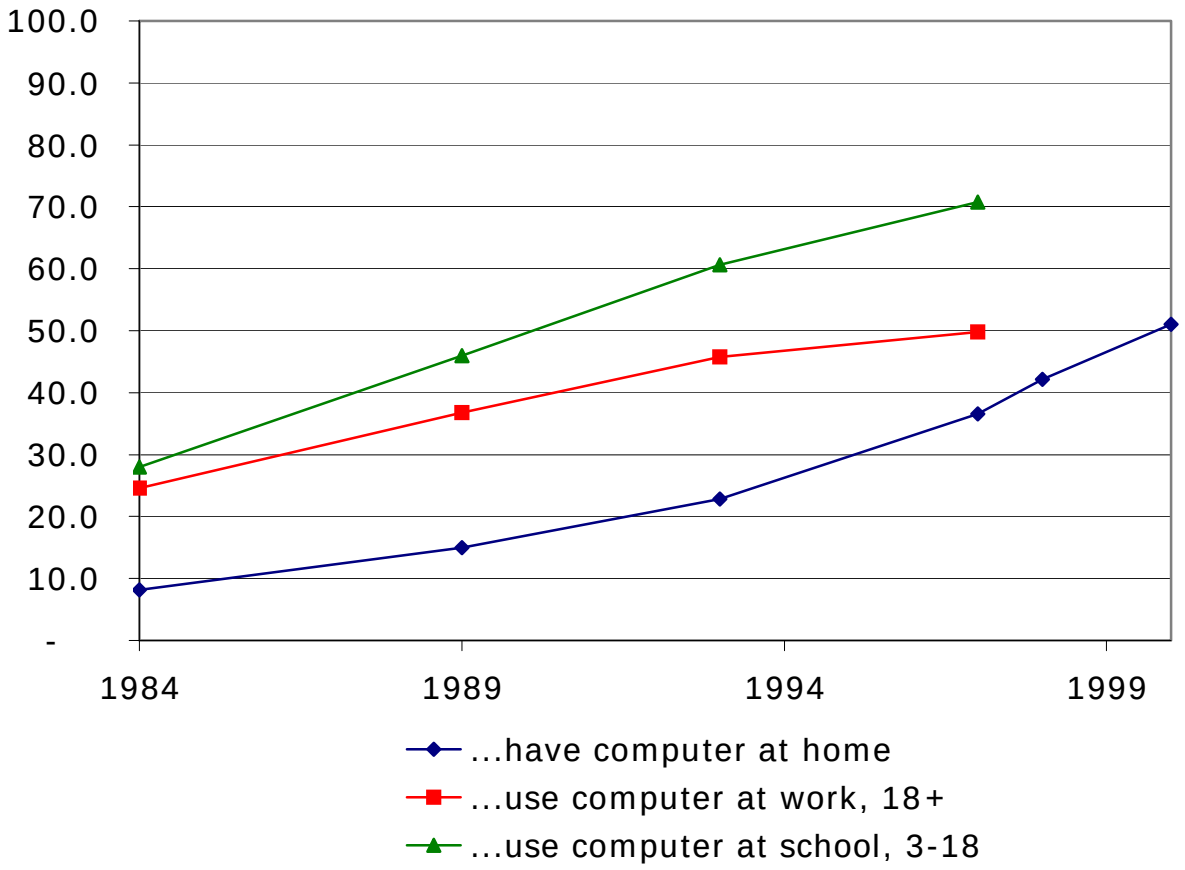
Concept	Measure
Personal computing	Percent of households with computer at home
Private computing	Percent of adults 18 and older using a computer at work
Public computing	Percent of children age 3-18 using a computer at school

Figure 2 points up public computing as the most distributed across the population, one could say (but only very roughly) the most democratic, reaching 71% of children by 1997. We can see personal computing as the least distributed, reaching 51% of households by 2000.

Crosstabulating technology data with demographic data points up digital divides not just between individuals, but between socioeconomic groups. Some groups are more likely to be "wired" than others. Figure 3 looks at white and African American households as an example. Again public computing, operationalized as children using computers at school, is the best equalizer. Private computing (using computers at work) shows a steady gap. Personal computing shows a widening gap, the gap the NTIA called a racial ravine.

Figure 4 examines the economic differential across households. It was not possible to take the highest and lowest income groups because college student households with temporarily low incomes skew into the low income strata. Educational attainment here is thus a proxy for income level. With the two most extreme education strata, the difference between the three domains is even more dramatic. Private computing and personal computing both show very wide digital divides. Public computing again is the place for equalizing or democratizing.

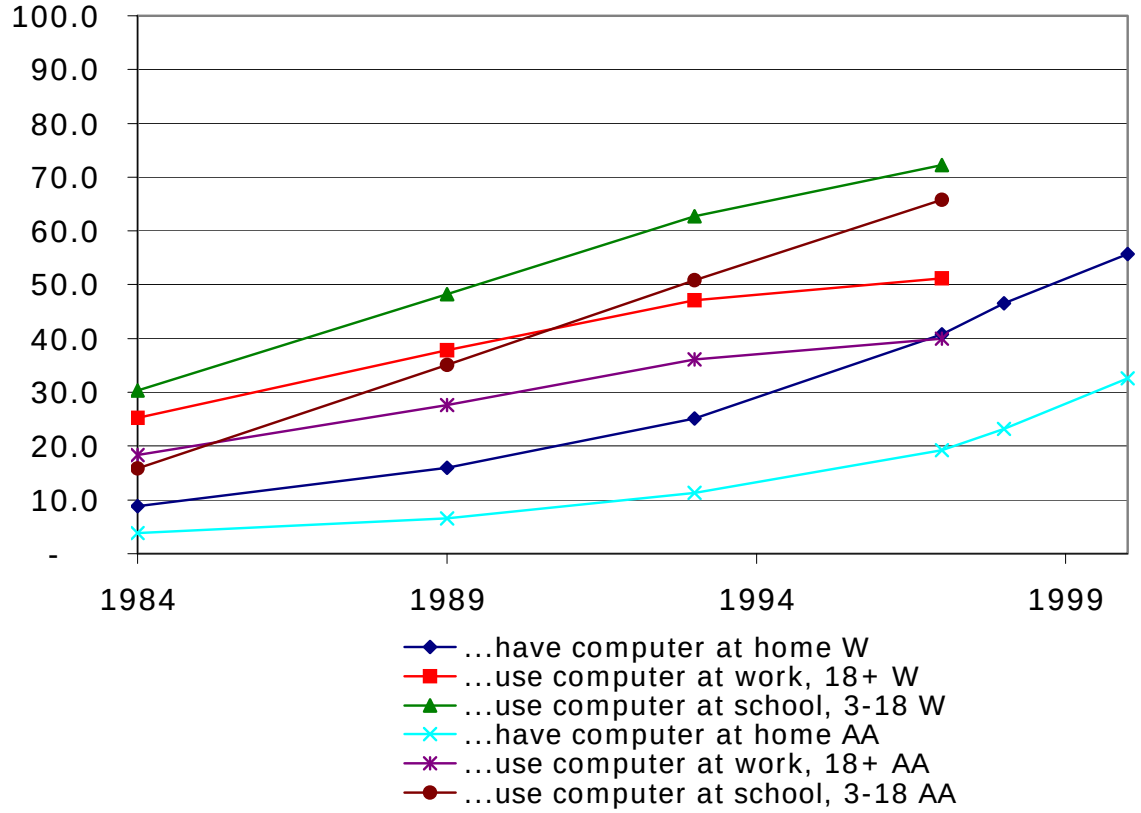
Figure 2. Operationalizing personal, private, and public computing: Percent of U.S. households which…



Percent of U.S. households which…	…have computer at home	…use computer at work, 18+	…use computer at school, 3-18
1984	8.2	24.6	28.0
1989	15.0	36.8	46.0
1993	22.8	45.8	60.6
1997	36.6	49.8	70.8
1998	42.1		
2000	51.0		

Source: 1998 and 2000 data from Falling through the Net 2000, other data from Kominski 1999.

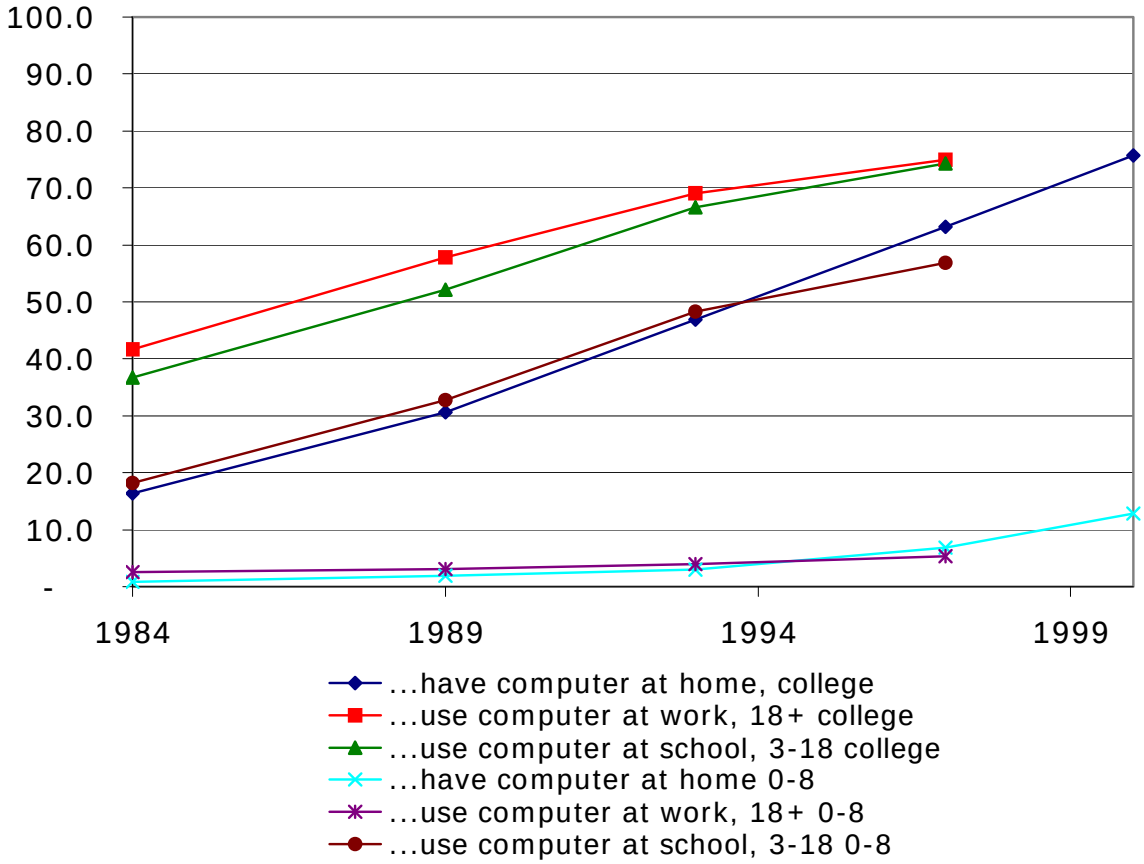
Figure 3. Comparing white and African American households



	White			African American		
	...have computer at home W	...use computer at work, 18+ W	...use computer at school, 3-18 W	...have computer at home AA	...use computer at work, 18+ AA	...use computer at school, 3-18 AA
1984	8.8	25.3	30.3	3.8	18.3	15.9
1989	16.0	37.8	48.2	6.6	27.6	35.1
1993	25.1	47.1	62.7	11.3	36.1	50.9
1997	40.8	51.2	72.2	19.3	40.0	65.8
1998	46.6			23.2		
2000	55.7			32.6		

Source: 1998 and 2000 data from Falling through the Net 2000, other data from Kominski 1999.

Figure 4. Comparing households with a college degree and those who completed 8 grades or less



	...have computer at home, college	...use computer at work, 18+ college	...use computer at school, 3-18 college	...have computer at home 0-8	...use computer at work, 18+ 0-8	...use computer at school, 3-18 0-8
1984	16.4	41.7	36.7	0.9	2.6	18.2
1989	30.6	57.8	52.1	1.9	3.1	32.8
1993	46.9	69.1	66.6	3.0	4.0	48.3
1997	63.2	75.0	74.3	6.8	5.3	56.9
2000	75.7			12.8		

Source: 1998 and 2000 data from Falling through the Net 2000, other data from Kominski 1999.

Before we move on, we must take note of at least three caveats to these charts.

First, in figure 4, literacy differences are at work as well as a digital divide. The personal computer is not user friendly for illiterate people as, say, a handheld computer game is.

Second, school is not all of public computing. Colleges, universities, libraries, are also important sites for public computing, not to mention all the 29 types of sites we saw in table 4. They may not be as equalizing as K-12 school computer usage is.

Third, school is compulsory. Compulsory computer use might be good at equalizing usage, but is it desirable? Is it something to rely on exclusively?

Finally, and we will discuss this more below, a great deal of information about the varied reality of personal, private and public computing, will remain invisible as long as we just examine answers to the baseline research questions.

But these three figures, limited just to data on the three baseline research questions regarding the digital divide, suggest a second dimension to our nascent research framework of personal, private, and public computing. We now can see there are various types of people who either use those sites or do not. Table 6 provides a 3 by 8 matrix which identifies eight types of individuals in a digitally divided society.

Table 7. Becoming digital: A typology of individuals in a digitally divided society

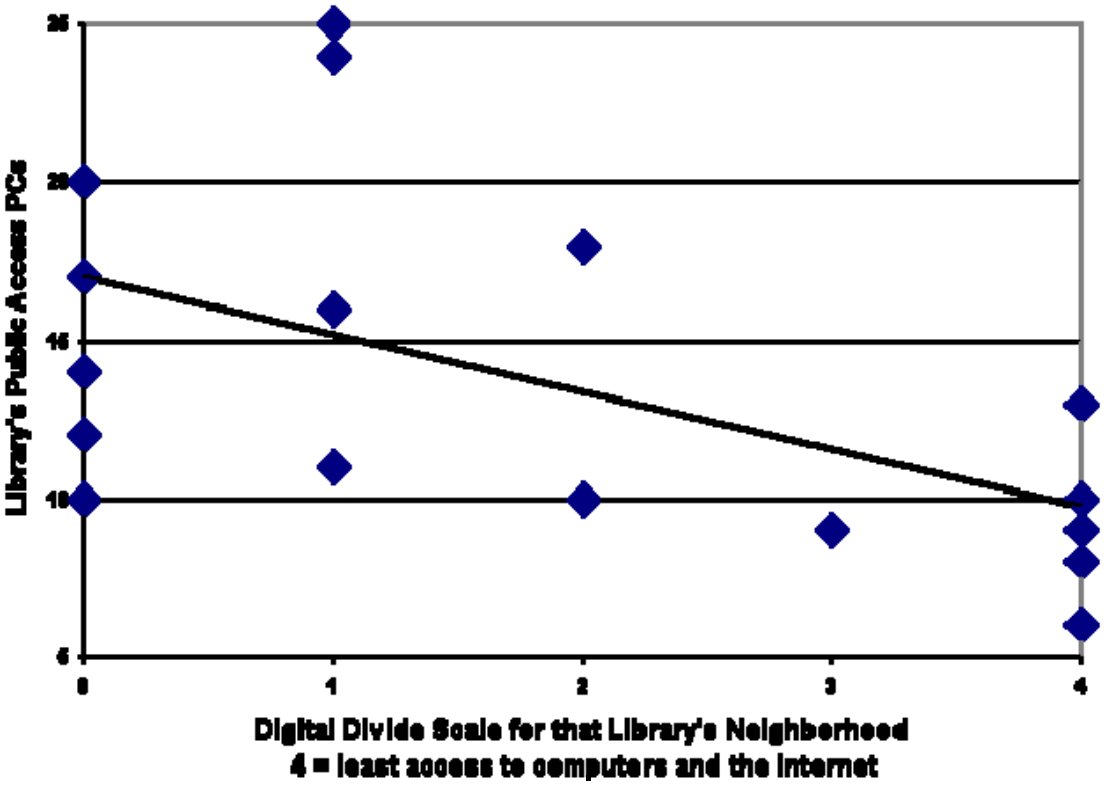
Personal computing	Private computing	Public computing		
+	+	+	1	netizenship
+	+	-	2	cyberactivism: 2 locales of connectivity
+	-	+	3	
-	+	+	4	
+	-	-	5	connectivity (in one locale)
-	+	-	6	
-	-	+	7	
-	-	-	8	exclusion

In the dynamic societies across the globe today, one can postulate that people are moving from exclusion to netizenship through various middle stages. Each movement, each stage is far more complex than computer ownership, yes or no, or computer use, yes or no. Past and future research from a variety of disciplines can be organized according to which cell or cells in this matrix it examines.

In addition, as we have seen in 12 of our 32 surveys, the unit of analysis does not have to be the individual. The institutional setting also needs to be interrogated and understood. For instance, Williams 2000 takes as its unit of analysis the public library outlet. The paper operationalizes public computing as the number of public access PCs in a given public library outlet, and measures that against a community's

digital divide status. The paper uses GIS (a geographic information system) and U.S. census demographic data to derive a measure of a community's digital divide status (as suggested by the Falling through the Net studies) within one mile of each outlet. The results in figure 5 indicate a definite trend line: library outlets in digitally divided communities have fewer computers than those in communities on the rich side of the divide. In this situation, the public libraries appear to be exacerbating the digital divide. These results bear further research, because the number of computers is an imperfect indicator of public computing: perhaps the libraries with fewer computers have allocated extra money to computer classes?

Figure 5. Public computing measured against a community's need for it



Each diamond is one of 17 library outlets (main library not included). The number of public access PCs in each outlet is on the vertical scale; the 4-point indicator of a community's being underresourced with respect to computers is on the horizontal scale. Source: Williams 2000.

Additional key concepts: Literacy and agency

Now, having boiled down the mass of data in 32 surveys to one 3 by 8 matrix-style framework for researching the digital divide, we can finish by arming ourselves as scholars with just two additional concepts: literacy and agency.

Literacy

Literacy is itself a sociotechnical system that predates the computer. We could consider the pen, paper and book in this or any recent century or the stylus, wax

tablet and papyrus scroll two millennia ago. It will be still more important to consider conceptual spin-offs from information literacy (Adler 1999) to computer fluency (National Research Council). But for now let us sum up the contributions and the experience of literacy scholars in light of the IT revolution and its social polarities.

Over two decades or more, New Literacy Studies has emerged as a network of scholars who see literacy as situated, social, cultural, and relating to power. Writing from the Australia, the U.K. and the United States, they conceptualize literacy practices generally as a variable that is dependent on myriad sociocultural realities.

Over the same time, literacy studies (lowercase) has become a split discipline. Apart from New Literacy Studies, other scholars have tended to literacy as an independent variable, upon which school and employment success depend. Projects such as an repeated multinational survey of functional literacy – testing, for example, the ability to read instructions or fill in a form, or applying and testing methods of elementary reading instruction that rely on recognizing words or sounds. For these scholars, literacy is not so much situated as mandated by the dominant communications channels in order for people to get ahead and get by.

There is also discussion between and among literacy scholars over what the workforce—and the public sphere—of the information technology revolution will require: more highly literate workers, or fewer; more functionally literate workers, or fewer; more workers, or more people prepared for leisure or idleness.

In an extended comment on a National Research Council book on the reading crisis (another phenomenon debated across literacy studies), James Paul Gee proposes some approaches to reassembling and combining the data and concepts of the New Literacy Studies and of other literacy scholars.

Many literacy scholars (Finn 2000, Lankshear 1997, Lankshear and Lawler 1987, and Rassool 1999, and Warschauer 1999 among them) are examining literacy in a computer-rich environment as well as literacy in our (so-called) information age. They have explored the daily texture of computer use in rich and low-income schools, communities, and countries and uncovered the power differentials that facilitate the maintenance of a digital divide. For instance, Lankshear and Finn are two literacy scholars who have each established that computer use by lower-income students tends to be more drill, less exploration; less time per week; and more student per computer. This close-up work merits more attention from digital divide scholars. But we must also see that these scholars are already headed our way, bringing a rich, even if (or because) contended, research literature to bear on the problem of the digital divide.

In advance of deeper exploration, what we can take from literacy studies is the recognition that the world of bridging the digital divide includes many identical issues. In general, people access computers and the Internet in order to better navigate their world as it is (in a rough correspondence to functional literacy) as well as to transform their communities and thereby the world (situated, social, cultural, multiliteracies). What we can see from our work in the digital divide is that people in fact need to and want to do both. And this is possible.

Agency

And this brings us to Agency. If we hold the rich concept of literacy in one hand, agency is the concept to hold in our other hand. Agency means examining the "digitally divided" not as mute objects of a powerful sociotechnical phenomenon, but as subjects of their own lives and active agents in the information technology revolution we started at in this paper. Our discussion of the counterpublic prepared us for this. As an example, Christopher Mele (1999) documents how mothers and grandmothers living on public assistance in public housing in North Carolina used the Internet via one previous locked-up public access computer to rally professional resources and win a seat at the planning table when housing managers decided to tear down apartments. Alondra Nelson (2000) presents a book of examples of less-powerful communities, cultures, and individuals "appropriating technology" for self expression and political mobilization—a new-technology echo of the literacy/power/culture nexus that the literacy scholars have uncovered in their studies

Ron Eglash (1999, 2001a, 2001b) carries this concept further by describing the digital divide as a two-way bridge, because knowledge and technology exist on both sides of the divide and spanning the divide means bringing both together usefully. Commenting on a project in rural Africa, he writes in an email:

> Rather than view the rural community as a place of technological absense, view it as having a *different* set of technologies than the west does. Your challenge is then to provide a kind of "translation" to make both sets of technologies—indigenous and western—available to both sides.

In studying such phenomena as low-rider "street engineering" of cars and fractal patterns in African architecture and hair design, Eglash focuses on the production of sociotechnical artifacts by people at the margins, with the orientation that:

> [a] society may be at the margins of political and economic power, but their knowledge systems can produce information that winds up in a first world high tech laboratory.

* * * * *

In the ten days of finishing this paper,

- The leaders of the G-8 governments convened in Genoa with one agenda item being their plans for bridging the digital divide, a full year after commissioning a report on the issue
- A photo of the first McDonalds restaurant providing Internet access to customers (in Israel) was printed in the Toledo (Ohio) Blade

The 20-odd doctoral students convening in Ann Arbor have experienced ourselves the excitement and the sometimes-unwarranted enthusiasm of those already wired who see the digital opportunity. We have also seen and experienced ourselves the frustration and sometimes-unwarranted feeling of powerlessness of those who see the digital divide.

Science, particular interdisciplinary, international, youthful science as it can be today with its laboratories and institutions wired, its universities as anchors for knowledge

development, its doctoral students among the most technologically adept, has a key role to play in making sense of these and other such developments, and then contributing to policy development. The work, let alone hitting the mark, is quite exciting.

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Computers, System Design and the Digital Divide:
Meeting Information Needs

Kent Unruh

Abstract:

Computer systems originated in the minds of scientists who were interested in extending human exploration, problem solving and communications. The personal computer and Internet have permeated the workplace and the home. Despite this, reports still indicate that computer ownership is not universal and that significant portions of society in the United States do not have reliable access to digital services. While there are many facets to the digital divide, the design and development of digital technologies and computer systems in particular play a significant factor. However, the technology that is common in the marketplace today is not necessarily designed to meet the information needs of those without access. The design has been driven primarily by workplace environment. More efforts need to be made to design systems that derive from the study and analysis of the everyday user in particular contexts.

Keywords: Contextual Design, Digital Divide, Computer History, Information Systems, System Design, User Centered Design

The Digital Divide

The term 'digital divide' continues to evolve in both meaning and conceptual boundaries. In the United States, the Department of Commerce defines the digital divide as "the disparities in access to telephones, personal computers (PCs), and the Internet across certain demographic groups (Department of Commerce, 2001, p. 18)." The Benton Foundation uses the term to describe a broader construct. "We use the term 'digital divide' to refer to this gap between those who can effectively use new information and communication tools, such as the Internet, and those who cannot (Benton, 2001)." Literature discussing components of the digital divide often incorporate the use of the term 'Information and Communication Technologies' (ICTs) to address technology in a broad sense, referring to whole systems including hardware devices, software systems, connectivity, and network resources (Lax, 2001) (Baker 2001).

Increasingly, the concept of digital divide is broadened beyond access to technology resources to issues of content and use. For example, Williams (2001) describes several characteristics of digital divide and its relation to specific populations. "This divide is between those who can access and use phones, computers, and the Internet and those who cannot. There are economic,

cultural, and also spatial dimensions to this divide, because, for example, the lower income inner city community is excluded structurally and physically, living in unmarked but well defined neighborhoods with different or fewer resources." Baker (2001) argues that the digital divide can be conceptualized from a user standpoint as a sub optimal condition of:

- access to technologies
  (oriented to hardware, networking, and access to advanced IT/Telecom services).
- content available
  (services and information can be accessed)
- utility/awareness
  (to the actual value as well as the perceived value or awareness of the user/citizen/business of the use of ICTs and associated services)

In a broad-based study on civic engagement, information poverty, and the worldwide Internet, Norris (2001) analyzes the digital divide on three dimensions. "The concept of the digital divide is understood as a multidimensional phenomenon encompassing three distinct aspects. The global divide refers to the divergence of Internet access between industrialized and developing societies. The social divide concerns the gap between the information rich and poor in each nation. And lastly within the online community, the democratic divide signifies the difference between those who do and do not, use the panoply of digital resources to engage, mobilize, and participate in public life (p. 1)." Norris (2001) makes several observations about the digital divide in the global arena:

- Despite a rise in the estimated number of Internet users from approximately 26 million in 1995 to 257 million in the Spring of 2000, still only 4% of the world's population are online.
- "In most developing nations the inequalities of resources that continue to produce disparities in health care, longevity, and education are also evident in the Virtual World (p. 5)."
- Basic access issues must be resolved before potential benefits of digital resources can be realized. This is true not only for developing nations but also for the "social divide" that refers to the "inequalities of Internet access and use by disadvantaged

groups within society, even in countries at the forefront of the information society (p. 4)."

The United Nations expresses similar concerns about the global digital divide in a report on human development: "The network society is creating parallel communications systems: one for those with income, education and literally connections, giving plentiful information at low cost and high speed; the other for those without connections, blocked by high barriers of time, cost and uncertainty and dependent upon outdated information (UNDP, 1999, p. 63). "As a result," according to Norris (2000), "poorer societies can become increasingly marginalized at the periphery of communication networks (p. 2)."

In the United States, the Department of Commerce has issued a series of reports from 1995 too 2000 entitled "Falling Through The Net" to document access issues across the country. The initial report documented the changing role of ICTs that moved beyond telephony. "While a standard telephone line can be an individual's pathway to the riches of the Information Age, a personal computer and modem are rapidly becoming the keys to the vault (Department of Commerce, 1995)." Concerned about this expanded role of information technologies, the Department of Commerce conducted additional studies that indicated that "the less that one is educated, the lower the level of telephone, computer, and computer-household modem penetration (Department of Commerce, 2001, p. 11)." In 1998, the Department of Commerce reported nationwide household access rates for telephone, computers, and Internet at 94.2%, 51% and 41.5% respectively. The report also indicated that computers in the home were concentrated in the upper income levels with 86% of the households with the income levels above $75,000 having computers. While the Department of Commerce reports increased digital inclusion for many segments of the population, general statistics indicate that roughly 45% of the general population in the United States have Internet access in the home with minorities lagging significantly behind this number with a 23.5% penetration rate for Black households and 23.6% in Hispanic households (Department of Commerce, 2000). The largest factor that drives Internet access in the United States continues to be income. "Although a combination of factors determines consumer likelihood to be online, income is the strongest predictor—across ethnic groups, online penetration rises as income rises (Walsh et al., 2001, p. 279)."

Development of Modern Computing Systems

There is a significant range in both the typology and complexity of the technologies discussed within the literature on the digital divide. The Department of Commerce reports, for instance, initially focused on access to computers and modems with emphasis on independent, proprietary networks such as Prodigy, Compuserve, and America Online (Department of Commerce, 1995). The 1998 and 2000 reports expand the focus to Internet access (Department of Commerce, 1998, 2000). Some studies (e.g. Hoffman, et al. 2001) have started to move beyond Internet access to examine Internet use of specific populations. This movement from defined systems (e.g. computers, modems, proprietary networks) to globally distributed network resources (e.g. the Internet) is an order of magnitude leap in technological complexity. This complexity is increased yet further when considering the specific usage patterns of multiple integrated technologies. Generalizations at this level are difficult if not impossible.

However, the systems and the technology behind them cannot be ignored. At the base of the discussion of the digital divide lies the technology itself. Access to systems of information and communication are at the heart of the concern about equitable distribution of technological resources. What role do these resources play in the digital divide? How have the development of these systems enabled or inhibited public access to information and communication? What is the role of system design? One approach to these questions is to review the panoply of current and historical technology and attempt to assess their applicability to public access. Ifrah (2000), Freiberger & Swain (2000) Jonscher (1999) Naughton (2000) Rojas & Hashagen (2000) provide excellent reviews of technology in historical context. An analysis of their historical accounts of developing technologies for the purposes of narrowing the digital divide provides limited utility, however, because most technological systems have been designed and implemented for particular work contexts and not to provide ubiquitous information and communication access to the entire public. The more beneficial approach taken here, is to promote the design of technical systems to meet the information and communication needs of those currently without access or effective use of digital resources. Designing systems for particular purposes will result in enabling information behavior of individuals in particular contexts. Sections on system development methodologies and an example based on a current study of online help seeking

through library-based initiatives in the United States are provided below. To frame the discussion, the paper first returns to three seminal concepts in the development of computer systems: the organization of information for access, connectivity, and the user interface. The problems and ideas behind the development of each of these concepts are of interest because they form the basis on which specific technologies and systems are eventually developed.

Organization of information for communication and access

In the United States, Vannevar Bush is credited with identifying the growth in stored knowledge and the challenges of accessing it. Bush, an MIT scientist that headed the Office of Scientific Research and Development which coordinated the contributions of over 6000 scientists during World War II, made a critical observation that the exchange of scholarly information was inhibited by the inability to effectively access relevant and specific information upon which quality research depended. In a classic paper, Bush (1945) outlines this 'information problem' and urges scientists to "turn to the massive task of making more accessible our bewildering store of knowledge (p. 101)." While Bush may not have been the only scholar to identify the growth in stored knowledge or the challenges of accessing it, he is recognized as one of the first in the United States to articulate the information problem as a fundamental barrier to modern research. Bush (1945) makes several important observations about how this phenomenon was affecting the scientific community: (a) scientists were simply bogged down with information as specialization extends the boundaries of knowledge (b) information contained in publication had expanded beyond the ability to be of practical use, (c) "professionally [scientists'] methods of transmitting and reviewing the results of research are generations old (p. 101)" and (d) more generally, the current methods of accessing organized/indexed material do not correspond to the way people consider and associate ideas. Within the scientific community, these issues remained directly relevant for years to come. For example, Roger Summit, a research scientist with Lockheed Missiles and Space Company in the 1960's confirms this point rather dramatically by explaining that "the common argument around Lockheed was that it was usually easier, cheaper, and faster to redo scientific research than to find out if anyone had ever done it before (Summit, 1998).

Bush's forethought and identification of crucial issues was not limited to the scientific community. Rheingold (2001) notes the broader conceptualizations and implications for the everyday user of information:

> But the future technology that Bush foresaw extended beyond the borders of science to the general citizenry. The day was coming when not only scientists but ordinary citizens would be required to navigate through ever-more complicated realms of information. In the pages of the *Atlantic*, Bush proposed that a certain type of device should be developed, a device to improve the quality of human thinking. Because one of its functions was to extend human memory, Bush called his hypothetical machine a memex. But Bush was one of the first to see that rapid access to large collections of information could serve as much more than a simple extension of memory. Although he described it in terms of the primitive information technologies of the 1940's, the memex was functionally similar to what is known as a personal computer—and more (pp. 175-176).

Connectivity

Connectivity to networked resources is the second essential concept shaping systems development. J.C. R. Licklider, a psychologist and computer scientist who held positions as professor at Harvard University, head of the Human Engineering Group at MIT and head of ARPA's information technology division played a key role in distilling the concept of connectivity. In a series of memos Licklider (1962) outlined a vision of networks and connectivity. Licklider "envisioned a globally interconnected set of computers through which everyone could quickly access data and programs from any site (Leiner, et al., 2001)." Licklider was one of the first to explicate the importance of computer connectivity to assist with tasks and the development of ideas. "He [envisioned] geographical barriers falling, as researchers share information and like-minded people communicate (Moschovitis et al, 1999, p. 49).

This conceptualization of the importance of connectivity was not developed out of brainstorming about technology itself but on specific problems he encountered. As a psychologist, Licklider knew the importance of the interaction between tasks, people, and ideas. The problem was that the people with potentially relevant ideas to particular tasks were not necessarily co-located. In his classic memo to "Members and Affiliates of the Intergalactic Computer Network" Licklider (1963) made explicit the interconnectedness of work as it related to specific technical projects. "It is evident that we have among us a collection of individual aspirations, efforts, activities, and

projects. These have in common, I think, the characteristics that they are in some way connected…the individual parts are…mutually interdependent (p. 1)."

Licklider and Taylor (1968) flesh out this concept of connectivity in an article entitled "The Computer as a Communication Device." They believed that "in a few years [people] will be able to communicate more effectively through a machine than face to face (p. 21)." They emphasized that the design of systems to facilitate such communication must be built upon two key concerns: (a) an emphasis on people and their tasks and (b) an understanding that to communicate is more than simply to send and to receive. "We believe that communicators have to do something nontrivial with the information they send and receive. And we believe that we are entering a technological age in which we will be able to interact with the richness of living information—not merely in the passive way that we have become accustomed to using books and libraries, but as active participants in an ongoing process, bringing something to it through out interaction with it, and not simply receiving something from it by our connection to it (p. 21)."

Rheingold (2001) notes several important key ideas behind the concepts of connectivity that Licklider and Taylor developed. First, "the authors emphasized that the melding of communication and computation technologies could raise the nature of human communication to a new level. They proposed the ability to share information among the members of a community and the presence of significant computational power in the hands of individuals were equal components of a new communicating and thinking environment they envisioned for the intermediate future (p. 214)." Second, the power of connectivity would lead to new ideas, ways of thinking, and interactions. Connectivity would lead to new things that could not be predicted. "The implications [of interconnectivity] were profound, they felt, and not entirely foreseeable: 'When minds interact, new ideas emerge' they wrote' (p. 214)." Third, the benefits of connectivity should be widely available, not restricted to select groups. "Licklider and Taylor were not talking about applying the network idea to the Strategic Air Command or nuclear weapons research, but to the everyday communications of civilians (p. 214)."

It is easy to lose this concept of connectivity as illustrated by Licklider and others with whom he worked in the discussion about the history and development of connectivity technology: time sharing, packet switching, Ethernet, TCP/IP, router, switches and the advent of ARPANet,

BITnet the Internet, WWW and Internet II. These original conceptualizations of connectivity, its importance, universal nature, and potential to enhance the exchange and development of ideas remains a core issue in the understanding of the digital divide and its impacts on the development of technology and both the users and potential users of connected systems.

User Interface

People access technical systems through a user interface. The user interface is the means by which people can access the functionality and content of computing systems. It is generally defined as "the portion of a computer system that the user directly interacts with, consisting not just of physical input and output devices, but also the contents of the displays, the observable behavior of the system, and the rules and procedures for controlling the system (Kieras, 1996, p. 1422)."

Initially, systems were developed for data processing which was conducted through a system of "batch processing." For many, even in university settings, using a computer had little to do with interacting with it. A stack of punch cards was handed to an operator and then left, only to return later when the user retrieved the results (Ceruzzi, 1998).

While batch processing was still the dominant paradigm, Licklider independently began to notice the constraints of his own methods of research work. "About 85 per cent of my 'thinking time' was spent getting into a position to think, to make a decision, to learn something I needed to know…my 'thinking time' was devoted mainly to activities that were essentially clerical or mechanical (Licklider, 1960, p. 5)." Licklider was convinced that computer systems could be used in partnership with individuals to solve problems. In an article entitled "Man-Computer Symbiosis" Licklider (1960) summarizes by stating that work "will involve very close coupling between the human and the electronic members of the partnership. The main aims are 1) to let computers facilitate formulative thinking as they now facilitate the solution of formulated problems, and 2) to enable men and computers to cooperate in making decisions and controlling complex situations without inflexible dependence on predetermined programs (p.1)."

Such a partnership as Licklider described requires true user interaction, one that transcends the limits of batch processing: operating only one program at a time and providing for no run-time

interaction. Douglas Englebart at Stanford Research Institute also realized the importance of human computer interaction. In an article entitled "A conceptual Framework for the Augmentation of Man's Intellect, " Englebart (1963) promotes the role of computer systems as augmenting intellectual capacities.

> "By 'augmenting man's intellect' we mean increasing the capability of a man to approach a complex problem situation, gain comprehension to suit his particular needs, and to derive solutions to problems. Increased capability in this respect is taken to mean a mixture of the following: that comprehension can be gained more quickly; that better comprehension can be gained; that a useful degree of comprehension can be gained where previously the situation was too complex; that solutions can be produced more quickly; that better solutions can be produced; that solutions can be found where previously the human could find none. And by complex situations we include the professional problems of diplomats, executives, social scientists, life scientists, physical scientists, attorneys, designers—whether the problem exists for twenty minutes or twenty years. We do not speak of isolated clever tricks that help in particular situations. We refer to a way of life in an integrated domain where hunches, cut-and-try, intangibles, and the human 'feel for a situation' usefully coexist with powerful concepts, streamlined terminology and notation, sophisticated methods, and high-powered electronic aids (p. 3)."

In an interview with Rheingold (2001), Englebart discusses his fascination with getting people to interact with computer systems as a graduate student at UC Berkeley.

> "'When we get the computer built,' this young engineer kept asking, 'would it be okay if I use it to teach people? Could I hook it up to a keyboard and get a person to interact with the computer? Maybe teach the person typing?' The psychology people thought it was great, but computers were hardly their department. The engineering people said ' there's no way that kind of idea is going to fly (p. 178).'"

Such casual interaction with computers would require a whole new way of human-computer interaction. The implementation of the basic concepts of the user interface quickly followed. Englebart invented the mouse in 1965 and displayed it at the 1968 Fall Joint Computer Conference in San Francisco. Known as the 'mother of all presentations,' "the demo anticipated many breakthroughs that wouldn't reach computers for a generation. It included collapsible and expandable outline lists, text with embedded links to other documents as in Web browsers today, a mouse, a one-handed chording keyboard that left one hand free for the mouse, and live video-and-audio conferencing with a user in another city (Freiberger & Swain, 2000, p. 304). This

demonstration of remote collaboration of "information space" included a broad range of functionality utilizing a user interface that is common today including mouse and keyboard input, windows that could be displayed in text or images, and document management. "Informational features were reordered, juxtaposed, deleted, nested, linked, chained, subdivided, inserted, revised, referenced, expanded, summarized—all with fingertip commands (Rheingold, 2001, p. 191)."

In 1963, Ivan Sutherland completed his dissertation, and with it another primary event in the development of the modern user interface. At the heart of the dissertation is the software program, Sketchpad (Sutherland, 1963) which allowed users to create graphic images directly on a display screen by using a light pen. "Sketchpad pioneered the concepts of graphical computing, including memory structures to store objects, rubber-banding of lines, the ability to zoom in and out on the display, and the ability to make perfect lines, corners, and joints. This was the first GUI (Graphical User Interface) long before the term was coined (Sun, 2001)." What was unique about sketchpad is that it allowed users the flexibility to experiment with direct manipulation of visual objects (Nelson, 1978).

Englebart's demonstration and Sutherland's Sketchpad provide early concrete examples of what would become almost the ubiquitous user interface. These concepts have been widely applied by systems designed for the business community and have been adopted as the de-facto standard for systems in other contexts as well. Stephanidis (2001) takes this one step further by stating that "the desktop embodiment of current interfaces is perhaps the most prominent innovation delivered by the user interface software industry…due to the unlimited business demand for information processing, the HCI community has progressively acquired a bias and a habitual tendency toward outcomes that satisfy the business requirements (p. 6)." In discussing tools to design user interfaces Meyers et al. (2000) confirms the lack of diversity in approaches. "These [design] tools have achieved a high level of sophistication due in part to the homogeneity of today's user interfaces, as well as the hardware and software platforms they run on. Whereas the 70's saw a tremendous amount of experimentation with a variety of input devices and user interface styles, much of the diversity is now gone from user interfaces (p. 3)."

Despite the dominant desktop metaphor and the fact that little has changed since Englebart conceptualized the basic constructs of the modern user interface, the original goals of the user interface remain germane. The utility of computer systems is their applicability to human ingenuity and problems. This is the goal of 'partnership' and 'augmentation' that is at the source of Licklider, Englebart, and Taylor's thinking. Computer systems usefulness, however, is dependent upon their accessibility to application, with the user interface playing a key role in determining how and when people can access computer systems. The user interface requires consideration of both hardware and software components. Because a large portion of the digital divide discussion deals with issues of basic access, the design of the user interface should be a central concern.

Methodologies of Systems Development

The early days of systems design and development are marked by highly experimental, almost ad-hoc approaches. Problems were encountered, potential solutions brainstormed, and experimental systems were designed. As the design process matured, methodologies were developed to guide the systems development process. While a plethora of system design methodologies exist today, historically most of them can be traced back to several methodological strains: the systems approach, the sociotechnical approach, and the participatory design approach.

The systems approach is built upon the 'systems perspective' in which whole systems are viewed in terms of their subcomponents. From the perspective of an organization's leadership "embedding a computer system in an organization means that the computer appears there as a component, interacting with other components (as a rule, human beings) to form a system, or subsystem of a larger system fulfilling a particular function (Floyed et al., 1989, p. 270)." The design of such a computer system means that boundaries of the larger organizational system are delineated and analyzed for essential functions that may interact with the desired system under design. This is the environment for the system under design. The system is then designed to meet the formal requirements placed on it by the functional specifications and the informal constraints of the operable environment. In sum "the process of developing computer-based systems, viewed from a systems perspective, means that the interaction of all system components

must be conceptualized, defined, and in the case of functions that are assumed by the computer, implemented (Floyd et al., 1989, p. 270)."

The sociotechnical approach was pioneered in Britain following World War II by Eric Trist and was refined by Einar Thorsrud at the Norwegian Institute for Social Studies and Enid Mumford at the Manchester Business School. "The basic idea behind the sociotechnical approach is to view business organizations as systems consisting of technical and social subsystems…[it] assumes that a business organization is an open system and that the technical and social subsystems that constitute it, which are governed by their own intrinsic laws, have to be matched to one another and to their environment if the organization is to enjoy lasting stability (Floyd et al., 1989, p. 276)." Mumford (1987) describes the main contributions of the sociotechnical approach as:

- viewing organizations in which systems are designed as open instead of closed systems
- highlighting the importance of matching social and technical systems in the most beneficial way
- recognizing the importance of individual worker's well-being and their need for self determination and autonomy
- understanding the problems of alienation in the work environment.

Systems designed with sociotechnical methodology must support the individual person within larger systems. Information within an organization must go first to where it is needed for action, not to upper management. Systems in the work environment should be designed to support the development of individual workers providing opportunities for learning, flexibility, and multiple skills (Mumford 2001).

Participatory design methodology extends the sociotechnical approach to include an active design role for users. "Participatory Design (PD) represents a new approach towards computer systems design in which the people destined to use the system play a critical role in designing it (Schuler & Namioka, 1993, p. xi)." The methodology of participatory design is characterized by (Schuler & Namioka, 1990):

- An assumption “that the workers themselves are in the best position to determine how to improve their work and their work life…[participatory design views] the users as the experts—the ones with the most knowledge about what they do and what they need—and the designers as technical consultants.”
- The belief that “the users’ perceptions of technology [are] at least as important to success as fact, and their feelings about technology [are] at least as important as what they can do with it.
- A view that “computers and computer-based applications [cannot be analyzed] in isolation, but rather in the context of a workplace; as processes rather than as products.”

In participatory design, users play a central role in the design of technical systems to meet the needs of their workplace and tasks (Mumford & Henshall, 1991).

Each of these systems development methodologies have the three common characteristics:

1. An understanding that the users of systems are very important to the successful design of computer-based systems. For the systems approach, users represent a function within the larger system and/or its environment. For the sociotechnical approach, users are considered for their insight into the blending of social and technical components of open systems. For participatory design methodology, users take on a primary role in the design of technology systems alongside of traditional ‘expert’ designers.

2. Special consideration for the context of a systems use. The systems approach is careful to delineate the boundaries of the environment within which the system will be used. This facilitates careful analysis of all of the elements of that environment that must interact with the system under design. Concentration by the sociotechnical and participatory methodologies on workers and future system users is highlighted because they provide crucial information about the context within which that system will eventually be used. Success or failure of a system design is dependent on this contextual information.

3. An overwhelming focus on the work environment. Each of the approaches were originally developed to apply to the workplace context. For the systems approach, it is the organization or a sub-unit of the organization that becomes the system for consideration. For the sociotechnical and participatory design methodology, the interplay between workers, management, and in some cases unions, played a critical role in mapping out a new strategy for system design in the workplace. This emphasis on the work environment, however, leaves open the question about the adequacy of these design methodologies for non-work contexts.

User-focused Contextual Design: Implications for the Digital Divide

> "We didn't start talking about the hardware and the software until we talked about what we wanted to do personally with such a system…We knew that there were technical problems to solve and we would challenge them in due time. First we had to consider the human functions we wanted to amplify (Rheingold, 2001, p. 223)."
>
> -Robert Taylor

The development of methodologies to facilitate system design indicates the importance of careful analysis and forethought as the basis for the design of systems for particular tasks. Without them, designed systems would fit only generally into a context and would contribute minimally to the task and problem solving needs of users. Systems design methodologies help to ensure that systems are designed for a specific purpose with the appropriate capabilities and functionalities for the context of their use.

System design methodologies are rarely, if ever, discussed in the context of the digital divide. Discussions of the role of systems in the digital divide are often limited to applying systems that were developed for other purposes. Personal Computers (PCs) are the classic example. They were designed from the beginning to fit on a desk in an office (Freiberger & Swaine, 2000)(Rheingold, 2001). For the user interface, the predominate metaphor has been the desktop, developed to provide the office worker with a familiar environment (Stephanidis, 2001). This metaphor has influenced the way information is organized and distributed for access. Hierarchy of folders provide the structure for document organization and task bars structure processes. Even the concept of local area connectivity (LAN) has grown out of the workplace context as

illustrated by Ethernet which was developed to distribute information between organizational workgroups. But what happens when the context is not the workplace but everyday access to information?

Mobile technologies have evolved to incorporate connectivity and access to online resources through the wireless application protocol. Personal assistant devices such as palm pilots and cellular telephones are able to provide access through the wireless application protocol (WAP). DoCoMo, the popular internet-enabled mobile phone service in Japan connects over 25 million people with internet access (DoCoMo.net, 2001). It is particularly popular among Japanese youth.

Another creative application of technology is the use of alternative access devices such as web TV or gaming consoles. A recent posting to a Computer Professionals For Social Responsibility listerve promoted the use of gaming consoles to close the digital divide. "I've long been claiming game consoles would be the computer of the developing nations. But they will be the computer of the industrialized world too. Windows PC's are far too unreliable to be a home appliance (Page, 2001)." An application of this is the World Economic Forum's recent announcement of a project to use modified Linux-based game consoles equipped with satellite links to help distribute information about vital health issues (Page, 2001).

While PC's with standard connectivity to the Internet, mobile technologies, and creative solutions like gaming consoles may play a role in closing the remaining digital divide, they will not close the gap completely. Ultimately, systems developed for other general purposes will not adequately meet the specific information needs of those without access to digital resources. It is no accident that all system development methodologies rely on careful analysis of the context for system access and use. Without a context, systems are designed in a general, cookie-cutter fashion that do not adequately meet the needs of the user. This is validated by the findings over the last 10 years in Information Science has a tradition of focusing on the context of information needs, access, and use (Vakkari et al., 1997) (Wilson & Allen, 1999).

This paper proposes that the movement to close the digital divide needs to focus energies on the design of computer systems that enable meaningful access to relevant content in particular

contexts. Systems should be defined along two dimensions: (a) the capability to augment the thinking and problem solving of everyday users of information and (b) the functionality that a system provides to enhance the information processing and communication of users. Systems designed to close the digital divide can be further defined in terms of the three seminal concepts discussed above. What is the best way to organize information for communication and access? What kind of connectivity does it provide (e.g. access to general tools such as email or the WWW, access to specific content or databases or connectivity to local, national, or international resources? What kind of interface is appropriate for users in a particular context?

A Case Example: Help Seeking in An Electronic World.

To provide a concrete example, consider a recent research study conducted jointly by the University of Michigan and the University of Washington entitled "Help-Seeking in an Electronic World: The Role of the Public Library in Helping Citizens Obtain Community Information (CI) Over the Internet (Durrance & Pettigrew, 2001)." Because libraries play a critical role in providing Internet access in the United States (Bertot & McClure, 2000), the study conducted a comprehensive national survey of 500 libraries followed by intensive case studies in three communities: Northeastern Illinois, Pittsburgh Pennsylvania, and Portland, Oregon. The study focused on three key questions:

- What prompts citizens to use/not use digital Community Information (CI) systems for everyday help?
- How do citizens deal with different barriers that they encounter?
- How are citizens helped by the Community Information (CI) that they obtain?

The study broadly defines Community Information (CI) as: "any information that helps citizens with their day-to-day problems and enables them to participate [in their] community (Pettigrew, 1996, p. 31)."

The initial results from the study revealed three basic findings. First, that the respondents reported using digital Community Information (CI) systems for a wide variety of situations and information needs. "We found that users seek the following types of digital CI (Pettigrew & Durrance, 2001 p.138):

Table 1.1 Digital Community Information (CI)	
business	local history and genealogy
computer and technical information	local information (local accommodations, community features)
education	local news (weather, traffic school closures
employment opportunities	organizations and Groups
financial support	other people (both local and beyond the community)
governmental and civic	parenting
health	recreation and Hobbies
housing	sale, exchange, or donation of goods
library operations and services	social services
local events	volunteerism.

Second, the published report moves beyond these general categories to emphasize the importance of the context that precipitated use of digital Community Information (CI) systems. "While the above categories are useful for understanding the types of digital CI [Community Information (CI)] that users seek, further insights are gained when one considers the actual situations. The following are just a few examples (p. 139):

- Teenagers used the network to find summer employment because it contained all the local job information in one place and was trusted as a reliable, current source.
- A senior used the network to find out about an important upcoming town council meeting.
- A man looking for a local directory of gay and lesbian organizations searched the Web, but only came across national resources. The network directed him to the exact local organization he needed.
- A homebound person used the network to research his family's genealogy because of its comprehensive organization of local resources, including public library, county agency and local historical association materials.
- A former resident organized a family reunion from across the country using the network to arrange everything, from activities to hotels.

- A women used the network to learn about local government information, such as current ordinances pertaining to matters ranging from trash pick up to flood damage prevention, and to identify sources of funding for a community service project intended to help a nearby low-income community.
- A man, who sometimes uses the network to find miscellaneous information, said he uses it "mostly for help with lung cancer and possible cures or ways of living longer whether it be conventional or alternative medicine."

Third, by extending analysis beyond the content and process of the information behavior represented by the data, the study distilled a series of "information enabling" categories. By focusing on the "attributes of the information that would aide users in whatever it was they were trying to accomplish (p. 139)," the study revealed critical data that can be used for the design of systems to support these activities. This is similar to the 'augmentation' strategy articulated by Licklider and Englebart back in the 1960's. The information enabling categories for the digital Community Information (CI) systems context included:

- **comparing** (similar to verifying but may come earlier in the cognitive process)
- **connecting** (finding people with related interests)
- **describing** (services offered, cost eligibility, etc.)
- **directing** information about where something is located or how to get somewhere)
- **explaining** (in-depth, content-oriented information that explains how something works)
- **problem solving** (information that will help bridge a gap or solve a problem)
- **promoting** (wanting others to know about them, e.g., that they're available for employment, that they've started a new club/organization, etc.)
- **relating** (information that is relevant to the individuals needs and situational constructs as perceived by the individual)
- **trusting** (information that individuals perceive as coming from a trusted source)
- **verifying** (a form of corporate intelligence, people want to keep up with what their competition is doing, be aware of new trends, etc.)

For scientists studying information behavior "these 'enabling' attributes provide a novel way of viewing information needs because they focus on what users are trying to accomplish for a particular situation (p. 139)." This information is a fundamental necessity, however, for the effective design of systems to bridge the digital divide for those seeking Community Information (CI) in this context.

Regardless of the methodology chosen, system design focuses on purposes (in the terminology of the study 'enabling characteristics'). Many systems are developed from basic content like the information presented in Table 1.1. The design from such information is guesswork. There is no analysis of static categories that can give insight into the design of the appropriate way to organize the information, provide connectivity, or design the user interface. The enabling categories help describe the context and specific purpose of the users in accessing the information and augmenting their tasks or problem solving. Systems can be specifically designed to facilitate comparing and verifying activities through the way the information is organized for communication and access, the user interface is designed, and connectivity provided.

This is confirmed later in the report when Durrance & Pettigrew (2001) discuss the information-related barriers users encountered when using digital Community Information (CI) systems. Table 1.2 maps these information-related barriers map directly to one or more of the three basic concepts in systems design discussed above.

Table 1.2

Information-Related Barrier	System Design Concept
low retrieval rates	connectivity
information overload	user interface, organization of information
poorly organized	user interface, organization of information
out-of-date & inaccurate data	organization of information
authority	organization of information
missing information	organization of information
dead links	organization of information
language used	user interface
security	user interface
specificity	organization of information
non-anticipatory systems	user interface (e.g. intelligent agent)

Employing one or more system design methodologies would uncover additional considerations for system design. The point here is that the original systems were probably designed without the benefit of a formal methodology to guide a comprehensive design of digital Community Information (CI) systems. With limited resources, emphasis might have been placed on providing basic content instead of initially researching the information needs and problem solving tasks that needed augmentation. This returns to fundamental concepts identified early in the history of systems design: design what is useful for a particular purpose in a context, not just what is technically possible.

Conclusions

With less than 4% of the worlds population having adequate access to online information resources, the concerns of the digital divide are clearly warranted. Even more concerning is the data by the United States Department of Commerce that access to online resources is divided along census-based racial categories, with whole minority groups lagging behind national norms. The seminal thinkers in the development of computing and communication systems were critically aware of both the potential of systems to augment human thinking and problem solving capabilities as well as the social ramifications of a divided society in which only privileged people can make use of the connectivity infrastructure.

> Looking toward the day when the 'intergalactic network' he speculated about in the midsixties becomes feasible, he [Licklider] remains convinced that the predicted boost in human cultural capabilities will take place, but only after enough people use an early version of the system to think up a more capable system that everybody can use: 'With a large enough population involved in improving the system, it will be easier for new ideas to be born and propagated,' he notes, perhaps remembering the years when interactive computing was considered a daring venture by a bunch of mavericks. The most significant issue, he still believes is whether the medium will become truly universal. 'What proportion of the total population will be able to join that community? That's still an important question,' Licklider concludes, still not sure whether this new medium will remain the exclusive property of a smaller group who might end up wielding disproportionate power over others by virtue of their access to these tools, or whether it will become the property of the entire culture, like literacy (Rheingold, 2001, p. 151).

Concerns about the future digital divide were articulated at the conceptualization of computing and connectivity, long before the term digital divide was popularized. The digital divide is not a contemporary concept but a universal concern by those involved in early system design. While debate over the statistics about who does and does not have access, and who might not want to be connected to the digital infrastructure continues in the current literature (Lenhart et al., 2000)(Campaign & Weinraub 2001).(Campaign$_{a+b}$, 2001), the discussion can not ignore the concerns of predecessors about the issues of access to connectivity and use of information by the entire public. In light of the history of these concerns, the digital divide cannot accurately be called a fad.

To make an impact, however, the digital divide movement must return to the basic concepts in system design. To be effective, the digital divide can no longer rely exclusively on the mantra of "access for all." Connectivity to resources is only the first step. People have reasons for being connected. The digital divide must carefully examine the reasons that people are not connected to online resources. Who are the users? What are the information needs? Of those information needs, which ones can be best fulfilled through online resources? In short, what are the human activities that the digital divide augments and extends in particular communities which are currently offline?

The next major step for the digital divide community is to build systems that facilitate online access. These designs must be based on an understanding of specific contexts and purposes. "No single design perspective, analogy, or metaphor will be adequate for all potential users or computer-mediated activities (Stephanidis, 2001, p. 7)." Designs to eliminate the digital divide must carefully consider the appropriate way for systems to (a) organize information for effective communication and access (b) provide connectivity to resources and (c) interact with users via the user interface. The design of systems needs to provide specific capabilities and functions appropriate for the context and purposes of a systems' use.

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Justifying ICT's in schools

A comparative study of the use of *Digital Divide* categories in educational policies in Latin America

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1. Digital Divide: not such a "natural" category
Why deconstructing social problems?

We are used to hear about spectacular statistical numbers. 65% of people around the world has never used a telephone. 40% doesn't have an access to electricity. 90% of Internet users live in industrialized countries, whereas Africa and the Middle East represent together only the 1%. 70% of the net contents are available in English, whereas Spanish represents not even the 3%. Just 4% of the world population has an access to Internet. That means Internet is absolutely irrelevant for the day to day life of the biggest part of humanity, even if we'll probably hear less often about the latter statistical data!

However, deep inequalities between rich and poor concerning access to information and communication technologies (ICT's) are an undeniable fact. Policy makers often resort to that kind of irrefutable facts while addressing to the public opinion, the academic community or the governments themselves, in order to attest the existence of a "digital divide". This term refers to the digital abyss separating info-rich and info-poor people: those who have and those who don't have an access to the economic, social, cultural and political benefits of ICT.

Even if those numbers are eloquent, they are not enough to set up the category of *digital divide* nor to explain the status of *social problem* it has acquired in the last years. *Digital divide* is not only related to inequalities regarding the ICT's access. To become an operational category, *digital divide* discourses need to associate these inequalities to a world vision that accords ICT's access a great value. They need in addition, to convince their interlocutors (clients of the DD reduction programs, local governments, grassroots responsibles, experts, etc) that it is a valid category. Only this way, *digital divide (*or any other social category) can became both a category explaining inequalities and a concept empowering efforts to bridge the gap.

Some recently dominating rhetoric furnishes this world vision. Thit kind of rhetoric has sanctioned by usage concepts like *globalization* or *knowledge society* as explanatory and prospective categories of recent economic, technological and cultural transformations. In this case, we are not dealing with an ideology *strictu sensu*, because it's not an structured an homogeneous corpus of beliefs. It's rather a group of notions about globalization and capitalism reconversion which can be shared by a large scope of positions. This could be linked with Castells' *information society* notion: "a particular way of social organization in which the creation, treatment and transmission of information becomes the main source of productivity and power. This is due to the new technological conditions of this period of history".
These notions are shared by liberal approaches as well as by developmental approaches and even by some so called "antiglobalization" approaches. Particularly by those who accept "globalization" and "digital

divide" as explanatory categories, but criticize the lack of democratic control of the process and equity in the access to benefits, or the unprotected conditions of low income and vulnerable populations.

According to the pragmatic approach of policy makers, this kind of questions are not very important. Their aim is to give a solution to this new social inequality problem, not to question the genealogy of categories that define it. But on the other hand, those are key matters for a sociological approach. The naturalization of any explanatory category or social problem represents a jeopardy which needs to be examined[1]. In the case of *digital divide,* the objective of this approach is not to deny the existence of large inequities between info-rich and info-poor people, nor to underestimate the efforts that thousands of people do every day in order to diminish this gap.

The point is to understand how this social problem has been socially constructed. How its legitimacy is supported? What does it make it a social problem? What's the difference between this and other social problems? How will it involve practices and people?

An uncritical acceptation of some categories may represent a hazard. A large group phenomena risks to be reduced into a single and hegemonic explanatory discourse. Sociological deconstruction attempts to show how the way we talk about a "problem" may exclude alternative approaches or pertinent questions. It's certainly a hard task, because it requires to doubt of commonly approached issues which count on a large legitimacy because of their well-meaning purposes. The proposed exercise must be understood as an effort of elucidation, and not as a judgment.

Even if *digital divide* is not the main subject of my work, I had to deal with that kind of deconstruction exercises concerning *digital divide* and other related categories in the frame of my thesis research. I'm interested in policy of education discourses regarding new technologies in Latin America, and the way some countries of the region put those policies into practice through national initiatives in order to introduce ICT's in schools.

That's why I'm interested in how international agencies (UNESCO, World Bank, IDB, UNPD, CEPAL and OREALC in particular) have influenced the direction of educational reforms in the 80's and 90's. I study their discourses about public education, information society, globalization process and technological needs. At the same time, I'm interested in the complex programs some of the governments of the region have created to implement those orientations in the K12 system, and how they retrieve some aspects of the agencies discourses to do it. Finally, I've decided to look from the perspective of the actors -technical and professional staff- involved in these programs. I would like to understand how people appropriate and give a practical sense to those discourses.

Through this research process, categories related to *digital divide* will often emerge in agencies, ministries, programs and actor's discourses.

[1] Examples of research in these direction are developed by:
CHARLOT, Bernard : « Du rapport au savoir : éléments pour une théorie ». Ed. Anthropos, Paris, 1997.
GUSFIELD, J: "The culture of public problems: drinking-driving and the symbolic order", University of Chicago Press, Chicago y Londres, 1981

2. Building and analyzing a corpus research

A critical sociology of politics of education and a justification sociology

It is not easy to integrate in a research varied corpus, such as institutional discourses about ICT and education subjects, descriptions of models and programs in ICT's and education, data about political, economic and social context of countries, and subjective representations from actors.

The critical educational sociology developed in England on the pasts two decades in the context of Thatcher's liberal educational reforms offers an interesting approach in that regard. Several researchers such as Roger Dale, Robert Cox and John Halliday have cautioned us about a growing propensity in some sociology of educational policies to the "resolution" of problems in the educational system, and not to the understanding and analysis of it[2]. This pragmatic approach, answerable to the policymaker level, use to isolate social problems, considering only a few variables, and producing fragmentary explanations of facts.

Those authors, as well as Stephen Ball and Basil Berstein, claim for a critical perspective interested in how a political and educational system is able to establish itself. This relating to specific elements of the system (as an educational agenda) to large process and structures,to macro social expectative, and to the way they are represented in actors.

Ball suggests a "mixed" analysis, including: a) an ethnographic approach of political actors, its purposes and intentions, b) a conceptualization of the State as a complex and contradictory institution, a constellation of sites whose determination by the economy is both general and varied; and c) a Foucault's idea of discourse, leading to attempt the infrastructure of power / knowledge which '*speaks'* policy.[3]
He also suggests that the voice of actors , as interpretational resources can be understood and interpreted in three ways: as "real stories" (the "how" of policies: description of events, information about the context) , as discourses (a way of talking about and conceptualizing policy); and as interest representation (in the sense of structural and relational constraints and influences which play in and upon policy making).

This perspective is useful to give coherence to a corpus moving from macro to micro policy spaces, as well as from discourses to concrete programs. But the assignation of multiples values and status to those data (polyvalence) is not enough to analyze these corpus. How to explain that a category -for instance *digital divide*- is used simultaneously at different levels of policy making (governments, agencies, programs and actors)? How to understand the (TRASPASOS) and the synergies among the different levels of policy? How to speak about this unifying and symmetrical categories?

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[2] This approach is developed in:
DALE, Roger .- « Applied Politics or political sociology of education ? » en HALPIN, David et TROYNA, Barry .- *« Researching Education Policy : ethical and methodological issues ».* Londres, The Falmer Press, 1994.
BALL, Stephen .- « Politics and policy making in education. Explorations in policy sociology ». London, ed. Routledge, 1990.
BALL, Stephen .- « Researching inside the state : issues in the interpretation of elite interviews » en HALPIN, David et TROYNA, Barry: *Researching Education Policy : ethical and methodological issues.* Londres, Ed. The Falmer Press, 1994.
BERNSTEIN, Basil .- « La estructura del discurso pedagógico ». Madrid, Morata, 1990.
HALLID AY, John .- « Market, managers and theory in education ». Londres, The Falmer Press, 1990.
HALPIN, David et TROYNA, Barry .- « Researching Education Policy : ethical and methodological issues ». Londres, The Falmer Press, 1994.
KOHN (ed).- « Cross-national research in sociology ». Newbury Park, Ed. Sage, 1989.
POPKEWITZ , Th. S.- « A political sociology of education reform » , New York, ed. Columbia University, 1991.

[3] BALL, Stephen .- « Researching inside the state : issues in the interpretation of elite interviews » en HALPIN, David et TROYNA, Barry: *Researching Education Policy : ethical and methodological issues.* Londres, Ed. The Falmer Press, 1994.

Luc Boltanski works may offer a pertinent frame to deal with this kind of questions. In *De la justificacion*[4], he and L. Thevenot study the critical and justificatory operations that actors put in practice to resolve a contention in a non violent way. They request how people build through dialogue a shared place - they call that "common worlds" - to legitimate criticism and justifications. This makes possible in establishing proofs as well as to organize beings and things in a coherent frame for actors. Recently, Boltanski linked justification theories with the large problematic of renewal of capitalism and globalization phenomenon[5]. He says that one main element in the process of legitimation of globalized capitalism since '80 is the ability to appropriate, in part, criticism from opponents. This is the case, for instance, of the impugnement due to the lack of creative freedom, and the standardization and repeatitive cycle of work activities. The same criticism are recycled by new management discourses since 80, and transformed in new values as "creativity", "dynamism", "flexibility" and "permanent change ". Those values became key factors of economic transformation. At the same time, they contribute to the construction of a new justification discourse, able to refer to a "common world" to mobilize people and energy.

From my research, the hypothesis: globalization, centrality of technologies, and emergence of a knowledge society, are categories that fill this place in the new policy justificatory discourse. This includes both educational system and technological initiatives in the field level and in the policymakers environment. It's a rhetoric that 'works' symmetrically in many levels.

This allows also to solve an other common problem in social analysis: the ambiguous separation of "qualification" practices used by ordinary actors, and those used by policymakers and academic researchers, guaranteed by "scientific objectivity" or "political criterion". Is it possible to make a sociological approach to the use of categories by actors without posing question to the uses policymakers and researchers do? Is it possible to make use of the same instruments and analysis tools to deal with both kind of discourses?

By putting together in a corpus of research official reports, internal papers, interviews to actors, description of programs, there is an attempt to symmetrically homologate those different discourses in a shared analysis frame: the study of policies of education. I considered policies of education as a large field, including a) ministries or international agencies orientations, b) practical decisions taken by local governments and c) what staffs concretely think about and do with it.

I use the notion of *dominant educational rhetoric* as a thread through the large scope of signification of discourses of policies of education. Defining *dominant educational rhetoric* an ensemble of explicit conceptual elaborations, which function is to articulate pedagogical and educational beliefs with a larger political and economic project of society. They are historically sedimented construction defining an dominant tendency in educational orientations. They have an arbitrary character because their basis are not *strictu sensu* scientific but politically oriented. They are dominant because they exclude, at least from "official discourse", other valid points of view. Educational rhetoric have three main roles: a) coordinate common interests ; b) mobilize energies in a determined direction, incorporating new relevant actors; and c) support practices following policies through the construction of proofs and criteria widely accepted. They are beyond abstract domain, in the concrete level. They influence -and are influenced by- institutions, practices, medias, and common sense constructions.

[4] BOLTANSKI, Luc et THEVENOT, Laurent .- « De la justification ». Paris, Gallimard, 1991.

[5] BOLTANSKI, Luc et CHIAPELLO, Eve.- "Le nouvel esprit du capitalisme", Paris, Gallimard, 1999.

Presented in this paper are two small parts of my research where I apply this approach in order to analyze the emergence of digital divide as an educational policy "common world" category.

3. International and regional rhetoric on '80
Globalization, knowledge society and digital divide

The first step in my research consists in establishing the way educational rhetoric , from policy maker level to the field, talk about ICT's in education. Building a corpus which includes documents from international and regional agencies, national bodies charged of educational policies (ministries of Chile and Costa Rica, parliament commissions, etc) and specifics programs of education and technology in the K12 system.

Part of this research in presented in this paper. By questioning the use of globalization, knowledge society and digital divide categories in the discourse of a few world-wide agencies (UNESCO, UNDP, World Bank) and regional agencies (CEPAL, OREALC, IDB), I've choose a few official reports from agencies related to education and development issues considered as *canonical* during the past decade concerning the redefinition of public educational system (structural reforms) and the characterization of wide world transformations (globalization)[6]. These are not the only documents but may be more influencial than others. They range between 1991 to 1999, but all of them are placed into a same historic period related to the emergency of globalization processes. Whereas the specific date is not important. The idea is not to fix a chronological declination based on the antiquity of documents but to understand in which way along the decade some dominant categories move from an abstract dominant rhetoric to specific discourses in different context.

At the world-wide agencies level we can observe a dualist interpretation of globalization processes. All the agencies accept and recognize the existence of a large group of phenomenon in a planetary scale, started in the '80, they agree to call "globalization process". However, the specific means of it, its consequences and amplitude, are not similar in the different perspectives of agencies.

From one global perspective, the World Bank, which presents globalization as the definitive confirmation of the liberal economic model as the best one, have an economical centered point of view,. In this frame, the development strategies for poor countries depends of the capacity of those countries to increase competitiveness in an open economy. From another perspective, UNESCO (through Delors Commission)

[6] Those documents are, for the global level:

World Bank.- " The World Developpement Repport 1998/99: Knowledge for Developpement" , Washington D.C., 1999
World Bank.- « Priorities and strategies for education », Washington D.C., 1995.
United Nations Development Program (UNDP) - « Human Developpement Repport 1999 » , New York, 1999.
United Nations for Education, Science and Culture Organisation (UNESCO).- Rapport a UNESCO de la Commission internationale sur l'Education pour le XXI siecle, presidee par Jacques Delors. « L'éducation, un tresor est cache dedans ». Paris, 1996.

And for the regional level:

Economic Comission for Latin America and Caribbean (CEPAL) .- "Transformacion productiva con equidad: la tarea prioritaria del desarrollo en America Latina", Santiago de Chile, 1990.
CEPAL – OREALC (Oficina Regional de Educación para América Latina). "Educacion y conocimiento: eje de la transformacion productiva con equidad", Santiago de Chile, 1992.

and UNDP considers the globalization process mainly as a "growing interdependence of all the peoples in the world". They understand globalization can also represent more segregation and poverty. So there is a need imagine new ways to drive the process and do it in a more ethical, equitable, sustainable and inclusive ways.

In the same way, ICT's are recognized as a crucial factor in this period of important changes. However, the interpretation and valorization of that in the World Bank differs from UNDP or UNESCO. The former consideres the incredible improvement of technologies is the consequence of the competition in an open economy. The future of ICT's depends of the continuity of the model. The later says ICT's represent both a huge opportunity for de development of poor communities and a new source of exclusion. The net, for these U.N. agencies, reinforce isolation of non-access communities, deepens divisions between educated and illiterate people, increase women's and older persons segregation, and exclude non English speaking communities. At the same time, the administration of the net (suc as the Worldwide Consortium W3), the monopoly of technological research by big companies, as well as the hegemonic market criteria in the definition of development priorities of the net, exclude the well being for equity and integration of poor countries.

This is in opposition to the World Bank's point of view, which considers unregulation, the opening-up to stranger capitals and privatization of infrastructure development as keys of integration of ICT's in undeveloped countries.

The reference to a *knowledge and information society* is a third aspect where this duality of perspectives under some shared categories appears. In the World Bank's perspective, the technological revolution allowed an acceleration in the production and transmission of knowledge. The performance of countries to lead to development depends of the capacity to generate and appropriate this knowledge. The gap between poor and rich countries is not only due to a problem of financial resources but also to a lack of knowledge in undeveloped countries (a knowledge divide).

Because the production of knowledge is an expensive activity, the World Bank proposes: a) the adoption and adaptation of existent knowledge; b) the absorption of these knowledge in different learning situations and diverse education models; and c) the communication of those knowledge through the net, by the enhancement of the ICT's access and the development of private telecommunications infrastructure.

UNDP and UNESCO admit and encourages the centrality of knowledge and information in development. But they disagree from the World Bank in two central aspects. One is the importance of ICT's in context of hard poverty where the provision of urgent needs (like drinking water or vaccines) is not resolve. Second, they do not believe (principally as stated fro UNESCO'S Delors commission, at a one way conception of knowledge (from have to have not). The local adaptation of knowledge is in itself a production process not only a "translation" of packages. The attainment of knowledge is not founded in a simple transmission process (which means to assimilate knowledge to objects) but in a learning process. So the ITC's revolution is considered by the UNESCO Delors Commission as a transformation of sociability and identity. From UNDP's their priorities about ICT's are: enhancement of connectivity, give the priority to community access, adaptation of technologies to local needs, definition of a government model to internet, accountable and representative of local diversity, and the creation of non-English contents.

Then it is possible to identify among the international agencies a duality about interpretation of globalization process and related issues. Financial agencies (like World Bank) and development agencies (UNDP and

UNESCO) seems to have an institutional separation allowing a balance among euphoric and distrustful positions concerning the impact of globalization in poor countries.

In the other hand, at the regional level the discourse seems to be syncretistic: the arguements are opposites in the international level, but seems to be integrated in the regional. Recall that documents mentioned to characterize the regional level are from 1991 and 1992, much older than UNESCO , World Bank and UNDP documents. It's not matter of chronological declination of discourses, but of the *construction* of a new one, which use the categories of globalization or knowledge society and organize it in a new rhetoric.

The CEPAL / OREALC report "Educación y conocimiento: eje de la transformación productiva con equidad" (Education and Knowledge, axis of productive transformation with equity), is a sort of "navigation map" to define the function of education in the development process in Latin Americas in the '90. The influence is particularly relevant in Chile in the frame of a large education reform after Pinochet dictatorship. This report presents a vision of globalization process where critical and euphoric arguments (linked to UNESCO / UNDP and World Bank respectively) are hierarchically organized. This is linked to a distinction done by CEPAL between internal and external challenges for Latin American countries. Internal challenges are related to democratization, social integration, equity and participation inside the nations, and external ones refers to the development of a growing competivity international level as a mechanism to integrate a global economy. The CEPAL / OREALC proposal presents globalization as an exogenous variable, mainly economic, which define the frame for Latin American development and fix some specific task to the education system. Globalization and technological revolution means more productivity, more competitivity and new competences for the region.

A second perspective closer to the UNDP and UNESCO positions trends to consider social and cultural effects of globalization, and to propose a new global governability deal. In the local level, that is related to democratization process, equality and the creation of new citizenship competences.

Through those examples we can observe how globalization and digital divide categories are understood by agencies discourses. Of course, there is not a definitive position. Actually, a recent document of CEPAL (Equidad, desarrollo y ciudadanía, CEPAL, 2000) criticize the hegemonic globalization model, and guard against the differences between a promess of "symbolic" integration to the global world by technology access and the limitations to a "concrete" integration of undeveloped countries. Yet it is possible to establish how those categories are used by agencies in a concrete discourse, and, principally, how categories are shared in a "common world" to establish arguments, justifications, criticisms and proofs about different visions.

At the same time, it can be ascertain that the core of discourses are dominated by an economic approach, and that poor regions of the world have a less capacity to influence a process built under a paradox: globalization is global. But a big part of this global world is unable to influence it.

4. From rhetoric to practices
Educational Technology Programs (PIE's) as an object of study

The reference to agencies' discourses is not enough to understand the way dominant rhetoric finds a place in the national education policies concerning ICT's in Latin America. The study of a determined field is necessary to understand how these rhetoric permeate practices in the public education system. The

programs of educational technology for the K12 existing in Chile (Enlaces)[7] and Costa Rica (PIE Foundation Omar Dengo)[8] represent a rich field to explore in this sense[9].

Both programs offer the advantage of having many common characteristics. Both of them are whether directly or indirectly linked to ministries of education. Both are the oldest initiatives in the region, fourteen years for Omar Dengo Foundation and eight for the Enlaces project. Both programs have a national amplitude involving 100% of secondary schools and 50% of primary schools. Both have an institutional structure charged of technological equipment, teacher's training, research, evaluation, contents and pedagogical assessment of schools. Both of them counted, at least at their beginnings, on the financial support of an international agency (World Bank, Inter-American Development Bank, US Aid). Both have a large prop of agencies and national governments (which usually present them as a successful experience and as the *vedette* of educational reform programs), as well as of local communities, which perceive in the arrival of computers to schools a concrete improvement in education. Finally, both experiences are developed in countries considered as "good examples" in the Latin American context: democratic stability (since 1949 for Costa Rica and 1990 for Chile); comparatively good levels in educational matters (at least concerning far-reaching, schooling levels and students permanency); engagements and international orientations (payment of external debt, acceptation of structural adjustment policies); integration to a liberal economic system, some integration of ICT's into the economic activity.
Form a theoretical and methodological point of view, these characteristics allow me to undertake a symmetrical approach to the way some dominant rhetoric and categories appear in policies, programs and people's discourses.
However, while approaching the chosen field, this rhetoric appeared to be crossed by other elements which made the comprehension of the phenomenon more complex. It is not possible to find these discourses in an unalloyed state. On the contrary, they seem to be in competition with other sources of legitimacy. For example, a strong constructivist paradigm behind the Costa Rican program, or a discourse about school management in the Chilean case.

While adopting a comparative perspective, the fact that both programs are not two "versions" of the same phenomenon becomes obvious. Behind some apparent signs of similitude, important differences appear. Organizational, pedagogical and practical aspects differentiate one program from the other. In the same way, the use of some categories as globalization, digital divide, or knowledge society is very different in each case.

[7] http://www.enlaces.cl
[8] http://www.fod.ac.cr
[9] For single or comparatives studies about those programs:

POTASHNIK, Michael.- « Chile's learning network » en *Educational and Technology Technical Notes Series Vol. I, Num.2*. Washington D.C., World Bank, 1996 ;
NUNEZ, Ivan.- « El proyecto Enlaces : estudio de caso », ed. UNESCO, 1996 ;
POTASHNIK et al. .- « Computers in Schools : a qualitative study of Chile and Costa Rica ». en *Educational and Technology Series*. Washington DC., World Bank, 1997 ;
FONSECA, Clotilde: "*Computadoras en la escuela pública costarricense: la puesta en marcha de una decisión".* Ediciones de la Fundación Omar Dengo, 1991 ;
DE MOURA CASTRO, Claudio (comp): « La educación en la era de la informática ». Washington DC, Interamerican Development Bank, 1998.

For a theoretical reflection about comapratives studies in educational policy:
ARCHER , Margaret: « Cross-national research and the analysis of education systems », en KOHN (ed) « Cross-national research in sociology », Ed. Sage, Newbury Park, 1989.

I'll try to show some of the operations through which those categories appear in the discourse as a source for justifying programs, reacting to critics, and answering to the requests of different actors involved in the programs.

Before doing so, It would be useful to clarify one point: the fact that an action in the education field might effectively be oriented to bridge the digital divide doesn't necessarily mean that this category becomes a justifying element of that action. Objectively, Enlaces and Omar Dengo programs represent strong initiatives to enhance access and introduce technologies into society. First, because they reach around 90% of the existing students. Second, because as public initiatives established in the public education system, those programs allow a balance of quality with regard to private schools. Finally, because for many communities, school's computer laboratories represent the only point of access to technologies and to Internet. In the Chilean case, in particular, Enlaces represents an important percentage of Internet penetration rates.

But this is not enough to validate the initiatives using *digital divide* arguments. To do so, *digital divide* needs to be set in a context, adapted to specific critics and requests. In the case of programs and policies related to ICT's in education, those critics and requests are very wide. They constitute a large and varied repertory, in front of which programs and polici[10]es need to display a large repertory of justifications.

What arguments could be used to maintain a coherence and legitimacy in front of such a diverse and even contradictory public? First analysis from the field research suggest that arguments used in the context of programs and policies debates are also wide and adapted to interlocutors, their expectations, and the kind of critics they often do. In any case, that doesn't mean those are just opportunist or incongruent discourses and arguments. In fact they are a consolidated rhetoric inside these programs, in which categories as *digital divide* and globalization, seem to have a central place. This game of critics, requests and justifications, makes possible to reinforce the role and legitimacy of programs on educational technology inside the educational system.

Teachers critics

Critics from teachers and teachers unions are often centered in excess of work (for instance, a Chilean teacher works around 48 hours per week for a U$ 400 / 500 month salary), bad work conditions or lack of pedagogical materials. In some cases, but this seems to become less important than a few years ago, teachers evoke the risk of being replaced by machines. The justifying discourse tends to present ICT's as a tool to support teacher's activities. Less time used in autocratic and management tasks, contents to be adapted, more possibilities of exchange with colleagues, are some of the benefits enunciated. But other argument is often added to the justification of programs in a more general level: the (re)professionalization of teachers depends, in part, on having access to the same tools as other professions which have integrated ICT's to their daily work. Then, a first configuration of *digital divide* categories appears, focused in the differences of access to technologies depending on the professional status. Teacher status is improved by having the same equipment as a engineer, a lawyer or an architect.

[10] A similar approach was developped in:
HAWKRIDGE, D. ; JAWORSKI, J. y McMAHON, H. .-« Computers in third-world schools: examples, experiences and issues », Londres, Macmillan, 1990.

The pedagogical critic

A second ensemble of critics deals with the bad quality of public education, related to the obsolescence of practices, the withdrawal of school institutions regarding society, or the isolation, neglect, and degradation of teaching quality. In this case, ICT's will be presented as a strong tool of communication and contents. ICT's would allow to resolve, at least partially, the isolation of poor schools through exchanging practices (interschool projects, forums, virtual communities of teachers, etc), teachers' permanent training and free access to digital libraries. In some cases and according to a constructivist paradigm, it is also argued that ICT's have a strong pedagogical potential. A second configuration of *digital divide* categories appears focused in the problem of access to knowledge and in the limitations of local space facing global world.

The technological critic

A third group of critics is related to the place technologies have in school and the priority it represents.
It may be argued that efforts to introduce technologies in the educational system are pretty old. The same effort was made with radio, television or cinema, and the only result was a systematic refusal from schools to these innovations. Others may ask themselves about the priority represented by objects as expensive and fragile as computers in schools that don't even have windows, blackboards or chairs. At this respect, the directors of Costa Rica's program often answered: "it's not possible to wait everybody to have shoes to start making highways". About the first critic, the common justifying argument is that new technologies are radically different than older ones, because ICT's are in the core of social activity: they are a key in the transmission of knowledge, but also in scientific research or economic exchanges. The configuration of *digital divide* categories in this case is related to the idea of globalization as an unavoidable process, the permanent evolution of technology, and the risk to widen the fracture.

The economic critic

A fourth domain of critics, oriented not only to the ICT's but to the whole education system, argues that the latter is unable to satisfy the students' needs once they finish school and try to integrate the work market. For agencies as well as for wide economy orientations, that means undeveloped countries don't have the ability to create formed human resources in the emergent productive areas. For students, disappointed because of the old style of these educational system, this represents a lack of credibility about education and its aims. For parents, this critic appears as a feeling of uncertainty regarding the system, and sometimes, as an irrational trust on private education. Parents think that school doesn't allow social mobility and a work market insertion as it did 20 or 30 years ago. Private enterprises criticize the radical division between education and market, and the incapacity of private sector to participate in areas of public education.

Face to these critical repertories, the argument displayed by programs, ministries and agencies tends to state that ICT's' introduction represents a new kind of deal between school and productive world, as well as the possibility of youth to open to new professional vocations. The configuration of *digital divide* categories in this case is related to the inequalities to participate in a globalized and strongly technological economy.

The evaluation critic

The validation of education programs through traditional parameters of success is a major problem. This situation is applicable not only to undeveloped countries, but also to developed ones. The justification of the use of technologies in schools only based in its pedagogical potentials seems to have lost its strength

through the time. On the other hand, when we consider the lack of economical resources of these programs and of the education system in general, the gap between expectations and realistic results is quite considerable. These situation tends to become more serious in the case of programs as the Chilean and Costa Rican, which are not "pilots projects" anymore, but developed and wide ones. This experiences involve more than one generation of students, so their results can be supposed.

But: how to evaluate? what to evaluate? which variables must be considered? which method is the most pertinent? Who should evaluate? What kind of accountability is needed from programs and policy making?
The Omar Dengo Foundation Program decided to resolve these questions underlying the constructivist spirit of the program. They validate a "formative evaluation", aiming at the same time to evaluate and to have some influence on the process. This evaluation is focused on the learning processes, according to the constructivist orientation of the program itself. Even if researchers have a facilitator role, the essential part of the evaluation process has to be done by the program staff itself, as an auto reflective practice. In this frame, Costa Rican evaluation process will criticize the concept of pedagogical success and its traditional parameters. The accent of the program will be put on the creation of metacognitive skills, and tests will be adapted in this direction.

The case of Enlaces is different, and its evaluation seems to be more complex due to many reasons: a) it is not possible to have a control group as it's done in a conventional test, since most of the schools are already in the program; b) changing the software available in schools may alter results c) it is difficult to isolate variables in the context of an educational reform, since other components of the education system are being transformed simultaneously; d) due to a decentralized strategy, results change from one region of the country to another; and e) the consideration of traditional parameters is contradictory with the aim of changing old pedagogical practices.

During the first years of the program, these problems were solved by underlying all sorts of transformations in students and teachers' attitudes: more confidence in themselves, more autonomy, motivation and creativity; pro-social and collaborative behaviors; improvement of professional status; horizontal relationships between teachers and students; integration of "problematic" students (hyperactive, undisciplined). Recently, it is possible to find, however, a growing use of justifications such as *bridging digital divide* or *integration to global society* as a main result of the Enlaces programs.

In fact, Enlaces represents a strong effort in order to bridge the digital divide, and a vigorous initiative towards global integration. But it is important to add that this shifting represents a movement from pedagogical justification to an strategic and economic justification. In this new frame, the telematic component of the project becomes once more, its main component. In this context, Internet access is linked to the creation of online contents and to the development of an educational industry. Claming a "superior objective" the program finds a new justifying platform based on strategies to bridge digital divide.

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Community Networks and the Digital Divide: Future Directions of Growth

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Introduction

Over the years, a number of terms and definitions have been applied during various times and in different contexts to express an understanding of community networks and how they work (Miller, 1999). Morino (1994) suggests several synonyms for community networking, like civic networking, community bulletin boards, community computing, community information systems, community telecomputers and telecommunity systems, amongst others like FreeNets and CivicNets, that very simply put, all make an attempt to "use computer network technology to address the needs of the community" in one form or another (Schuler, 1995, http://www.scn.org/ip/commnet/iwdec.html). Community networks are seen as computer-based representations of traditional community information system (CIS) components such as information and referral (I&R) services in public libraries, community bulletin boards in convenient stores, local job placement services, and program databases in social service agencies (Bishop et al., 1999). The essential demarcation of community networks is in the role of computer-based information and communication technologies (ICTs) for providing information resources and communication services electronically to the public in local communities (Virnoche and Marx, 1997). Beamish (1995) defines community networking as "… a network of computers with modems that are interconnected via telephone lines to a central computer which provides: community information; and a means for the community to communicate electronically" (http://alberti.mit.edu/arch/4.207/anneb/thesis/toc.html). The Association For Community Networking (AFCN) "Evaluation of Community Networking" Task Force (http://www.afcn.net/resources/definition.html) has created the following "working description":

> "Community Networking (CN) projects bring local people together to discuss their community's issues and opportunities, learn about Internet technology, and decide upon and create services to address these community needs and opportunities."

Similarly, in the context of understanding civic networking as a "process facilitated by the tools of electronic communication and information, that improves and magnifies human communication and interaction in a community," Morino (1994) outlines the following agendas of civic networks:

- Promote debate and discussion towards resolving shared issues by bringing together diverse members of a community;
- In a timely fashion, organize information exchange activities and enhance communication relevant to communities' needs and problems;
- Establish ongoing relationships with a broad base of citizens from different races, professions, and social strata and attempt to include all members of the community, especially those in low-income neighborhoods and those with disabilities or limited mobility;
- Make basic services freely available or at minimal costs; and
- Represent local culture and build a community sense of ownership and pride.

In addressing deeper political and socio-economic realities, Schuler (1996) uses the term "community networking" to encompass goals of local participation, community building, and democracy, and intentionally stresses broadly upon the connection between "technology and how it is used in community context" (Gurstein, 2000, p. i). Based on principles developed earlier by the Seattle Community Network, Schuler (1994) identifies three non-commercial benefits of community networks in terms of their potential to support community cohesion, provide access to education and training, and produce informed citizens and strong democracy (1994, p. 43). In reference to this discussion, Schuler (1996) points out the need for a "marriage of necessity" between community and technology for creating a new kind of community that may lead to:

- development in a community's capacity building in terms of "skill and knowledge bases, local institutions, local resources, and programs that empower a community to deal effectively with its own circumstances" (http://www.scn.org/ncn/chpt1.html);
- citizen participation of all members in the community for addressing the problems in their communities and to provide more creative solutions;
- citizen-led projects for motivating citizen action and developing leadership qualities for strengthening the following six interrelated community core values of: conviviality and culture; education; strong democracy; health and well-being; economic equity, opportunity, and sustainability; and information and communication;
- redefining of roles of government institutions, business organizations, and citizenry in order to build community;
- synergistic intercommunity cooperation to build "interlacing communities of communities" (http://www.scn.org/ncn/chpt1.html) in terms of an "outward movement" (Morris and Hess, 1975) that will interlink communities across the world.

Defining community context in terms of expectations of community members to improve the quality of life and economic development of the community, Bajjaly (1999) identifies the following three ideals that need to form the basis for any community networking initiative:

- equity as making the same information resources available to all individuals in society;
- decentralization in providing multiple access points in different locations in order to ensure that information is conveniently available to a diversity of users; and
- collaboration between various community stakeholders to make culturally appropriate and relevant information delivered accurately and in a direct, accessible manner.

In a similar tone, based on his analysis of two community networks, namely, The Chebucto Community Net, in Halifax, NS, and The National Capital Freenet, in Ottawa, ON, Avis (1995) presents the goals of community networks in terms of: increasing democratic participation, facilitating community development, and education. These three are considered deeply embedded and inter-related to the success of a democratic system where a knowledgeable and literate citizenry are essential prerequisites for a healthy democracy and progress in society. As Doctor (1994) writes, "Information Democracy can be defined as a socio-political system in which all people are guaranteed meaningful opportunities to benefit from access to information resources ... It means giving people the information tools they need to participate in the decision-making structures that affect their daily lives" (p. 4). Additionally, Doctor points out how the creation of an information society perpetuates the gap between rich and poor, because the affluent can afford computers and have the education to use them. The solution is empowering the citizenry, and the instrument to achieve this is via a "computerized community information system" (p. 12). It is in the context of this vision, that this working paper attempts to draw the connection between the role of community networks in addressing "digital divide" issues between information haves and have-nots, and its relationship in fulfilling democratic ideals of social equity and social justice.

The term "digital divide" is used to describe the obvious and troubling gap between those who have access and use ICTs and those who don't. National studies on the "digital divide" have revealed such disparities in information technology access and use to be based along socioeconomic lines (Bishop et al., 2000). Thus in essence, though the "digital divide" is a "connectivity gap," its is intensified and often expressed in terms of several intertwining factors such as race and ethnicity, geography, gender, income and education level (Lentz et al., 2000). The "digital divide" was first academically perceived to be a problem in 1995, after James Katz conducted a series of studies on random telephone sampling of more than 2500 individuals for the non-profit Markle Foundation, the results of which were released by Bellcore Labs (Katz and Asfden, 1998). In a CNet News interview (http://news.cnet.com/news/0,10000,0-1005-200-317366,00.html), Katz accurately predicted that the problem would be getting worse instead of better. "The rich are going to be getting richer in terms of information," Katz said. "The information-poor will become more impoverished because government bodies, community organizations, and corporations are displacing resources from their ordinary channels of communication onto the Internet" (March 14, 1997). This seemed highly significant in the context of the previous Clinton Administration's National

Information Infrastructure (NII), which was eventually codified in the Administration's publication *Agenda for Action* that established the Internet as its primary infrastructure and centered its policy decisions around three central factors: access, resources, and skills (Lentz et al, 2000). Studies since such as those conducted by the National Telecommunications and Information Administration (NTIA) have affirmed earlier results of computer use and Internet access to be less prevalent among marginalized groups: the poor, ethnic minorities, women, as well as those with less education or the elderly (NTIA, 1999; Novak and Hoffman, 1998; Novak, Hoffman, and Venkatesh, 1998). Consequently, agencies like the Benton Foundation have made it a part of its mission to search and support creative ways "to make computer networking more a part of the social lives" of disadvantaged and underserved sections in society (1998, p. 12). Findings from a study supported by the RAND Corporation (Anderson, Bikson, Law, and Mitchell, 1995), a public policy discussion forum, also suggest community networks as a positive counteraction to the growing computer literacy gap owing to their existential foundation resting upon efforts to: meet the needs of the general public; increase public access to information; and serve traditionally marginalized members in the community

The philosophical foundations of community networks in social justice is based on an idealistic, yet extremely real need to provide equality of access to information and resources for all people, irrespective of their personal characteristics, cultural backgrounds, or socio-economic and political affiliations (Obe, 1999). The vision is idealistic for there is a long way towards fulfilling this dream. Yet in its basis in principles of equality and democratic values such as the acceptance of human diversity that surrounds us in all its manifold expressions, this dream becomes very real for its relevancy and applicability today. It is in this context, of trying to address "digital divide" issues between information haves and have-nots and its relationship in fulfilling democratic ideals of social equity and social justice that this working paper presents an understanding of community networks and their history and philosophy underpinning their origins. This paper also presents the author's involvement in various projects related to community networks and digital divide-related issues as a way to open for discussion strategies and concerns that are perceived significant in addressing these complexities in different contexts. The discussion is not pretending to be complete or thorough in addressing all the kinds of community networks that have evolved in different situations and geographic areas; instead via the medium of analyzing my own personal experiences within community networks for addressing digital divide issues, I hope to present some thoughts on the future role of community networking in bridging the digital divide.

Salient Features of Community Networks in their Historical Development

The following section historically traces the origins, theoretical frameworks, and methodologies associated with the creation and evolution of community networks. The essay is not intending to be complete in its encompassment; the idea is to present typical instances and their salient features in order to identify issues and characteristics that may help us to understand the role of community networks for bridging the digital divide in the present and suggestions for future directions of growth.

The Internet has grown exponentially since its inception in the 1960s as a private network that facilitated communication amongst small scientific communities, particularly those involved in defense-related research (Leiner et al., 1998). As scientists across disciplines and graduate students in university settings became engaged to maintain some form of electronic contact, the computer connections spread to soon encompass nonscientific communities as well, linking about a million users in 1990, and reaching its current estimate of 125 million users who are connected to each other via a "seamless web" (Bijker et al., 1987, p. 3) of communication networks and computer technology (Nua, at http://www.nua.ie). Community or civic networking dates to the work of Tom Grundner in 1984 at the Case Western Reserve University in Cleveland, Ohio, who first experimented with networking endeavors in providing the public online access to health information over an electronic bulletin board system. Grundner (1994) captures the philosophical spirit of civic networking when he wrote:

> "America's progress toward an equitable Information Age will not be measured by the number of people we can make dependent upon the Internet. Rather, it is the reverse. It will be measured by the number of local systems we can build, using local resources to

> meet local needs. Our progress … will not be measured by the number of people who can access the card catalog at the University of Paris, but by the number of people who can find what's going on at their kid's school, or get information about latest flu bug which is going around the community." (in Doheny-Farina, 1996, p. 125)

Grundner's efforts formed the precursor to the prototypical example of a community network, the Cleveland Free-Net that has today evolved into a sophisticated network system serving over 160,000 registered users in the Greater Cleveland Area (London, 1997). The Cleveland FreeNet, arguably the world's first, provided free dial-up access to a university server to local community members who had a computer, a modem, and an inclination to connect to the Internet (Kanfer, 1994). Free-Nets are "loosely organized community-based, volunteer-managed electronic network servers" (Victoria Free-Net Association, 1994, http://www.viatec.bc.ca/vicfree.htm) that recognized the public need for (low-cost or free) access to the network for information about the local and global community. Free-Nets were based on pre-Internet public computer networks, the first such community access network is identified as the Community Memory Project at the University of California at Berkeley started during the early 1970s (Resnik, 1997; Farrington and Pine, 1992; Levy, 1984) by Efrem Lipkin, Lee Felsenstein, and Ken Colstad. The Community Memory Project involved installing public-access computer terminals in laundromats and libraries that provided facilities to citizens for posting materials on a centralized, timeshare-type electronic bulletin board (Polly and Cisler, ?).

In 1989, a group called the National Public Telecomputing Network (NTPN) organized and formalized Free-Nets as applied to unix-based systems using the FreePort software developed by Grundner's team or other homebrew software from NTPN (1995). However, as Grundner remarked in a personal conversation on May 17, 1993 with Steve Cisler (1993):

> "The unifying factor is not software or hardware; it is conceptual in nature. All Free-Net's are: 1) Free to the user; 2) are primarily dedicated to the development of local information resources (supplanted by national-level feeds from NPTN); and 3) are dedicated to opening up the information age to as broad a spectrum of people as possible, That defines a 'free-Net' a lot more than mere software or hardware" (http://www.cpsr.org/program/community-nets/building_electronic_greenbelts.html)

The goal of the NPTN was to "help new systems come online and to support them afterwards with services and information resources" (Bajjaly, 1999, p. 8). However since Free-Nets were essentially volunteer-based and survived on donations, as they grew in size and came under pressure, the NPTN was not able to maintain control and went bankrupt in 1997 owing to a lack of sustainable business models, serious revenue strategy, workforce planning and future organizational policy, as well as other internal and external pressures (Carvin, 1998). Additionally, a restructuring of Free-Nets took place owing to the involvement of commercial Internet service providers (ISPs), university administrators and government officials, as well as a legal discussion over the term "Free-Net" that was trademarked by the NTPN. Subsequently, some Free-Nets still supported the ideology of free public access to information and electronic networking. Others evolved to "community networking," charging for additional service and facilities, while at the same time often focusing also upon community development issues as related to the role of technology in community building (Agre, 1999). In a current attempt to conceptualize ICT applications to community needs, Gurstein (2000) presents the term "community informatics" as a "technology strategy or discipline which links economic and social development efforts at the community level with emerging opportunities in such areas as electronic commerce, community and civic networks and telecenters, electronic democracy and on-line participation, self-help and virtual health communities, advocacy, cultural enhancement, and others" (p. 1).

Community networks as not-for-profit institutions have followed the access framework for meeting their goals of providing equitable distribution to ICTs for all sections in society (Mitchell, 1999). The earlier provision of free dial-up to server has taken a broadened expression in the creation of public access centers where hardware, software, and technical support are provided to community residents, especially those from low-income and disadvantaged groups (Beamish, 1999). Though the actual services

on a community network vary from system to system, Martin and Cohill (1997) provide a general flavor of some of the following services that are offered by community networks:

- provide access to online community information and Internet services (for example, electronic access to specific health-related nonprofit organizations and government agencies for minority groups);
- develop and distribute tools (for example, software and computers) at minimal costs;
- identify and support participation from various community groups;
- provide user support and training about use of tools and provision of information;
- cultivate computer technology as an information and communication tool (for example, use of e-mail, listserves, and newsgroups such as those on gay activism, "ask the mayor," neighborhood news, etc.);
- connect real and virtual communities through social activities, get-togethers, and forums for information-sharing;
- establish public access terminals in comfortable, easily accessible, and neutral settings.

In this context, it is also important to note the action-oriented role of community networks in avenues associated with the "core values" of the community: democracy, economic equity, health and well-being, education, conviviality and culture, and information and communication (Schuler, 1996). All these community values are intertwined and closely related to digital divide issues for the underlying basis of their support via community networks (or in synonymous undertakings) lies in an equitable distribution and access to communication and information resources for all members in the community. For example, the Community Access Program (CAP) was created in Canada during 1995 to establish broad-based low-cost access to rural and remote areas (http://cap.unb.ca). In recent years as ISPs began to provide competitive service, CAP started providing public access sites and the focus has since shifted from technical access to social access. This has involved providing service to various disadvantaged communities including the physically disabled, unemployed and underemployed, and those with lacking computer and literacy skills. Central to the digital divide is the issue of access in areas where there is lacking human, financial, or technical resources. Real situational considerations such as choice, availability, cost of appropriate physical facilities, associated technical and social infrastructure, management and sustenance of such facilities, and the linking of those to existing local service delivery mechanisms (Cisler, 1993) plays a considerable role in shaping designed solutions for successfully meeting the needs and expectations of specific user communities. Under the auspices of CAP in Canada, for example, trying to resolve some of the above-mentioned issues led to the location of community access sites in existing social spaces daily frequented by community members such as in schools, libraries, community centers, fire-halls, and commercial areas (Gurstein, 2000). Similar "community networking" efforts have been given different names in different places, such as community information networks (CINs) in the Missouri Express Program (Pigg, 1998), telecottages or community resource centers in UK (Day and Harris, 1997), Community Teleservices Centres (CTC) in Scandinavia (Qvortrup, 1991), and telecenters in Africa and in other developing countries (http://www.idrc.ca/acacia/).

Community networks can play a significant role in rebuilding the democratic process via promoting the five basic criteria of democracy, namely, effective participation, voting equality, enlightened understanding, citizens' control of agenda, and inclusiveness (Dahl, 1989). Allowing representation of these criteria in manifold ways, community networks are providing new forms of democratic participation (Pillar, 1994) such as open electronic civic meetings, online access to government agency employees, government web pages eliciting public opinion and feedback to elected officials on significant policy issues, electronic availability of government information and services, etc. An example of a community network that has been experimenting with community-oriented participatory democracy for a long time is the Public Electronic Network (PEN) in Santa Monica, California. Initiated in 1987 by Ken Phillips, Director of the Information Systems Department of Santa Monica, and Joseph Schmitz of the Annenberg School of Communications, PEN was established in 1989 as an example of the first government-run public-access community network in the United States. The PEN community network provides citizens online access to city government information (city council agendas, reports, public safety tips, library's online catalog, etc.) and to government services (granting of permits, reporting of petty thefts, etc.).

Citizens can also use e-mail, electronic conferences and online communication exchanges with public officials and city servants on various local civic issues (Phillips, 1990). The PEN community network has also played an important role in supporting purposeful political action in the context of finding and maintaining homeless people jobs by providing them with morning showers, laundry facilities, and lockers for their belongings (Wittig, 1991). PEN Action Group, a diverse group of community members and homeless residents organized themselves electronically using PEN, when they realized the potential of the electronic network to act as an initiator for political action. The project, dubbed SHWASHLOCK (for Showers, WASHers, LOCKers) involved philosophical and political exchanges between homeless residents, the online PEN Action Group, social service agencies, various businesses, the City Council, and other residents of Santa Monica via PEN's convenient discussion forum for debating, deliberation, strategizing, and action.

Community networks can provide ample growth in economic opportunities, sustainability, and in the process of economic regeneration for the community as a whole as well as for low-income and disadvantaged groups. For example, in Ipswich City, near Brisbane in Australia, a high unemployment in the mid-1980s owing to the demise of traditional industries like coal mining, engineering works and meat preservation led to the development of a community-based network that changed "the focus of employment into smart industries based around a smart community" (Balson, 1995). Similarly, closer home in Blacksburg, Virginia, the community network of the Blacksburg Electronic Village (BEV) and its collaborations among Virginia Polytechnic Institute and State University, Bell Atlantic, and the Town of Blacksburg, has replaced a rising unemployment in the 1980s with significant economic growth, health and well-being. Today BEV is considered the world's most truly "connected" community network with more than 85% of the community online in 1999. Andrew Cohill (2000), current director of the project, identifies the following key factors that were instrumental in making BEV a winner:

- Planning "lightly," and in an open-ended and flexible manner;
- Focusing the goals of the community network on education, rather than technology;
- Increasing use of the community network by showing people how to use technology, instead of telling them how to use it;
- Identifying spokespeople who were able to speak in a simple language about the human use of computers as a tool for information-gathering and communication;
- Involvement of public libraries as a primary focal point for community network education, training and use to ensure equality of access;
- Understanding that breadth and depth of content shape use;
- investing in an independent telecommunications infrastructure for low-cost direct connections;
- Encouraging public/private partnerships;
- Community support from all segments of the population was critical.

Current educational programs in the United States are considered intellectually muffling for they involve systematic constricting of thought in schools that has led to stifling practices, disempowerment, and a lack of interest in students (Illich, 1972). Community networks have the ability to counteract such tendencies and support new forms of innovative collaboration in education as well as apply towards distance education knowledge dissemination to select user communities (Soloway, 1993). Academy One, an NPTN-initiated international K-12 educational program based on community networking principles makes wide-ranging information resources and curriculum-related materials available to classrooms across the world via Internet connectivity (Delzeit, 1995, NPTN, 1993). The Big Sky Telegraph (BST) community network is another example that applies towards education, economic opportunity, and individual self-sufficiency in supporting rural long-distance education (Odasz, 1991). Initiated in 1988 by Frank Odasz of Western Montana University in Dillon, the project is helping to support community development in the rural west. It is contributing towards bridging the digital divide in rural educational communities by connecting schoolhouses and rural libraries across the state to overcome problems of sparse population and long distances. Based on its "low-cost, low-tech, high-imagination, scaleable networking models" (BST, 1993), BST offers teachers opportunities to validate and share information resources, subject curricula, and

education software, as well as offers online courses in areas of study such as network use, bulletin-board services, teacher-in-service training, etc.

Projects like the New York Youth Network (NYYN) and Plugged-In (PI) attempt to address digital divide issues related to poor and disadvantaged youth in urban areas. The NYYN was started in 1987 as an important educational resource for providing social support and psychological communication services for economically disadvantaged youth. It has involved promoting discussion and deliberation on critical issues such as teen pregnancy, gangs, drugs, alcohol-related aggression etc. Similarly, the Plugged-In community network project in East Palo Alto, California, helps community youth learn sophisticated technologies and associated skills like videotaping, HTML web-coding, etc. that they apply to community-based educational projects (Schuler, 1995).

Playing to Win, a technical assistance program was first started by Antonia Stone in the basement of a Harlem housing project in 1981 with 20 Atari 400s. It provides low-income user communities networked computer technology facilities via community computing-centers across the United States. Providing a physical public center located in social spaces of daily usage like libraries, museums, YMCAs, settlement houses, etc., Playing To Win has significantly promoted educational literacy and economic self-sufficiency agendas. It has also been able to address a wide range of social and technological issues such as promoting conviviality, community orientation, and strengthening community development and empowerment of citizens. The community-center movement is "guided by radical democratic principles, resting upon the conviction that basic tools of daily life need to be accessible to everyone" (Miller, 1993). Such community computing-centers become "third spaces" where people can go and feel a part of a community, way from home and work-associated pressures (Oldenberg, 1991).

Community networks and libraries have had a long history of association in the context of creating convivial cultures and providing mechanisms for information delivery and community services, though there is yet tremendous potential for developing these ties further in the future (Bajjaly, 1999), especially in the context of the digital divide and the specific needs of marginalized communities (Bishop et al., 2000). The first library-based online community information system in the United States, developed by the Pikes Peak Library System in Colorado began providing dial-in access to community information in 1978 (Toms, 1994). Some of the earliest library-based community networks such as the Sacramento Public Library's nearly twenty-year old Community Information Center are still operating (Motenko, 1994). They provide a range of facilities and services for community development such as public Internet access, computer-based I&R services on community information, online calendar on community events, employment listings, local business resources, etc. An instance where overlapping and shared functions between a Free-Net and a public library have been beneficial to the community as a whole is seen in the example of The Three Rivers Free-Net (TRFN) (http://trfn.clpgh.org), a service of the Carnegie Library of Pittsburgh (CLP), that provides web space, training, in-house equipment, e-mail accounts, and support for developing websites (Holmes, 1998).

The city of Urbana-Champaign, Illinois, was ranked by *Newsweek* magazine (November 9, 1999) as one of the ten most wired communities in the world. Prairienet Community Network (hhtp://www.prairienet.org), a nationally recognized computer-based community information network that was started in 1993 serves the twin-cities and the surrounding East-Central Illinois region by providing the following information facilities and community services: creation and management of online digital collections of community information; provision of Internet access and communication tools such as e-mail; establishment of public access computing sites; and delivery of outreach, training, and user support (Contractor and Bishop, 2000). Grants from the Telecommunications and Information Infrastructure Assistance Program (TIIAP) and the Kellogg Foundation have supported positive collaborations between Prairienet, the Urban League of Champaign County, and the Graduate School of Library and Information Science (GSLIS) at the University of Illinois at Urbana-Champaign for community development and bridging the digital divide. These have contributed towards "integrated research and service programs to expand technology access and literacy in low-income, predominantly African American neighborhoods" (Bishop, 2000, pp. 473-474). One such endeavor is the Community Networking Initiative (CNI), a community-based research effort "that is conducted by, with, or for communities" (Loka Institute, 1998). CNI has the following goals: analysis of local information needs and practices; training and computer

delivery to teens and adults; providing technical assistance to community-based organizations; and the enhancement of Prairienet's information content and retrieval capabilities (Bishop, 2000).

As a step towards understanding the digital divide, an important strategy in the CNI project has involved working within existing social networks of disadvantaged communities and marginalized groups. It has contributed towards bridging the digital divide, building appropriate information content, and helping towards community development in the following ways: acknowledged recognition of local capacity and resources; contextualized provision of information services to local expectations and needs; and enhanced participation of local community members from minority and marginalized groups within community networking circles. One such activity involved my involvement in applying action research methodologies for building a digital library for small business information exchange that was incorporated as part of Prairienet's information resources (http://www.prairienet.org/cced/directory). The project entailed building culturally relevant online resources via participation and feedback through interaction with members of the Community Collaboration for Economic Development (CCED). CCED comprises of a self-motivated group of individuals that has come together to make their contribution in bridging the digital divide by developing entrepreneurial training programs for disadvantaged and minority people interested in starting a small business or expanding existing businesses. Under the auspices of CNI Prairienet, the initiative was sponsored by a Partnership Illinois Grant and formed a part of a larger group undertaking with CCED and its members from the business community/residents living in the northend of Urbana-Champaign. Action research strategies have involved my participation in training and as a voluntary member of CCED for eliciting members' responses for evaluation of existing information resources, analyzing their business information needs, and understanding the social dynamics associated with the group and disfranchised members in the community. It has also contributed towards making an appropriate match between the provision of Prairienet's small business information services to local needs and expectations of disadvantaged community members, while at the same time insuring a positive 'fit' between the two. Exchanges with CCED members indicated appropriate strategies for collecting and evaluating information resources relevant to targeted user's needs and practices as well as provided positive design solutions for building online digital collections of seemly community resources. User-centered evaluation and action research played a significant role in not only building appropriate online resources, but also contributed towards empowerment and community building. Community-based action provided a collaborative approach to inquiry and investigation. It gave me an opportunity to work in a team for providing CCED members the means to take systematic action to a resolve a specific problem (Stringer, 1999); in this context, the problem was to develop appropriate online resources that would meet the needs of members belonging to low-income communities.

Historical developments through time have shown a tremendous range of community networks or associated ventures. Some community networks were earlier seen as mere bulletin boards, while others are now based on providing large commercial services; some are unix-based systems connected to the Internet, while others have been entirely local. Moreover, the range and types of information and services found, the sort of connections the systems use, who starts and maintains the community networks, sources of funding, etc. are also varied (Cisler, 1993) and depend upon the nature of contextual dynamics associated within each situation. Additionally, there have been other models of community networks in the past, different from the traditional examples described above, that have also been in existence, serving similar functions in specific instances. Documenting intertwining relationships between such networks and associated emerging technologies, economics of mass media, and public communications, Neuman (1991) explains the social role of technologies like community-produced cable television, electronically filtered news, computer discussion groups, and community networks in bridging gaps between personal and social expectations. In the early 1980s, Ithiel de Sola Pool (1983) described how rural farmers formed telephone cooperatives and gathered online to connect together for social interaction and information exchange. Another category of alternative community systems known as pubnets or "grunge" networks such as Little Garden in the San Francisco Bay Area are "assembled with low cost materials, a lot of sweaty equity, and innovative designs that made do with available materials" (Cisler, 1993). The main goal in such instances has been to provide really low-cost options to small numbers for Internet connectivity and access to e-mail and Usenet news groups. The role of public or community access television, usually provided through a local cable station, has played similar roles as community networks in the United States (Kellner. 1992). One of its commanding forms is community "interactive programming" where viewers participate in the show

through phone-ins and other means. Such strategies are closely twined with public empowerment since they bring back "an element of power, control, and choice to individuals and communities" (Goldberg, 1990, p. 161). Community networks internalize the process of interactive communication with tools like e-mail, real time chat, voice and video channels, etc. (Avis, 1995).

Computer-mediated communication (CMC) has attracted much attention, and here in the context of community networks, only a brief note will be made. The field of CMC and its social implications in addressing issues like organizational reflections, disadvantaged applications, public access and regulatory problems, economics, and human-computer interface design were clearly mapped in an early work in this area by Hiltz and Turoff (1978). Research has been done since exploring the interactions between network-mediated communication and the resulting forms of communities that have emerged, with their myriad social formations, meanings, and values developed in terms of what Steven G. Jones (1995) calls "cybersociety" (p. 2). Researchers today realize the advantages of CMC, in creating not entirely new communities, but in their role in strengthening existing social networks (Fukuyama, 1995). There is understood to be a close association between forms of online and offline communities, and electronic realities are today seen, not as separate cyberspaces, but in their association with the physical world (Rheingold, 1993). In the context of the digital divide and community networks, it is hence equally important to understand the social processes and transformations owing to the interaction between "virtual communities" and face-to-face relationships. Such interactions in community networking have tremendous impact upon perceptions of community, empowerment, and political actions (Jones, 1998) since community networks incorporate both forms of interaction. CMC strategies involving the use of computer conferencing, bulletin board systems (bbs), e-mail, and real-time chat are integral components in community networks and play an important role in expressing and addressing digital divide issues for minority and marginalized communities. My documentation of the role of an online mailing list via a social network approach, in the process of "queer" identity formation for members of the Lesbian, Gay, Bisexual, and Transgender (LGBT) communities in East-Central Illinois shows how CMC was an effective medium for sexual minorities seeking social support and information within the "coming out" process in a university campus town setting. It also shows how community members perceived the electronic mailing list as a significant social service for building a socio-cultural resource base for social networking and education-related agendas. In this context, CMC established a sense of community via the electronic medium that also acted as a tool for mobilizing a political force and concrete action. An important finding was related to the dependency of online-offline realities and how CMC and its established sense of community were intimately tied, in their 'embeddedness,' to real social settings and interactions.

Participatory Action Research (PAR) in Community Networks

> "In moving society forward, many different communities may be destroyed or die, but for the survival of mankind we must not capitulate to the concept that the sense of the community is dead. The most binding, vital, and healthy sense of community may be generated through this struggle." (See cite in Schuler, 1996)

I feel this sense of optimism lies dormant and needs to be activated by exploring the role of community networks in their reconfiguration capacity as expressions of information and communication technologies. A tracing of developments in community network history presented in the earlier section shows that we have traversed through their substitution phase (where information and communication technology is used to accomplish similar tasks that were done formerly) and enlargement phase (an increased use of information and communication technology to maintain continuing interactions, rather than create new networks) (Contractor and Bishop, 2000; Fischer, 1992; Malone and Rockart, 1991; Sproull and Kiesler, 1991). As various scholars have pointed out, in some ways the "substitution" and "enlargement" phases in the use of ICTs have exacerbated the digital divide (Wolpert, 1999). Ties developed in computer-mediated electronic communication reinforce preexisting social patterns (Castells, 1996) or augment rather than substitute face-to-face communication (Rheingold, 1993; Wellman and Gulia, 1999). Scholars realize how computer-mediated communication has become "a powerful medium to reinforce the social cohesion of the cosmopolitan elite" (Castells, 1996, p. 364). Thus the exuberance in ICT developments have in a manner had disastrous implications for low-income community networks

where it has led to isolation for people "without resources, expertise, motivation and experience to access and make effective use of local information infrastructure" (Contractor and Bishop, p. 155; Novak and Hoffman, 1998; Schon, Sanyal, and Mitchell, 1999). Hence there is now a tremendous need to reconfigure social realities in community networks and their embedded relationships, practices, and values. Community networking philosophies and methodological frameworks need to determine ways to reconfigure realities and nurture those via redefining relationships between technological "experts" and users from disadvantaged communities. Community networks should attempt to facilitate action-related strategies that will build capacity in disfranchised community members and lead to their empowerment for bridging the digital divide.

I believe one approach that can be significant in this context is the participatory action research model as applied to creation and development of community networks. Participatory action research involves people who are supposed to be beneficiaries of the research in all the stages of the research and design process (Hall et al., 1982). It has its roots in Paulo Freire's (1972) theory of conscientization, where he advocates a strategy for liberation of oppressed peoples via engagement and collaborations with local people for cultural action to oppose dominating power or cultural forces. This has direct relevance today in the context of the cultural forces that shape the digital divide and marginalized communities. PAR has a strong basis in motivating citizen involvement for empowerment through "the process of constructing and using their own knowledge" (Reason, 1994, p. 328). It has ingrained potential to "the development of democratic values and processes" and establishes a strong relationship with community development that forms as its basis "the idea of active citizen involvement for its implementation and success" (Anyanwu, 1988, p. 11).

In 1995, as a part of a class project, I interacted with community members from four midwestern towns in Illinois, namely Galesburg, Lockport, Champaign, and Urbana, about the role of public participation in Illinois' historic preservation-planning (HPP) process. This led to a subsequent study involving a focused user perception analysis of concerns of local business owners about the HPP process in relation to community revitalization in downtown Champaign. These experiences motivated me further to explore socially grounded methodologies and community participation methods in the context of design and planning as well as understand its connection with community building and community development. I became aware of the rhetoric of "community design" and principles of social architecture where strategies associated with involving people in "shaping and managing their environment" (Sanoff, 2000, p. x) are perpetuated. The underlying philosophy of such endeavors is based on the principle that the "environment works better if the people affected by its changes are actively involved in its creation and management instead of being treated as passive consumers" (ibid, p. x).

This idea involving local people in every phase of social development is central to the thesis of this paper where I highlight participatory action strategies in community networks for building democracy at the grassroots and bridging the digital divide. It is also the reason for the presentation of my involvement in different projects that express this philosophy, whether the projects have been associated with building of the physical landscape or contributing towards strengthening of community ties in today's cultural environment of marginalization and the digital divide. Community building involves organized efforts to make older and low-income neighborhoods economically self-sustaining via "community-based intervention strategies" that enable them to "acquire, develop, and use human, economic, and institutional resources for the benefit of their residents" (Naparstek and Dooley, 1997 p. 79). It is closely tied to community development, a process "rooted within the context of the physical and social environment of the community" (Chavis and Wandersman, 1990, p. 56). Community development broadly helps to improve the quality of community life and involves participation of individual members in the social mechanisms at stake. My participation in an ongoing team effort during 1995-1996 for undertaking cross-disciplinary action research related to community development and information exchange in the East St. Louis Action Research Project (ESLARP) proved invaluable in learning this lesson. The ESLARP was initiated in 1990, when State Representative Wyvette H. Young requested technical assistance from the University of Illinois at Urbana-Champaign. Since then, a number of collaborative partnerships between local residents, UIUC faculty and students, and government officials have been established to produce "tangible improvements in very poor neighborhoods, enhanced the quality of life for ordinary citizens and increased the ability of neighborhood organizations to successfully complete community development projects" (Choksi,

http://lrs.ed.uiuc.edu/Students/b-choksi/ESLARP/index.html). My experiences in ESLARP involved working closely with neighborhood organizations and community members, understanding their expectations, and analyzing their needs, in order to make recommendations for re-building the physical and cultural landscape based on positive community participation in the design process (http://www.eslarp.uiuc.edu/la/LA437-F95/final/bharat/main.html). ESLARP today stands as a positive model of PAR that strongly represents its six key features, namely: a social undertaking; participatory in nature; practical and collaborative; emancipatory; critical; and recursive (Kemmis, 1998).

Central ideas in PAR are related to "increased democracy, political equality, and social justice" (Elden and Levin, 1991). These have been the goals of the Afya (Swahili for "health") project, one of my recent involvements where we are applying participative and democratic practices to bridge the digital divide via targeting barriers in access to health information and services experienced by African American women in the community (See Bishop et al., in press; Bishop et al., 2000). The Afya project addresses digital divide issues at the community level through social and digital literacy, equitable access, training, and content initiatives (Bishop et al., 2001). Led by Professor Ann Bishop at the University of Illinois at Urbana-Champaign, this project has been funded by the National Leadership Grant from the Institute of Museum and Library Services (IMLS). It has involved establishing partnerships with SisterNet, a local grassroots social network of African American women committed to addressing physical, emotional, intellectual, and spiritual health issues. Collaborations between local Black women and community health care and information providers are forming the backbone of this endeavor to bring about social justice and empowerment for the targeted disfranchised group. Faculty and students at GSLIS are helping to facilitate such collaborations, advance participative techniques, and develop resources that support the work of community organizations in the Afya project. An important partner in the Afya project is Prairienet, the local community network that is providing computer technology, training, and web development services. Parkland College, a supporter of SisterNet through its Department of Adult and Continuing Education, is providing in-kind support as well as access to computer hardware, software and other resources.

The following have been some socially grounded participatory action research strategies incorporated in the Afya project for achieving relevant outcomes, building local capacity, and actively incorporating the involvement of Black women in every phase of the project:

- Scenarios or "use oriented design representations" (Carroll, 1995) were employed to address Black women's health-related information and use in terms of: Black women's vision of an ideal resource; significant health concerns; recent knotty and positive health situations experienced; health information resources sought; barriers in seeking health information; use of computers; and actions proposed for improvements in existing health information resources (Mehra et al., 2000). Scenarios were expressed as typical problematic situations experienced in health information service delivery narrated by local SisterNet women.

- Application of scenarios in situated user evaluation studies of local resources and national websites on Black women's health as well as evaluation workshops on existing communication services on the Internet have helped provide participatory feedback from community Black women about available health information services. It has grounded "design and evaluation of online services in real world social context" (Mehra et al., forthcoming). SisterNet women are playing a significant role as community action researchers in data collection, analysis, and the development, implementation, and assessment of web-based health resources.

- Visions of social empowerment of local Black women are being actualized in reality via implementation of Afya's Community Action Plan that has been chalked out by local Black women for concretizing their goals. These provide action-oriented participative strategies for developing community-wide social practices that engender a Black women's "space" in community networking associated with health care and information delivery. The Community Action Plan encompasses some of the following outcomes:

a) Development of social mechanisms to improve and redefine relationships between health information providers and Black women whereby women are taking on the role as "creators" of health information that scales existing imbalances in social and power dynamics.

b) Institutionalize ongoing information provision from Black women in both digital and print formats that is enhancing the role of Black women in the process, thereby building confidence, self-esteem, as well as improving the quantity and quality of culturally-appropriate, jargon-fee, and relevant health information resources.

c) Facilitate the role of Black women as trainers for increasing computer literacy that also contributes towards developing strong social networks for information exchange on health-related issues and computing.

The following are some philosophies and practices adopted in the Afya project that I consider significant in light of the discussion on community networks and digital divide issues:

- Action-research entails that researchers and stakeholders "define the problems to be examined, cogenerate relevant knowledge about them, learn and execute social research techniques, take actions, and interpret the results of actions based on what they have learned" (Greenwood and Levin, 1998, p. 4). Action-research has important implications for it goes beyond just reminding "people that it is participants' own activities which are meant to be informed by the ongoing inquiry" (McTaggart, 1997). More significantly, action-research presents concrete goals and practical applications that express a committed sensitivity towards change. It also reveals an intentioned willingness to implement those changes and support words with deliberate deeds. In the Afya project, "action" is underlying every stage of the thought process. It is the inclination to act for betterment of available health information resources that has motivated evaluation of online health resources by local Black women to suggest improvements for change. Additionally, action is also the motive for community Black women to design the SisterNet website for providing access to culturally relevant health-related information and communication resources. Such endeavors to involve disadvantaged and disfranchised members in action-oriented strategies are important in community networking for trust-building and achieving relevant outcomes that contribute towards bridging of the digital divide.

- Participation of Black women during all stages in the Afya project has been key to its role in community networking for establishing social justice and empowerment of disfranchised members. "All stages" implies that even the conceptualization of a project should involve participation of marginalized community members. The commitment of Professor Ann Bishop, Principal Investigator in the Afya project, to closing the digital divide led her to initially invite Imani Bazzell, SisteNet Founder and Director, to collaborate and develop the Afya project. The role of local Black women in development and implementation of subsequent phases in the Afya project has been significant. These phases have included analysis of needs and expectations of community members, evaluation of online and offline local health information resources, and organizing of health conferences, health fairs, and other social events. It has also included areas where traditionally there has been no involvement of low-income or marginalized community members. In the Afya project, these have revolved around the creation of the SisterNet website, development of local health-related resources, and the defining, planning and implementation of the Community Action Plan. SisterNet women adopted the motto "Health, healing leadership – For the lives we've always wanted," a vision that in on its way to reality thanks to the participation and involvement of Afya's local Black women in leadership roles. This has provided important lessons to learn for development of community networks and digital divide-related issues. PAR in the Afya project is attempting to re-define relationships in the context of traditional social inequalities and privileged power dynamics between researcher, local Black women, and health care and service providers by shifting ownership into the hands of marginalized community members. In order to successfully bridge the digital divide, community networks need to adopt a similar stance for transferring the control over the 'whole process' into the 'hands' of community members traditionally considered to be disfranchised. In such a context, the role of the researcher, "tech person," community network director or whichever other designations have been traditionally used for people in charge of running the community network, changes from leadership to facilitator in the implementation

process for translating the needs of disadvantaged members into a reality. This means that even the research process and any preordained methodology itself may be reinterpreted and reconstituted by the participants (Tandon, 1988). It makes sense in the context that community's disfranchised members, the community network with its goal of fulfilling community expectations, and knowledge generation in PAR are all context bound (Susman and Evered, 1978). Any abstract theory cannot realize the lived social experience of any specific context (Elden and Levin, 1991). Hence it should be flexible to accommodate changes made by those who experience the realities associated with any situation.

- An important lesson to learn from the Afya project for bridging the digital divide has been building of appropriate community networking strategies, while at the same time incorporating those within existing social institutions and activities of marginalized users. For virtual communities do require some ties to the physical community (Rheingold, 1993). Community networking does not necessarily mean only building online resources without any connection to how that information is made available within the social fabric of user communities. The provision of community resources is meaningful only when it is tied to purpose that can be generated by incorporating those within community affairs and events (Winner, 1986). Similarly, electronic networks are not "separate worlds in cyberspace" (London, 1997), but "nervous systems for the physical world" (Agre, 1996), that need connections to social realities in order to make them evocative. In the Afya project, developing SisterNet Resource Centers for making health-information resources available at local public spaces such as health salons, churches, libraries, and family centers will be significant in trying to integrate provision of information access strategies within the daily social life of community members. Similarly, strategies like the location of computer training labs in the local Urban League, Workforce Prep Center, and within Prairienet premises, as well as the organization of the SisterNet Health Fair this summer in a local public library, have been significant in this regard. Such community networking endeavors are helping to promote improvements in health information resources and service delivery by taking advantage of users' familiarity with local social institutions. They are also effectively developing from the local resource support infrastructures of these institutions for achieving health-related outcomes.

- A key activity in the Afya project has been promoting collaboration between marginalized community members, health care and information providers, researchers, local organizations and civic institutions, as well as other community stakeholders. The Afya project is attempting to make public libraries an important place for enacting such collaborations. Presenting participative strategies in public libraries for promoting access to networked digital information for marginalized users has been one such endeavor. The organization of the SisterNet Health Fair in a public library was designed to provide an opportunity for interaction between community Black women and health information service providers. This has contributed towards trust building as well as knowledge exchange about relevant health-related social practices and availability of appropriate resources. Florin and Wandersman (1990) point out the significance of citizen participation in collaborations between community organizations and institutions for nurturing empowerment and building of individual and community problem-solving capacity. For strengthening traditional sources of support, an important strategy in the community building process is to promote new forms of collaboration and partnerships between "people working together for a common purpose in groups and organizations" (Naparstek and Dooley, 1997, p. 79). Collaboration is important in the context of community networks and digital divide issues for it helps to bridge connections between diverse communities, often from traditionally dialectic ends of the continuum—haves and have-nots, 'insiders' and 'outsiders,' disfranchised and franchised, individuals and organizations, etc.—for mutual benefit that leads to overall progress. It is based on developing mutually productive exchanges where each contributes, based on their own strengths that compensate for weaknesses of others in those areas, for achieving the overall community goals. This is important in community development for it relates to community organization and mobilizing of physical and human resources for taking action on social problems perceived by community stakeholders (Rivera and Erlich, 1998).

Community Networks and the Digital Divide: Future Directions of Growth

This concluding section suggests future directions in community networking that can be taken in terms of action-oriented participative and democratic strategies for bridging the digital divide. These are perceived as extension in the roles of community networks in their existing capabilities and capacities. The strategies introduced here all have a common agenda to address empowerment of local people from disadvantaged and marginalized communities. Attacking the roots of the problem rather than providing mere surface solutions, they encompass larger socioeconomic and sociopolitical issues as well as specific areas associated with information access, use of technology, and the role of community networks as effective for addressing the digital divide. The following are presented some ideas, open for discussion, related to future directions that community networks can take for overcoming the digital divide:

- **Strengthen the role of public and academic libraries in community networking:** "The modern public library in large measure represents the need of democracy for an enlightened electorate, and its history records its adaptation to changing social requirements" (Shera, 1949, p. vi). There is tremendous potential for future development in the area of libraries as 'gateways of provision and access' to the Information Age for all members in the community (Wellisch et al., 1974). In 1990 the American Library Association adopted the policy, "Library Services for the Poor," in which it was stated that libraries should recognize their role "in enabling poor people to participate fully in a democratic society, by utilizing a wide variety of available resources and strategies." (ALA Handbook of Organization, 1999-2000, policy 61). Today, public and academic libraries have to be more creative in making themselves open to marginalized community members by loosening bureaucratic procedures, changing national and local limiting institutional practices, discarding rigid administrative frameworks, and redefining library policies based on incorporating representative community voices in planning and policy deliberations. Libraries also have to be actively involved in outreach activities and proactive service to marginalized communities in their areas. This should involve active participation of librarians in planning initiatives and conducting assertive environmental scanning procedures to determine possibilities of need, collaborative decision-making, and positive action. It should also involve working towards change in broader policy issues via political action and legislation (McCook, 2001). "Working our collaborative and citizen-based efforts into the formal, local political structure will not only create policy that reflects the values of citizens but will also hasten reform of local government from that of a purely representative form to a highly participatory and dynamic decision-making structure (Gates and O'Connor, 2000, p. 167). As Imani Bazzell, SisterNet Founder and Director, writes (Bishop, et al., 2000): "If you want to open the library's doors and be inviting to Black women, that means transforming the whole organization and how you do things. If the library wants to make sure it reaches members of that community, it needs to alter its relationships with them. Libraries should not just serve information; they should help build the community's capacity to create information." Strengthening the role of librarians in community building processes for achieving sustainable community development based on economy, ecology, and equity (American Library Association,), will lead to transfer of authority and responsibility from higher-level agencies to the neighborhood or community (McCook, 2000).

- **Reconnect library and information science (LIS) education and pedagogy with service learning in community networking:** Community networking provides a great opportunity for involving students in LIS and other disciplines for participation in "projects of relevance that will prepare them for engaged citizenship" via service learning (McCook, 2001). Such interactions are seen as symbiotic for they contribute towards developing engaged service and socio-humanistic angle to the teaching of librarianship that has been recently focusing on only the technological solutions to information problems; on the other hand, it also helps improve real communities and build local community capacity. Such endeavors will help apply knowledge to practical issues and engage universities to become active partners in the quest for solutions to contemporary social, civic, economic, and moral problems (Boyer, 2000). It is directly tied to service integration ideologies that help promote citizen engagement with students in academic settings based on collaborative strategizing of local capacity and resource sharing for community building and civic renewal.

- **Support activities and actions in community networking that empower marginalized communities by participation and inquiry into social reality of marginalized communities:** Similar to libraries, community networks too have to build upon local capacity of marginalized communities within the process of creation and dissemination of information in order to become meaningful in any real manner that may impact social values, patterns, and practices in the community. Working with the community while its members decide what course of directions to choose, is central to efforts for building capacity and engagement in participative democracy for making positive changes for a better quality of life (McCook, 2000). Involving citizen participation, such empowerment can systematically support people, organizations, and communities achieve mastery over their own affairs (Rappaport, 1987). It also contributes towards creating knowledge and developing culturally appropriate information resources that meet needs of real users, for such resources are built by members of the community themselves (Stoecker and Bonacich, 1992). Such empowering activities in community networks have to tap into the practical value of technical studies (Shera, 1949) in terms of incorporating them within the social life of daily users. This can only be possible by participation and inquiry into the social reality of marginalized communities in order to build potential for accommodating technological solutions within users' existing social structures and activity patterns.

- **Enhance participation of marginalized communities in user-centered planning and policy implementation, community-specific role setting, and self-evaluation:** Activities undertaken during each phase of community networking developments need to be evaluated in terms of their impact upon the lives of marginalized communities. Feedback can be gained from disadvantaged community members via socially grounded methodologies such as focus groups, interviews, mail surveys, and telephone interviews about the perceived nature and evaluation of activities undertaken under the auspices of the local community networks. Responses of community members about their participation in user-centered planning committees and programs can also be elicited. Community network planning and policy implementation of community-specific role setting and activities should incorporate findings from such interactions. Efforts such as these will help re-engage members belonging to underserved and marginalized communities with each other and the process of public policy development to address issues associated with the digital divide (Dialogue on Poverty, 2000).

- **Promote outreach activities based on deeper collaboration and partnerships with grassroots organizations and local groups:** Community networking can be effective only if attempts are made to network all individuals in the community and include members from all groups, organizations, and institutions. This helps to strengthen community ties and impact less-connected peripheral community members. Some community set-ups that can play an effective role in collaborations and partnerships for addressing digital divide-related issues may include civic and business associations, non-profit and voluntary organizations, public and private schools, community colleges and universities, public libraries, health centers, etc. The underlying idea is to work "with" people rather than simply "for" them by integrating scientific knowledge, disciplined effort, and learned skills into a more contextualized interactive practice (Boyte, 2000). Zimmerman (1992) highlights examination of grassroots community organizations for promoting empowerment in marginalized groups. Citizen participation in voluntary community organizations, for example, is empowering for marginalized community members for it leads to higher competencies, confidence, sense of citizen duty, and lower feelings of helplessness (Ahlbrandt, 1984; Florin and Wandersman, 1984; Zimmerman and Rappaport, 1988).

- **Engage in promoting adult literacy programs:** Community networking initiatives should engage in promoting adult literacy programs. Activists and scholars are only now beginning to fully recognize that such programs have potential for great impact upon awareness, acknowledgement, and realization of socially constructed prejudices and discriminatory practices that have been central to digital divide issues. Community networks can also be involved in increasing the use of computer technology and coordinate technical assistance in adult literacy programs. These may involve organizing workshops and conferences on themes such as race and gender discrimination; effective methods to measure and document the gains made by learners;

design of telecommunication networks for making appropriate resources accessible to different users; Internet for literacy exchange, etc. (McCook, 2000).

- **Target neighborhood to enhance resident participation and build on neighborhood assets:** Community networks can be potent in linking service and development initiatives to the local community asset base via concentrating upon targeting specific neighborhoods for intervention in order to make "residents become more involved in shaping strategies" (Naparstek and Dooley, 1997, p. 81). This recognizes that residents feel impacts of policy and planning decisions particularly at the neighborhood level. It also recognizes that all kinds of communities, including poor and disadvantaged user groups, also have assets (Kretzmann and McKnight, 1993) that can be acknowledged within planning efforts. Grounding themselves to real geographic areas, such strategies accommodate an integrative and comprehensive vision of community building that realizes the collaborative and interconnected nature of community components, issues and solutions. Community development corporations (CDC) provide an instance, based on social planning principles, where endeavors to employ local resources via asset and associational mapping for neighborhood development have played a significant role. CDCs have assimilated community-building principles such as Rothman's (1995) three models of neighborhood intervention—local development, social planning and policy, and social action—in areas such as investments, family development, education, health, and human resource development. Similar strategies may be tried in community networking using computers for achieving desired goals.

- **Integrate online and offline worlds in order that they mutually support each other**: Within the context of community networks and the digital divide, a significant point to note is the mutually supportive nature of online and offline communities. In community networks even though the tools may be technology-driven, the vision is yet towards strengthening community (London, 1997) as it means to Robert MacIver (1970) in terms of "the common life of beings who are guided essentially from within, actively, spontaneously, and freely relating themselves to one another, weaving for themselves the complex web of social unity." Putnam's (1993) comparative study of communities involved in civic engagement in northern and southern Italy draws to attention the importance of existing social networks, organizations and neighborhood associations in economic development. This needs to be understood in the context of developments in community networks for effective implementation and service in areas where it is due.

This working paper has taken a brief journey through the historical development of community networks in different forms and contexts, in order to present the salient features of community networks as related to digital divide issues. Philosophical frameworks and characteristics of community networks are highlighted in order to place in historical perspective, the need for a more participatory action research methodology to effectively address the digital divide and associated socioeconomic and sociopolitical realities. Constructive action-oriented democratic strategies for achieving social justice and social equity are suggested for future directions of growth of community networks to address digital divide issues.

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Some Useful Electronic Resources

- **Prairienet Community Network,** a member and donation-supported community information network for Champaign-Urbana and the surrounding East-Central Illinois region, is offered as a community service by the Graduate School of Library and Information Science at the University of Illinois at Urbana-Champaign. [hhtp://www.prairienet.org]

- **Community Connector** is a project of the University of Michigan School of Information that contains directories of CNs, conference announcements, bibliographies of papers, community-building information and other relevant resources. [http://www.si.umich.edu/Community]

- **The Benton Foundation** promotes public interest use of communication technologies and associated social benefits. The foundation advocates research and policy analysis, community action, outreach to nonprofits, and online publishing for the National Information Infrastructure in order to demonstrate the value of communications for solving social problems. Information on the digital divide, resources to help nonprofits effectively use communication technologies, etc. can be found by following the link to Communications Policy & Practice [http://www.benton.org/cpphome.html]

- **The Alliance of Information and Referral Systems (AIRS)** is the professional association for nearly 1,000 programs throughout North America that provide information and referral on human services in their respective communities. [http://www.airs.org]

- **Technology Opportunities Program (TOP)**—formerly the Telecommunications and Information Infrastructure Assistance Program (TIIAP)—of the Office of Telecommunications and Information Applications in the U.S. Dept. of Commerce's National Telecommunications and Information Administration annually awards matching grants to promote effective use of information technology at the local level. [http://www.ntia.doc.gov/otiahome/top/index.html/]

- **Association For Community Networking (AFCN)** is an educational nonprofit corporation dedicated to fostering growth of "Community Networking"–community-based creation & provision of appropriate technology services. [http://www.afcn.net/]

- **Community Technology Centers' Network (CTCNet)** is a network of nonprofit organizations in the US that promotes training, support, and access to computers and the Internet. [http://www.ctcnet.org/]

- **Community Building Resource Exchange** is a project of the Aspen Institute Roundtable on Comprehensive Community Initiatives for Children and Families. It provides a collection of resources and information about innovative community building efforts to revitalize poor neighborhoods and improve the life circumstances of residents and their families. [http://www.commbuild.org/]

- **Morino Institute** is a nonprofit organization that "explores the opportunities and risks of the Internet and the New Economy to advance social change." The website provides resources in four key areas, namely, stimulating entrepreneurship, advancing a more effective philanthropy, closing social divides, and understanding the relationship and impact of the Internet on our society. [http://www.morino.org/]

- **Markle Foundation: Improving life in the information age** works to realize the potential of emerging communications and information technology to create unprecedented opportunities for improving people's lives. Some of the most promising areas for Markle to meet public needs are in the following programs: Policy for a Networked Society, Interactive Media for Children, and Information Technologies for Better Health. [http://www.markle.org/index.stm]

- **Community Tool Box is** created and maintained by the University of Kansas Work Group on Health Promotion and Community Development in Lawrence, KS, and AHEC/Community Partners in Amherst, Massachusetts. The "how-to tools" provided on this website provides guidance on how to do different tasks necessary for community health and development. [http://ctb.lsi.ukans.edu]

- **Free-Nets and Community Networks** is developed by Peter Scott, and provides a directory to community networks across the world and links to relevant resources.

- **Closing the Digital Divide** is a comprehensive clearinghouse for information resources about digital divide issues and efforts to provide all Americans with access to the Internet and other information technologies. [http://www.digitaldivide.gov/]

- **Digital Divide Network: Knowledge to help everyone succeed in the digital age** provides information resources about the digital divide and related issues. [http://www.digitaldividenetwork.org/content/sections/index.cfm]

- **Digital Divide** is a two-part series for PBS that explores how the rapid spread of computer technology is affecting young people across the country. Narrated by Queen Latifah, the series asks the question: is everyone participating equally, if at all, in the Digital Revolution? The series focuses on the many aspects of the digital divide, exploring how the issues plays out in terms of education, employment, race, and gender. [http://www.pbs.org/digitaldivide/]

- **Global Culture: Trade and Technology: Digital Divide Project** is a collaborative venture between the Seattle School District and the University of Washington to create a curriculum for middle school and high school students that begins to engage them in some of the complexities of the digital divide, especially in the global dimensions of these issues. The website provides access to relevant resources.

- **Digital Divide** provides access to articles, reports, chat forums, and other relevant information resources on the gap between minorities and whites in Internet access. [http://racerelations.about.com/newsissues/racerelations/cs/digitaldivide/]

Deconstructing the "Digital Divide": Toward a Grounded Theory

DRAFT DRAFT** DRAFT**

Working Paper

For

Community Technology Alliance Workshop
Ann Arbor, Michigan

(*Please do not quote or distribute outside the workshop without authors permission***)**

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Working Paper for Community Technology Alliance Workshop

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Theoretical and practical questions relating to the "digital divide" are becoming more and more important in policy and scholarly circles. The exponential media coverage dedicated to the 1999 Department of Commerce NTIA "Falling Through the Net" Report led to the increased awareness of the emergence of a "new" division in our society.[1] Still, the "new" concept is not fully elaborated. The NTIA report has not yet clarified the concept well enough to forestall certain confusions. The present criterion of the "digital divide" is "between those with access to new technologies and those without" and the "divide between the information rich (such as Whites, Asians/Pacific Islanders, those with higher incomes, those more educated, and dual-parent households) and the information poor (such as those with lower incomes and education levels, certain minorities, and those in rural areas or central cities.)"[2] This simplistic formulation suppresses the social context under which technology is embedded, created, and reproduced. The problem of "digital divide" is embedded within and generated from the existing inequality of resources and opportunity.

The technological revolution, centered on information technologies (IT), is shaping a new economy, society, and culture. Information and telecommunications are the most important enabling technologies in the new economy (Castells, 1996). In this

[1] During this period, there were over 11,000 articles dedicated to the topic of the "digital divide." This is exponential to the less than 100 articles during 1995. (Source: Arquette, Toby. Presentation. UCB. Summer 2001)

revolution, IT and the ability to use it are essential to the performance of the new production function (Castells, 1996). They affect every sector and industry in the United States in terms of digital-based products, services, and production and work processes (U.S. Department of Commerce, 1999). Competitive pressures have driven businesses to adopt a wide range of computer systems to improve productivity, manage production, increase both internal and external communications, and offer customers new services (U.S. Department of Commerce, 1999). Furthermore, industries are requiring higher skills for many more jobs, regardless of location. As a result, a growing mismatch between the location of the new economy (in the suburbs and in post-industrial metros) and the skills it demands and the large and rapidly growing population of lower-skilled and often minority residents in low-income communities is likely to occur. The skills mismatch can contribute to unemployment and underemployment in such communities and is likely to exacerbate current economic and social problems in the urban core. As technology restructures urban core economies to become more service oriented and more highly skilled, improving technological access, skills, and education levels of urban residents will be increasingly important. To compete in an era of rapid technological change, cities and metro areas must successfully adapt to the new technology system. In contrast, metropolitan areas, cities, or parts of cities that will not or cannot adapt run the risk of being left behind to face stagnation or decline (Borja and Castells, 1997). Following this logic, urban core survival will depend on the adaptation of people, institutions, and the built environment.

[2] U.S. Department of Commerce. National Telecommunications and Information Administration. Falling Through the Net: Defining the Digital Divide. 1999.

In the context of a knowledge-based economy, information technology and the ability to use it are essential in the performance of the new production function. Following this logic, productivity necessarily stems from innovation and under this new system of production, labor is redefined in its role as producer. Thus, in informational capitalism, it matters if individuals and societies are producers or consumers, and this along with capital and labor defines the social location of each. The definition of technological inequality and poverty then depends critically upon enhanced access, ownership, and the ability to understand, navigate, utilize and produce information technologies.[3] This I put forth could shape our understanding of who is unequal or not in the information-network society. To fully understand the reality of the phenomena, policy makers and scholars must resituate the problem and concepts with the dialectic of the means of production and consumption. To extrapolate and understand such relations we must superimpose the "new" trend of exclusion with the preconditions and context under which our society functions. *Praxis* could help.

The simple conceptualization of the "digital divide" totally rejects and loses sight of existing inequalities. To move beyond the simple notion and understanding of the "digital divide", theory must involve a *praxis* that goes beyond technology. Technology cannot be separated from the social relations that exist; from the organizational context under which it operates; the process of its appropriation and use; and mode of development and production--all of which are socially and institutionally defined. Hence, it is not surprising to discover that many patterns of subordination, exclusion, and

[3] Information technology in this paper is defined as "study, design, development, implementation, support or management of computer-based information systems, particularly software applications and computer hardware." This definition is adopted from the Information Technology Association of America (ITAA, 1998).

marginalization are found. There is now a broad emerging consensus that members of ethnic and social groups residing in low-income and economically deprived areas do not have equal access to technology. This may in fact contribute to the already existing and growing inequality in our society. Thus, inequality is enhanced. Understanding what is new of the praxis is what we need to focus on. The "new" connections and disconnections to "new" spaces within an originating and historically defined society and territorial location must be understood and related. These should be supplanted by formulations of empirical fact in the fields of stratification--inequality and poverty. Separated from praxis, theory of the "digital divide" ineffectively comes to grips with insoluble problems.

The discovery of praxis does away with autonomous delineations between technology and society[4] and speaks to relations, context, organization and process. And these have a temporal element as well. The key to uncover is when does time matter to connect? Does it matter when you connect? Or disconnect? For who? Under, which conditions? Why and How? How is time connected to distance? The increased inclusion/exclusion and value/valueless dichotomy is better understood by the distance between those who can embody external technology and internal innovation and those who cannot. This progresses. Thus, the 'digital divide' is better framed when discussed as the relation and distance between the technologically self-sufficient (those who can manipulate and embody the productive function of technology and internal innovation and assumes control) and those who are technologically dependent (those who do not know what to do with it and are therefore controlled by it). The fundamental distinction is

[4] These can never be realistically separated. They are inextricably linked and embodied, thus not transparent.

the capacity to manipulate and master the productive function of new technologies. This translates into prosperity for some and neglect and control for others. The intensity of the gap remains unknown. But, the interplay between the differentiations can translate into different spatial forms that crystallize up and down the ladder of social stratification. Thus, we must uncover the intensity of the distance and the factors that underlie differential pace of access. The effects likely vary depending on the locality, culture, institutions, social and economic organization, levels and forms of development.

There are leapfrog technologies but not leapfrog processes and mechanisms or techniques. How do you explain the world of the Internet? How do you impress and relate this "new" space? And how do you connect people to the exponential learning curve of embodied generations of valued and transferable external technology? [5] --and internal innovation? --or knowledge expertise that is embodied over time? In, real time? What about value of information? Is it that certain generations do not embody such value or that our society does not value it? This is not clear yet. Connection to technology is not the same as connection to the exchange values of society or the economy. The key question at stake is: under which conditions and through which processes does technology have more prospects for (re)producing and reversing the process of increased inequality? Between populations? Between places? Between societies? Can "democracy"

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[5] And the speed of technological invention continues. Moore's Law correctly predicted the exponential rate of improvement of technology. The rate of advances in technology is incredible, new technologies are created everyday and always in time to keep performance advancing smoothly. Bill Joy in his widely read and seminal article, "Why the future doesn't need us." predicts that because of the "recent rapid and radical progress in molecular electronics—where individual atoms and molecules replace lithographically drawn transistors—and related nanoscale technologies" Moore's Law rate of progress will be met. He predicts that by 2030, machines are likely to build, in quantity—a million times as powerful as the personal computers of today. Joy is cofounder and Chief Scientist of Sun Microsystems, was co-chair of the Presidential Commission on the future of IT research, and is co-author of the Java Language Specification. Joy, Bill. "Why the future doesn't need us." Wired Magazine, April 2000.

be translated into technology? Or does technology translate "democracy"? The new technologies, by themselves, do not create new processes or forms of social organizations. Many questions arise to which it is difficult, at the present time, for lack of information or comprehension of the phenomena, to give satisfactory answers. We must continue a discussion and debate of what the appropriate questions are.

For sure, technology enhances and illuminates what exists and doesn't exist---the continued and historical divisions of power and value. New technologies also enable archaic forms of control and these can be articulated together with modern productive networks. Technology facilitates this. Filters are often employed in particular institutional settings.[6] The network architecture does not mean that it is open to all. Under which conditions then does technology make opportunities possible for the excluded? When are the marginalized able to overcome existing obstacles through technology? If technology is not deterministic or an agent, what are conditions and mechanisms that make possible the employment of technology for the benefit of society? And community? What about the contradiction between what is possible and unrealized with the introduction of new technologies? What is the domain of possibility? What results from the fusion of technology in action? Connection to technology is not the same as connection to mainstream society. So what continues to impede the reversal of inequality? The basic inequality in the information society is exactly the lack of access to value, exchangeable

[6] It is important to note when and for what filters are employed. Through my research with CTACs I found that some administrators employed filters that prevented participants from using free email such as hotmail. Thus, one of the most important elements of IT, communication, is limited and controlled. In one case, I found that this was decided by the educational institution under which the CTAC was incubated. In this way, the CTAC is not independent of established rules and regulations imposed by the organization or institutions under which they operate. Connection must be observed and studied closer and institutional regulations must not be underestimated or ignored for they predetermine and condition access. The CTACs ability to provide online resources and the full capacity of technology for the participant. Under a certain set of conditions, rules and regulations access is undermined (Gordo, 1999).

and transferable information of basic opportunity. Technology can be an opportunity. The radical negation of existing inequalities will not help us address this problem but rather support the reproduction of the same.

Praxis does away with autonomous and simplistic delineations between technology and the social. But, it progresses toward the realization of theory only to the extent that that an efficacious and revolutionary praxis relegates to the past—along with the traditional perceptions of traditional thinking of the division of labor and the state, what is new. Meaning, what is the “new” logic of social action and whatever technology allows. Only a full exposition of the concept, of what it implies as well as of what it makes explicit, will show that the “digital divide” phenomena contains many sociological elements—sociology of needs, of obstacles, of opportunities, of objects, of knowledge, of everyday life, of territorial limitations and opportunities, of production, of political life, etc. These are relative and vary in value. The question is not whether these relate to technology but how they relate.

Not only is the NTIA’s work unfinished, even its most developed notion of technology is insufficiently elaborated. This has contributed to no small extent to later misunderstandings and rhetoric of how high speed and new technologies are rather a “luxury” rather than a need as stated by the Michael Powell, the current Secretary of the Department of Commerce. According to other conservative think thanks, like the Pew Institute, the “digital divide” is narrowing and if not closed near an ending. The miracle is realized within three Department of Commerce reports. These claims are inconsistent with empirically observed facts. In fact, high-speed technologies do create a comparative advantage not just in producing high technology goods (content, etc.) but also in giving

and edge in the ability to master the tools. Michael Powell and Pew conceive technology as a luxury and in this way the end of the “digital divide” without its realization. This will later be discarded and interpreted as a political strategy.

The praxis involves differences, levels, polarizations, and contradictions. There are many ways to typecast even simple connection as is described by the NTIA. For instance, we can distinguish the technological connection in three ways: 1) connection anytime anywhere, 2) connection sometimes somewhere, 3) no connection anywhere. This matters, different level choices determine how “connected” you are or not. The fragmentary techniques and categories promptly give social scientists one-step in and give speculative unity to formless mass of facts, techniques, and results. The report has fuzzy statistics that are politically manipulated with the transfer of a Republican Administration and conservative ideology. Speed and quality of technology matters—technology becomes obsolete exponentially. Slow hardware cannot maintain the fast changing and competitive free software on line---and not just the poor get frustrated with a slow and constantly breaking down computer. What kind of competitive edge could the poor ever have with recycled computers even if they are connected? In this way, time is relevant to understanding distance. Here again if we care to develop a mechanism and opportunity for upward mobility, high speed, high valued technology for retrieval of the raw material (information) matters for competitive production. These matters will be developed later.

Grounded theory needs to unify the clear dimensions of the “digital divide.” The dimensions are technology, class, race, education, and income. Perhaps even culture, that is lived-experience. These dimensions simply articulate the already existing inequality,

polarization, and spatial differentiation that exist but it does not make clear the intensity of the division. There is a new distinction that interplays with existing inequality with the introduction of varying quality and capacity of new and high- speed information technologies. It is important to note that while new information technologies are not the cause of inequality they are now an infrastructure that is a prerequisite for the existence of enhanced inequality, technological poverty and destitution.

The “digital divide” then is intrinsically interwoven with existing inequalities. Socio-techno praxis, or superimposing the new technology over existing inequalities is the first step. Without this we will not understand what exists. And what is intensified? How? Why? And what interventions are possible? For this we must understand the instrument—technology is not static, but rather dynamic. The design of new social processes that are enhanced or aided by technology must be studied. Process involves design and training and these may or not adhere to the needs of the underrepresented and disadvantaged. Process involves an upgrade-ability path for accommodating new technology. It involves work practice. A distinction must be made between technology designed to aid people on their way of working and reshaping work to fit systems. It involves control. Technology can be designed or employed in ways to “dummy down” or enhance intellectual development. Hence the critical need for socio-technical frameworks --in which solutions to social problems, aided by technology, can be discussed. Again, tools without any process redesign is most likely bound to fail the marginalized and excluded. In superimposing and interweaving the “new” with the “old” inequalities, it is important to remain critical. These may in fact be changing, may be more complex. If the current economic transformation and institutional crisis has affected society and its logic,

then most certainly it has affected the poor. Here then we must uncover, what "new" "old" or a recombination of more complex new and old problems and obstacles exist and are enhanced. Poverty is not a condition it is process.

Scholars interested in grounded theory of the "digital divide" must also take care not to adopt or fuel existing stereotypes. There has to be new language created to articulate the new poverty and exclusion that evades the most marginalized and excluded from the design and development of new productive technologies. In particular, we must be careful not to confound and compound "folk" with "conceptual" constructions of race, ethnicity and gender. The association being made between race and ethnicity with "information rich" and "information poor" is scientifically poor if not inappropriate. These associations "racialize," "ethnocize" or "feminize" the problem. In fact, differential pace of access to the Internet and its information is related to a greater range of opportunities for access, adoption, relation, and diffusion.[7] These are historically rooted and located in territorial space. Even more, simply being poor, black, Latino or a woman does not equate lack of embodied information, knowledge, or creativity.[8] Rather, what is important to note here is the relative exchange value of such information and knowledge. What might explain that? What could concern us here are those differences that can be effectively demonstrated by a laborious analysis of the space between resources and lack thereof. Also why we may value them differently. The same input information and content may be valued differently and thought of as productive or unproductive. Of course, the context and setting matters. For instance, Nalini K. studied

[7] The empirical record confirms that Blacks, Latinos, and women tend to exist in extreme pockets of poverty and a high percentage of these social and ethnic populations are structurally, systematically, and spatially separated from their counterparts. Bandwidth and broadband in space parallels such divisions.
[8] That it is realized or not is a different matter.

web design skill for her Masters thesis at UC Berkeley. She found that the web design skill was undefined. Furthermore, the inputs were code and art. Code was overwhelmingly created by men while the arts component of the website were created by women. While they were of equal importance and the value could not be segregated, women remained under paid. Why? Is this related to the “digital divide.” According, to the NTIA report there is no gender divide. These are questions upon whose future grounded theory and planning action count. Thus, to understand reality what must be studied is the space and relation in between the connection and disconnection, the distinction between valued and undervalued work. We find ourselves in this dilemma--the lack of understanding--because the poverty of philosophy in this area and during this time is compounded with poor research design and methods.

Research Design Appropriating the “Digital Divide”

Talkin B(l)ack to the Divide: Literacies, Technologies, and Problems of Access

Draft version of presentation for d3 Conference
University of Michigan
August 1-5, 2001
Adam Banks, Pennsylvania State University Department of English

It might seem entirely irrelevant to some, but I'm fascinated with the fact that during the period of what is often called the greatest advance in technology in the last 100 years—and what some even suggest is the most important communication technology to emerge since the printing press—the nation and English departments throughout were mired helplessly in an Ebonics debate we've already been through decades ago.

I'm fascinated with the simultaneity of these events for many reasons: I wonder why the Oakland School Board's claim on federal resources for educating Black children caused such a furor 30 years after the Ann Arbor trial and 50 years after Brown v. Topeka Board of Education; why, almost to a person, Black "leaders" and advocates sounded just like white conservatives in early parts of the debate; and why assumptions about the supposed inferiority of African American varieties of English that have been dismantled consistently by Black and white linguists over the last several decades still hold such force, especially with language teachers and professionals. But the most important reason they're important to me is because of what wasn't happening during the debate: serious, thoughtful discussion about race and the problem of access to computers and Internet technologies.

While African American engineers and science professionals have long understood the importance of equal access to these technologies, writing and communication teachers have been mostly silent on the subject. If, however, the most important characteristic of computers and the Internet is their role as **communication** technologies—if, as Jay David

Bolter and many others argue, these tools will be responsible for a revolution in communication more important than any other in the 500 years since Gutenberg's printing press, the results for African Americans, who have consistently and often systematically been denied access to communication technologies, can be catastrophic.

This said, English departments (I'm specifically concerned with Composition and Technical Writing programs within them) have been staggeringly silent about the problematic relationship between race and technology access that we now call the Digital Divide. This silence is a peculiar one, given the facts that Composition as a field, in many ways, owes its existence to struggles with questions of access to higher education, and has worked diligently at important points in its history to address the role of race in these struggles, especially as it has been crystallized in Ebonics debates. Further, it is an odd silence because Technical Communication is **the** intellectual space within English studies that potentially can do the most to address the Divide. I want to look that silence over the last 5 years as it echoes throughout journals and books published in Composition and Technical Communication to show just how little has been said, offer an assessment of those attempts Composition and Technical Communication specialists have made, and identify places where we can enter this discursive divide that maintains the severity of the Digital one that is so pervasive.

Black people don't exist. At least not online we don't—or so we might be led to believe. Caught between cyberspace theory that argues race is irrelevant (and that it should be) online, a tradition of black social and political struggle that seems to privilege cultural production over scientific and technical production, and scholarship in Composition and Technical Writing that has barely begun to seriously engage questions of technology access, African Americans scholars—especially those who teach Composition or Technical

Communication who want to address the Digital Divide must first cross the discursive canyon that exists on the issue. During the last 5 years, not a single article in the three major technical communication journals, *Technical Communication*, *Technical Communication Quarterly*, and the *Journal of Technical Writing and Communication* addresses the Digital Divide or broader technology access issues, though all journals frequently take up questions of the promises and perils of computers and the Internet. No article in *Technical Communication* addresses any issue related to race and technology—in fact, no article in the journal takes up the question of race at all—in spite of a significant presence of African American and Latino/a engineers in the workplace. When "cultural" issues are raised, the subject is always international students, employees, or clients, with "international" frequently focusing on Arab, Asian, or European. *Technical Communication Quarterly* manages a grudging nod in the direction of Black people with Heather Brodie Graves and _____ finish citation article on the need for cultural sensitivity in technical editing "Masters, Slaves, and Infant Mortality." *JTWC*, the Journal of Technical Writing and Communication continues the silence on access, but includes two articles over the last 5 years on African Americans and communication: a study of Ebonics that purports to examine student attitudes toward Ebonics by "translating" a Jesse Jackson speech into Ebonics that says nothing about the specific features of African American varieties of English their translation used, (Payne, Downing, and Fleming) and one on **the** Black communication style—the authors' words, not mine: "A descriptive study of the use of the Black communication style by African Americans within an organization." This 1997 article by Vonnie Corsini and Christine Fogliasso that ends with a call for an awareness of cultural differences. Composition hasn't done much better: the major journal of the field, *College Composition and Communication* has published exactly two articles on technology access and writing instruction: Cynthia Selfe's 1997 chair's address to the Conference on College

Composition and Communication, "Technology and Literacy: A Story about the Perils of Not Paying Attention," and "The Politics of the Interface: Power and Its Exercise in Electronic Contact Zones," a 1994 article by Cynthia and Richard Selfe demonstrating that computer and other technology interfaces can uphold the very exclusions that some think they will help to eradicate. The good news is that the Selfes' work has helped to push Composition in a more progressive direction than technical communication, one that acknowledges the political and social forces at work in the development and use of any technology. But that's almost it.

How is it that the problem of differentiated access to computers and Internet technologies is understood to be connected to race, and that in spite of our understanding them as communication technologies a discipline that has long struggled with issues of race and access, and a field that sees its work as teaching students and professionals to become critical users of technologies, Composition and technical communication have ignored the convergence of these issues in the Digital Divide? How is it that the ways African Americans and other people of color use computers and the Internet are entirely neglected in even the few conversations that do happen? This discursive divide occurs in part because both areas have simply been slow to make the connection. Charles Moran argues in his essay "Access: the 'A' Word in Technology Studies" that Composition as a field has to look carefully at the problem of race, gender, and wealth differences in access to technology and the effects these differences have for scholars' teaching, research, and writing—but in 1999. And he acknowledges that his work represents first steps for this kind of inquiry: "Most of us simply do not deal with the relationship between wealth and access. I think of some of the major texts in our field…none of which raise the question of access in a substantial way" (210). He continues, with a reflection on the institutional side of this neglect, "I would add

to this list, too, university alumni magazines and public relations documents that boast of their institution's technology without mentioning the fact that it is available only to a privileged few" (210), and adds that scholarly anthologies in Composition are complicit as well.

James Porter, a technical communication professor at Michigan State University offers a definition of access in his book, *Rhetorical Ethics and Internetworked Writing* that starts to take into account social and pedagogical issues, but does not explore the ways that race or ethnicity might affect that defintion. Cynthia Selfe begins to engage the connections between race and access in *Technology and Literacy in the Twenty-First Century*:

> But if the project to expand technological literacy has been justified as a means of achieving positive social change and new opportunity, to date it has failed to yield the significant positive social progress or productive changes that many people have come to hope for. Indeed, the American school system as a whole, and in the culture that this system reflects, computers continue to be distributed differentially along the related axes of race and socioeconomic status, and this distribution contributes to ongoing patterns of racism and to the continuation of poverty. It is a fact, for instance, that schools primarily serving students of color and poor students continue to have access to fewer computers than do schools serving primarily affluent students or white students. And it is a fact that schools primarily serving students of color and poor students continue to have less access to the Internet, to multimedia equipment, to CD ROM equipment, to local-area networks, and to videodisk technology than do schools primarily serving more affluent and white students (6).

Selfe's project, as she outlines it in this part of her book, is important not just because it begins to explore issues of race and technology access. She also uses the book to examine the social and political implications that are involved in, but often hidden in conversations about, technologies by looking at the Clinton Administration's Technology Literacy Challenge. What appeared to be a positive agenda by President Clinton, with stated goals of "wiring every school in America," posed and poses the danger, according to Selfe, of merely providing technology producers with the perfect market for their products: passive consumers dependent on these technologies, but unable to effect any meaningful change in the lives of those who have been marginalized. Access to any technology involves political power and literacies: "[i]n a formulation that literacy educators will feel most keenly, the

project to expand technological literacy implicates literacy and illiteracy—in their officially defined forms—in the continued reproduction of poverty and racism. And it implicates teachers as well" (7).

But the subtitle of her book shows us just how much her understanding reflects how Composition has addressed issues of access: *The Importance of Paying Attention*. Both Selfe and Moran note that the field has not paid attention as of 1999 and 2000, even while they contend that it is crucial for us to take access seriously. While race, and especially the connections between race and technology access serve as what Catherine Pendergrast calls the "absent presence in Composition" (and I would add Technical Communication), conveniently contained within easy labels that prevent action on an anti-racist agenda (36), the silence is not all-engulfing, as some have begun to pay attention. There is important work being done with, and in response to, Selfe and Porter, even if that work still amounts to rumors and rumblings in the wider discourse communities of Composition and Technical Communication. ***And even with the best of intentions of the few people addressing access in Composition, very little of the work done in the field actually looks at what Black people or other people of color actually do online***. (move)

Charles Moran and Cynthia Selfe, in an article published in *English Journal* , a refereed journal for K-12 English teachers, "Teaching English Across the Technology/Wealth Gap," continue their call for teachers to place the Digital Divide at the center of research, teaching, and activism for writing specialists, and acknowledge the critical role that race plays in technology access (48). But they also press on to identify important problems for those who take up the challenge. They note that embracing technology uncritically can not only contribute to worsening the wealth gap and power differences between people of color and

whites, but also make teachers the best allies a global capitalist society could hope for by providing ready-made consumer bases for technology firms:

> Advocates for technology often have an agenda that has nothing to do with our students' learning. If one is a politician or academic administrator in this decade, it is almost mandatory to call for technology in our schools, not because of any proven link between technology and learning—there really is no consistent evidence of such a link, especially in language arts and literacy studies—but because technology is seen as a quick and cheap fix for the perceived problems in our educational system. Anything associated with technology has a special glow these days. We note in this regard the extraordinary bubble in technology stocks that is helping to drive the stock market….In language arts and English classrooms, we need to recognize that we can no longer simply educate students to become technology users—and consumers on autopilot—without helping them learn how to understand technology issues from socially and politically informed perspectives…[otherwise] we may, without realizing it, be contributing to the education of citizens who are habituated to technology but who have little critical awareness about, or understanding of, the complex relationships among humans and machines and the cultural contexts within which the two interact (48, 52).

Given these problems, Moran and Selfe articulate an agenda based on activism for equitable access, but one that is also critically informed—the most important point, for me, when we consider the ways Black students are continually dumbed down by skills only curricula, whether in the name of "raising standards" or providing "remediation." Technology must be as much the work of writing and communication teachers and scholars as writing and communication, and the field must find ways to build students' and teachers' technological literacies in the current environment of poorly funded schools and racialized education politics as well.

To that end, in addition to placing issues like the Digital Divide in curricula and pushing professional organizations to take public stands on technology policy issues, Moran and Selfe call for teachers to find ways to use any and all technologies available in the project to expand access now, suggesting that given the expense of cutting edge technologies, the job of promoting communicative and technological literacies might be best accomplished with lower-end tools in many cases (52). Regardless, the most important change for writing and communication teachers is to make sure that clearly articulated pedagogical goals drive **all** technology decisions so that purchases, training, and planning time related to technology

implementation remains relevant to the learning, social, political, and economic needs of those involved.

So a theoretical framework for initial action is in place in the field, if the voices offering it remain lone ones. Jeffrey Grabill makes gestures toward filling the most important void in Computers and Writing scholarship with his "Utopic Visions, the Technopoor, and Public Access: Writing Technologies in a Community Literacy Program;" namely, the need to engage some of the nascent policy/political/theoretical commitments in studies of how issues of access are played out in specific teaching and writing sites. Grabill's work is significant not only because it is concerned with access, but because of his argument that it is time for Computers and Writing specialists to take their work outside the Composition classroom, to consider how "our understanding of how people write with computers will change because work in nonschool settings will alter inquiries and the knowledge produced" (311). His understanding of access is built on Porter's definition (infrastructure, literacies, acceptance) and Porter's argument that access: who gets the resources; where do they get access; what will the environments look like; who will make the decisions about all of these is a key ethical issue that must be a major part of any conversations we have about technology (301). The Adult Basic Education program that Grabill studies serves primarily white women, but does clear important theoretical ground for communication or writing faculty interested in community technology issues, and could link up in important ways with work on African-American language in literacies outside the classroom, as Beverly Moss does in her edited collection *Literacy in Communities*.

A few other pieces, mainly Susan Romano's "The Egalitarianism Narrative: Whose Story? Whose Yardstick?" and Kristine Blair's "Literacy, Dialogue, and Difference" advocate the use of computer mediated communication technologies in the writing

classroom, and attempt to disrupt simplistic assumptions that computers will magically create egalitarian, democratic environments—moves that speak back in important ways to technology theorists like William Mitchell, whose *City of Bits* offers an architecture and urban planning model for the development of cyberspace with no consideration of the relationship between the histories of those fields and the racism that created the conditions that bring us here to discuss the Digital Divide. These studies foreground questions of Hispanic identity, however, and are not overtly concerned with access.

The major piece that does directly take up questions of race and technology access as they affect African-Americans is "African American Women Instructors: In a Net" by Elaine Richardson. In her case study of 3 Black female writing instructors, Richardson is concerned with the political forces involved in their decisions to become more technologically literate, and to employ computer technologies in their teaching. Richardson's point, while she acknowledges the importance of access to computers is that women of color do not have the luxury to be technology critics or to "opt out" based on their critique that others in the academy, and particularly in English departments, have. This constraint, when combined with the obstacles that hinder these three faculty members from gaining meaningful access (teaching loads, graduate study, publishing, family and other responsibilities) can make that access, even when achieved, highly problematic. Richardson's study is also highly relevant for our conversations about the Divide because it reminds us of how much is involved in access beyond the mere acquisition of the hardware, literacies, and acceptance that comprise Porter's valuable but limited definition.

While many African-American scholars and teachers are concerned about how new technologies might open up possibilities for resistance to racism and participation in American society on their own terms, the pressing need for these writers has often been to

address the perception that African Americans just don't "do" science and technology. In "Computes on Campus: The Black-White Technology Gap," a *Journal of Blacks in Higher Education* article published in 1993, Terese Kreuzer quotes Richard Goldsby, an African-American teaching Biology at Amherst College at the time: "'They aren't likely to be hackers or computer nerds. Computers are not part of Black culture" (93). A jarring comment, even if made eight years ago, but one repeated many times in different ways in the scholarship on African-Americans and science and technology. In another *JBHE* article, "Will Blacks in Higher Education Be Detoured off the Information Superhighway," Raymond Winbush recognizes the difficult selling job in store for those who care about access: "Black kids are not going to have the access to computers or online information services. We need to turn educators on to this problem. We are not sure how it's going to be done, but if it doesn't happen the technology gap between the races is going to widen. It's already wide, but it's going to get worse" (98).

Lois Powell begins an article in the *Journal of Negro Education* with the heading "The Black Scientist, a Rare Species." Some claim that there is no real problem with access to science and technology fields, but as recently as this year, the National Action Council for Minorities in Engineering (NACME), a consortium of fellowship programs, faculty, foundation members, and National Science Foundation representatives working to solve this problem published *Access Denied: Race, Ethnicity, and the Scientific Enterprise*, examining the systemic factors limiting the participation of people of color in the sciences, engineering, and mathematics.

Knowledge of the systemic barriers that Black people have faced in the sciences and technology doesn't help much here. Goldsby's comment still echoes: "computers are not part of Black culture." However laced with the same kinds of self-defeating stereotypes

about Black people that undergirded the Ebonics debate, Goldsby's concern points to the perception that the sciences and technology have never been central to African-American struggles against racism and for equal participation in American society. Almost 25 years ago, Herman and Barbara Young, in "Science and Black Studies," urged Black Studies programs to make study of the sciences a more central part of their curricula: "most Black studies programs have been concentrated in the fields of humanities, history, and the social sciences. They have neglected one area of special significance in achieving their objectives, which is the contributions of Black men to the fields of science" (381). The argue that African-Americans have a long history of achievement in the sciences, and that more focus on those achievements would help meet all of Black Studies' major disciplinary goals, including "provid[ing] alternative ideologies for social change" (380).

But Black intellectuals have always been concerned with improving African American participation in the sciences and technology, and to the degree that the humanities and social sciences are privileged, that emerges from the specific nature of the intellectual underpinnings of Western racism. Henry Louis Gates and Nellie McKay look directly at this privileging of the humanities, offering some understanding of why literary production has had such a central role in African American struggle against racism for more than 200 years: "African American slaves, remarkably, sought to write themselves out of slavery by mastering the Anglo-American belletristic tradition" in ways "that both talked 'black' and, through its unrelenting indictment of the institution of slavery, talked back (95-96). Literature—and literacies—hold this important place for several reasons, Gates and McKay contend. Black inferiority was a dominant theme in Enlightenment philosophy and science, as they show through extensive quotations from Immanuel Kant, David Hume, and Thomas Jefferson. Many people already know the story of Enlightenment justifications of racism,

but the assumptions that Black people had "no ingenious manufacturers amongst them, no arts, no sciences" (97) was accompanied by a draconian body of public laws, making two forms of literacy punishable by law: the mastery of letters and the mastery of the drum" (96). Given this legal history, and its legacy from then until the present contest over African American access to education and public resources as it has occurred in the Ebonics debate—all of the assumptions about Black intelligence that were and still are wrapped up in language about language, it becomes easy to read African Americans commitment to literacy (and the drum, but I don't want to trace musical history from the clearing to the sampler and drum machine and the same judgements about Black people that are glossed over in comments about music) as technological commitments, and given the African American literary and rhetorical traditions, as technological mastery.

This connection between Black language and literary traditions and political struggle becomes even more explicit in Larry Neal's manifesto defining the Black Arts Movement. It is the Black Arts Movement that "is the aesthetic and spiritual sister of the Black Power concept" (122). While the Black Arts Movement articulated goals for literary production that were very different from those of Phyllis Wheatley or writers in the Harlem Renaissance, the larger purpose remained the same—to undermine Western racism based in pseudo science by using literature to talk back by talking black, as "[w]riting, many philosophers argued in the Enlightenment, stood alone among the fine arts as the most salient repository of 'genius,' the visible sign of reason itself. In this subordinate role, however, writing, although secondary to reason, was nevertheless the medium of reason's expression. We know reason by its representations" (Gates and McKay 96).

The fact that this literacy and literary activity was always engaged in a relationship with scientific and technological discourse cannot be overstated. V.P. Franklin and Bettye

Collier-Thomas show this relationship in their reflection on Carter G. Woodson's work in founding the Journal of Negro History. They note that Woodson

> made it clear that this was to be 'a quarterly scientific magazine' committed to publishing scholarly research and documents on the history and cultures of Africa and the peoples of African descent around the world….Woodson understood that publishing these articles and collecting these materials was the only way 'that the Negro could escape the awful fate of becoming a negligible factor in the thought of the world.' The activities pursued by the members of the ASNLH [Association for the Study of Negro Life and History] would 'enable scientifically trained men and women to produce treatises based on the whole truth'….V.P. Franklin used the life writings of African American literary artists and political leaders to demonstrate that 'race vindication' was a major activity for black intellectuals from the 19th century. African American preachers, professors, publishers, and other highly educated professionals put their intellect and training in service to the race to deconstruct the discursive structures erected in science, medicine, the law, and historical discourse to uphold the mental and cultural inferiority of African peoples (1).

In other words, the chasm between literary and cultural production on one hand and scientific and technological pursuits on the other is, not a part of the Black intellectual tradition, at least for one of the greatest intellectuals of that tradition, Dr. Carter G. Woodson. But just as dangerous as assumptions that Black people are not technologically inclined, that our history of social and political struggle privileged literary production of scientific and technological pursuits, and Composition and Technical Communication scholarship that, with the exception of a handful of important voices, has all but ignored problems of technology access, what makes the discursive canyon that I'm talking about even more difficult to bridge is the assumption that race is, and should be, irrelevant online.

Beth Kolko argues that the problem goes further than the discourse, however, and that this assumption is programmed right into the interface of online environments like MOOs and MUDs—writing spaces similar to chats that accounted for much of the initial popularity of "cyberspace." Her essay, "Erasing @race: Going White in the (Inter)face "questions how race as a category has been elided in such media through various design choices, and it further investigates how the construction of 'raceless' interfaces affects the communicative possibilities of virtual worlds" (214). This elision is a landmark not only of

the MOO and MUD environments with which Kolko is concerned—"the history of online communities demonstrates a dropping-out of marked race within cyberspace" (214).

Kolko builds on the work of Richard and Cynthia Selfe with her examination of the interface as a raced yet e-raced space. This problem is important, in her words, because "[w]hat this line of inquiry seems to represent is a growing awareness that technology interfaces carry the power to prescribe representative norms and patterns, constructing a self-replicating and exclusionary category of 'ideal' user, one that, in some very particular instances of cyberspace, is a definitively white user" (218). This is a very different conclusion about racelessness in online spaces than that reached by many theorists caught up in the initial technological rapture, who frequently assumed that cyberspace as raceless space would mean that race, gender, and economic class would no longer matter and would usher in new, equal and thoroughly democratic worlds—both online and off.

While some might wonder why it happens that, in the Composition and Technical Communication scholarship on access, and even on race that I've surveyed here, the users are almost as definitively white as the interfaces Kolko examines. Even though Elaine Richardson is the only African-American scholar in the work in these fields, this work is important for several reasons: it takes technology access seriously as an intellectual and activist project for Composition and Technical Communication instruction; it acknowledges directly the connections that exist between wealth, class structure, and racism rather than attempt to reduce the Digital Divide to an outbreak of class envy or economic playa-hatin, as has current FCC Chair (and son of US Secretary of State, Colin Powell) Michael Powell, and has charted an agenda for addressing the Digital Divide that goes beyond the mere existence of hardware and software to the quality of that hardware and software and Internet

connections, technological literacies, and critical understandings of technology that are a must for anyone to have meaningful access to any technology.

These are important first steps, but barely even that. There are many projects that remain for students, teachers, and scholars who are interested in the relationships that exist between communication and the technologies that enable us to speak, write, and share thoughts with each other, and to eliminating both the Digital Divide and the lack of important dialogue about it that I've called the Digital Discursive Divide. First, Black scholars specializing in language or communication must enter these conversations about technology, from their own theoretical perspectives, with their own projects; we must insert ourselves, however that has to be done, in dialogues that have begun without us. Part of how we begin to do that is, even if we are new to studies of technology ourselves, by connecting our work in language and communication to the work of those who are working with and talking about technology. We have to link our work with that of the Alliance for Community Technology that has brought us here; with scholars like Abdul Alkalimat, Director of Black Studies at the University of Toledo, who has developed his department's curriculum around and written extensively about the relationships that exist between technologies and Black struggle; with technology critic Oscar Gandy, who, among other things writes about how corporations' ability to use and manipulate potential customer data from sorts of hundreds of databases results in electronic redlining that often replicates racial exclusions. My point is that we have to become interdisciplinary again, understanding the connections between literacies and technologies that I argue have been a consistent refrain in our history in the United States, and making those connections clear for our students who might very well continue to assume that science is too hard, or that he or she won't make it through a computer science program because "it's too white." We also have to engage in

dialogue with those writers who have produced the rumors and rumblings in Composition and Technical Communication that I've outlined in this presentation, using what is there to press for informed educational and public technology policy.

Further, while it might seem that cyberspace is the new Jim Crow south, we need to remember that no matter how steep the Digital Divide, Black people are also agents online, and that there is a critical need to pay attention to how African Americans who have crossed the Divide talk b(l)ack—to postmodern theories of race, to ideas about the role of technology in Black social and political struggle, and to thoughts about how to address problems of differentiated access. We have to look where we are on the web, whether it's community websites, professional listservs, political-, or entertainment- related websites to see how race and voice come together in these spaces to do what David Holmes suggest African American speakers and writers do in his "Fighting Back by Writing Black," an essay published in *Race, Rhetoric, and Composition*: "They [race and voice] can be used to map territory, create community, and ensure an ongoing sense of self—and group affirmation" (65). Looking at how we talk b(l)ack to the Divide can help us to understand how the politics of technological production act just as Tricia Rose says of hip hop in "Fear of a Black Planet: Rap Music and Cultural Politics in the 1990s": "As is the case for cultural production generally, the politics of rap music involves the contestation over public space, expressive meaning, interpretation, and cultural capital. In short, it is not just what one says, it is where one can say it, how others react to what one says, and whether one has the means with which to command public space. Cultural politics is not simply poetic politics, it is the struggle over context, meaning, and public space" (277). Even those discursive practices we would want to dismiss as just noise, like chat, personal home pages, email, and even online nicknames, are all connected to a history of ideological, political, and rhetorical struggle.

The gaps in this scholarship remind me of the context of the Ebonics debate I began with. Smitherman, the nation's most renowned sociolinguist, in her reflections on the history of the Conference on College Composition and Communication (the major professional organization for writing teachers of all kinds, and an organization that adopted, with leadership from Smitherman and other scholars, a policy on linguistic difference that would push college writing and language specialists toward recognizing African American varieties of English as rule governed and systematic, and to stop using them as excuses for failing to admit students of color or tracking them into remedial courses) points to the problems that can keep well-intended beliefs from becoming effective policies, and from well-intended policies from being implemented in ways that can create change:

> The other major reason that CCCC language policy pronouncements have not had broad-based impact has to do with the need to publicize these policies. One must do something, somehow actively engage in the process of language attitude change, organize language discussion panels and program events outside ivory—and ebony—towers, go out into the vineyards and speak truth to the people, wherever one finds them—in the churches, the streets, the bars and pubs, at block club and other kinds of community meetings, on television talk shows, in one's personal social life, and on and on (372).

The Ebonics debate has been just as much about access—to education, to economic stability, to full participation in American society—as our current conversation about the Digital Divide, and, as I've tried to suggest, just as much about relationships between literacies and technologies, however we might define them. Smitherman's comments lay down a charge for those of us who are here to explore, examine, and ultimately, do something about the Digital Divide in our educational, political, and personal locations. One part of that job has to do with the scholarship and the immense gaps that exist on technology access and African Americans. But da rest come from Da Diva, as we call Dr. Smitherman: let's step outside, as some of the fellas would tell you when it's time to stop talkin' and make sum'n happen: outside allegiances to the Composition classroom as the only site worthy of study about computer technologies and literacy, outside the engineering

major and firm, outside the science lab, outside the sharecropper relationship between these industries that Technical Communication seems to need to cling to to get the enrollments, the sections, and the staffing it needs to be viable enough to pursue the lines of inquiry I've outlined above. Stepping outside can remind us, as Dr. Smitherman reminded listeners to her keynote address at a conference on American Ethnic Rhetorics about Ebonics, "we done been here befo,'" that we have a whole tradition of technological, literary, and rhetorical brilliance to draw on as we step to this new spin on the "same ol' same ol.'"

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The Digital Divide in China: Current Situation and Progress in Research

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Abstract

As the largest developing country China is striding into the information age. But China has many obstacles in the way to combat. The digital divide is the tough one. This paper firstly discusses the digital divide's meaning and importance. Then six aspects, namely, infrastructure, content, digital divide policy, education and learning, gender and economic development, affecting the digital divide and the current situation in China are introduced respectively. Some comments on the research in this area are made. At last three essentials on how to overcome the digital divide and some initiatives in China are addressed.

1 Introduction

1.1 What is the Digital Divide

Digital divide is a new word that was first diffused in *Okinawa Charter on Global Information Society* in July 2000. (1) Then it has been the frequently discussed topic. It is also one of the most unclear and confusing concept. What after all is the digital divide? The simple explanation could be the separation between technology haves and have-nots. However, the digital divide is not just about having hardware, software and Internet access, but also about accessing enough information content and knowing how to use basic tools of the information age. The most accepted definition in China is that the digital divide refers to the new difference among groups and polarization among the rich and the poor because of the different level of information and communication technologies among different countries, areas, industries, enterprises, groups in the process of global digitalization. (2) This definition puts more emphasis on the scope of the digital divide, and extends it from people to countries,

areas, industries, enterprises and groups. But it fails to mention other factors such as economic and educational factors that contribute to the digital divide other than the technologies. Hence the understanding of digital divide could be in a broad sense: *it refers to the unequal status in acquiring information due to the difference in ability, economy, education, language, age, gender, technology and so on.*

1.2 The Digital Divide Research in China

Though the precise definition of digital divide had not come into being, there was an early debate about this issue when China began the informationization in 1993. China is making unique strides towards an information society. Therefore when the issue was brought forward it attracted the attention of industries, academia and government. Most of them consider it a crisis not a topic. Because the digital divide exists not only between developed countries and China, but also within the different regions in China. The information inequality will be in the way of an information society. Then the heated discussion about digital divide has been taking on in Internet. Some IT website, such as yesky(www.yesky.com), chinabyte(www.chinabyte.com) and enews(www.enews.com.cn) hold a column of digital divide. However, the number of articles in journals focusing on this topic is small and no book and dissertation on digital divide has been published till now. It indicates that the research of digital divide in China is in a preliminary stage. The subject of research covered these aspects: what is the digital divide; how to bridge the digital divide; the comparison study between China and other countries. There was a trend that we emphasize the hardware and overlook the software and information resources. But now our scholars are taking the latter into account. Some articles discussed the importance of the information resource planning in overcoming the digital divide. (3) It is further steps to understand the digital divide more broadly and deeply. People have realized that the digital divide is not a pure technological issue but a social issue that concerns economy, culture, education and technology. (4)

1.3 Why does the Digital Divide Matter

People are getting more relying on the information resources and technology than ever before. According to the release of Department of Commerce report of U.S. *the digital economy in 2000* the information industry contributed 33% to the growth of domestic economy from 1995 to 1998. (5) Information has become a strategic resource in the world. Hence, information poor will be at a disadvantage.

At the macro-level a country at the disadvantageous side of the digital divide will encounter numerous obstacles in developing economy and pursuing a competitive strategic position. Two examples as evidences will clarify this. The first example is e-commerce. In *the global e-commerce framework* tariff-free of e-commerce was brought forward. Economic invasion will get easy through the tariff-free trade in the world of e-commerce predominated by developed countries. The second example is transborder data flow. The developed countries import data from developing countries and export information to developing countries. This is

the same with the traditional industrial economy where developing countries imported materials and exported products. The uneven flow of information can threaten developing countries' national safety if their strategic information is held by a foreign country. Therefore safeguarding the information sovereignty is of great importance for developing countries. (6) These two examples both describe the harmful effect of the information inequity to the disadvantageous countries. But this is not to say the information rich country will take advantage of it. On the contrary it will be harmful to the advantageous countries too. The divide has an adaptable mechanism. When the digital divide is widened the wealthy side provides the sufficient supply but the effectual demand made by the poor side is not enough. Every economic crisis in history was the result of the insufficient effectual demand. When the gap between the higher-end and lower-end was wide the higher-end will be damaged too. Hence bridging the digital divide will benefit both the two sides. This is the reason that the issue of the digital divide was first brought forward by G-8 Summit. (7)

At the micro-level the individuals at the two sides of the digital divide are in a different status in occupation, education, economic position and social participation. The unlucky side will have fewer opportunities to participate in the new economy based on information where more work is related to the computer. Meanwhile they will have fewer opportunities to participate in the online education, training, amusement, shopping and communication. Therefore the digital divide is considered as the difference in the ability to create wealth. Since if you work in the IT department you will be paid 80 percent higher than in other departments. (8)

2.Factors in the Digital Divide

Now let us look at the current situation of digital divide in China. Six aspects is referred to, that is information infrastructure, content, digital divide policy, gender, education and learning and economic development.

2.1 Information Infrastructure

The information infrastructure is the base of physical access to the Internet. It comprises of hardware (specifically computers and telephone lines, but also modems, printers, scanners, etc. and other means of connecting to the Internet), and software.

2.1.1 Hardware

By the end of 2000 PC penetration in China was nearly 30 million, that is to say there are 2.5 computers per 100 people.

Access paths to the Internet comprise of dial-up at home or at work, Internet Café, community technology center, community broadband network and DSL connection.

By the end of June, 2001 telephone penetration is 398 million household (fixed phone users is 281 million household, mobile phone users is 117 million), which is the second most in the world, in other words there were 24.4 telephones per 100 population in China, 39 telephones per 100 urban inhabitants, and 9.2 mobile phones per 100 population. (9)

According to the survey report on the development of China's Internet (July, 2001) made by CNNIC (China Internet Network Information Center), the number of computer hosts in China was about 10.02 million. Among them, 1.63 million are connected through leased lines and 8.39 million are through dial-up connections. The Internet users in China are 26.5 million. Among them, 4.54 million use leased line connections, 17.93 million are dial-up users and 4.03 million use both. Besides computer users, people who use other equipment (e.g. mobile terminals and information electrical appliance) are 1.07 million. (10)

Though we increased at a high speed when all these numbers are compared with that of American the digital divide is wide. The PC penetration is more than 50% in America while this number is only 2.5% in China. So does the Internet penetration. In China Internet penetration is only 1.5% while in American this number is more than 50% too. (11)

The digital divide is not only exists between China and other developed countries but also exists in the different parts of China. The affluent eastern China is prior to the central and western China in the information infrastructure. From the survey report of CNNIC we can find the evidence. Beijing, Shanghai, and Guangdong had the highest rate of penetration at 31.05 percent while the last 10 provinces in the rank had the total rate of penetration at 8.54 percent. These provinces are situated in the central or western China. The registered number of domain names also reflects the unbalanced distribution of network. The registered domain names in Beijing have the percentage of 34.8 while most the central and western provinces have the percentage less than 1.

Community networks in China are not so popular as in America too. Only the newly built communities in big cities such as Beijing and Shanghai have this utility. Community broadband networks have become one of means for real estate companies attracting vendees. Nonetheless we cannot count on community networks and community technology centers to play an important role in improving the physical access now because of their limited quantity.

The current situation of information infrastructure in China is introduced above. These are what we have known. What we need to know is the problems existed in the construction of information infrastructure and how to reform.

According to the same survey report cited above when the participants were asked the most serious problems in China's Internet 42.7% people selected slow access speed and 19.0% people selected high price. The limited bandwidth is the cause of slow access speed. And this limited bandwidth and high price were the results of the monopoly of telecommunication. Because only depending on the investment of China Telecom the funds were not enough and other companies who had funds could not gain admittance to the telecommunication markets.

Furthermore the monopoly was the source of bad service and high price. To solve this problem China government had taken action to break up the monopoly of China Telecom. By 2000, China Telecom was broken up into separate companies for fixed telecommunications (China Telecom), mobile communications (China Mobile), paging (transferred to Unicom) and satellite communications. Additional players, such as China Netcom, China Railcom have also been established. Another action to reduce the price of telecommunication is that the installation fee for fixed-line phones and network connection fees for mobile phones were eliminated by the government on July 1, 2001. (12)

All these were the first step to deregulate the telecommunication. The next step should be to unite the existing networks such as telecommunications, cable TV and computer networks into an integrated network. This will actualize the reasonable allocation of resources and each network can contribute to the construction and share the benefit of others. (13)

On the other hand to increase the Internet access on the premise of that PC penetration will not be improved quickly because of the low income China should encourage non-PC equipment such as non-wintel NC and all kinds of information electrical appliance accessing to the Internet. It is adapt to the situation of the increase rate of PC was only 30% each year but the number of people accessing to the Internet was increased at the rate of nearly 200% each year. (14)

2.1.2 Software

In addition to the hardware the software is also necessary to Internet access. The software is divided into two categories: the system software and the application software. The system software includes the most important operating system software. Microsoft Windows is the prevailing operating system in China now. But this situation might be changed in the future.

China is rapidly standardizing on Linux because it offers a lower cost and open operating system, according to Ransom Love, president and CEO of Caldera Systems, Orem, Utah, a leading Linux distributor, Linux will soon be the No.1 market share operating system in China. (15)

Red Flag LINUX is the operating system developed by Chinese to support the Government Online Project that aims to bring government agencies to the Internet. This project did not select the Windows as its operating system is out of consideration of national information safety. Since the core technologies of Windows are predominated by the foreigners. Except for the consideration of safety the open source of LINUX provides an opportunity to catch up with the advanced software technologies. Thus developing independent operating system is of great importance for China. Moreover Windows operating system cannot meet the requirement of non-wintel NC and all kinds of information electrical appliance accessing to the Internet. So LINUX is the necessary choice of tackling the digital divide. (16)

2.2 content

When people talked about the digital divide the PC penetration and Internet penetration are usually the topics. But in my opinion technology is not the whole of the digital divide. We need to recognize the digital divide in content because of its great value. The statistical number below can explain the digital divide in content.

There are over 313 billion pages on the World Wide Web, and 7 million new ones get posted everyday; yet, 85% of them are found in US domains, and most of them are in English. While the pages on the World Wide Web in Chinese are only 500 thousand, which equal to only 3.9 percent of the web pages in the world. (17) This is out of proportion of Chinese, the widely spoken language. Databases, the other form of information resource is in the same situation. Though the absolute quantity of databases is more than 3000 its scale is small and the quality is poor. So it cannot compete with the foreign databases such as Dialog and STN.

I have discussed the importance of information resources to a country and the danger of information import country above. Here I reiterate the importance of information resources for a country to attract the attention of digital divide in content. Whoever controlled the information he or she win the competition in the future. Therefore to narrow the gap in content is at least of the same importance as to narrow the gap in technology.

The other aspect of digital divide in content lies in digitalization of the traditional culture heritages. Some countries not only digitalize their own heritages but also want to digitalize other countries' heritages relying on the strong support of economy and technology. China is a country with a long history and precious heritages but lacks of the abundant fund to digitalize. Then many foreign companies aim at the digitalization of these heritages. If our attitude is laissez-faire can we own the property by ourselves? For example by the end of 2000 the Palace Museum and a Japanese corporation made an agreement on the collaborative research of the digitalization of the Palace Museum cultural heritage. Another example is Dun Huang Cavern. To lessen the possible harm done to the fresco by the tourists the local cultural relic administration made an agreement with the Mellon Foundation in America to build a digitalized virtual cavern. We cannot be optimistic about the prospect: can we take hold of the future of our information and culture industry? Are these cultural heritages our resources after the digital alteration by others?

Maybe this worry is superfluous and the digitalization by other countries will help us maintain our heritages by spreading to the world. But the understanding of Chinese traditional culture is not easy for foreigners. Then usually in the work by foreigners could not find our tradition. For example the folktale of Mulan is widely known in China. This story was been filmized by Disney. When the Chinese audiences watched the film they concluded that Mulan had the character of an American girl not a Chinese girl in ancient China. If our children watched the film before they read the folktale the first impressions are strongest. Then the worry of traditional culture's lost is understandable. (18)

To solve these two problems China should spare no effort to exploit information resources. The government should draft policies to encourage the exploitation of information. Professor Gao Fu xian advocated 3 years ago that information resource planning in China lag behind the information infrastructure (optical cable, Internet etc.). This is not only a waste of resources but also the more difficult part to bridge than the information infrastructure in the digital divide. The news came from the Ministry of Information Industry reported that the information development and utilization had lagged behind the developed country 10 to 15 years. And everyone knows the telecommunication network infrastructure did not lag behind so many years. (19)

In a word the digital divide in content is the key point that we need to know.

2.3 Digital divide policy

The related policies of the digital divide mainly comprise of telecommunication policies, Internet policies and information resources policies. Each will be discussed below.

2.3.1 Telecommunication Policies

Telecommunication Statutes was enacted on Sep.25, 2000, which was the first comprehensive administrative law on the telecommunication industry in China. The status of no rules to obey is ended in the telecommunication industry. The key principle of Telecommunication Statutes is to protect competition and promote technological advance. Based on the Statutes telecommunication law is being drafted out now. (20)

People who are excluded from the Internet access because of the expensive cost will benefit from the competition in telecommunication industry because the competition can lower the price.

Another policy is to keep increasing the investment in telecommunication infrastructure in order to supply the universal service. This will narrow the digital gap especially between the urban and rural areas.

2.3.2 Internet Policies

On the one hand the integration of three networks discussed above has been written into the outline of the 10th Five-Year (2001-05) Plan and it will greatly facilitate the development of the Internet industry.

On the other hand it is necessary to regulate the access and use of Internet. In China the Ministry of Information Industry (MII) regulates access to the Internet while the Ministries of Public and State Security (MSS) monitor its use. In late 2000, the Government issued

regulations governing ownership, content and other aspects of Internet use. In October 2000, Internet Information Services Regulations went into effect banning the dissemination of any information that might harm unification of the country, endanger national security, or subvert the government. One new regulation, covering chat rooms, requires all service providers to monitor content and restrict controversial topics. (21)

The latest lecture by President Jiang on legal work can be seen as the golden rule of Internet policies in China. He urges to formulate laws and regulations on information networks and improve the existing ones in China. And he stressed the need for a sound law enforcement mechanism to protect the legitimate interests of citizens, safeguard the country's political and economic security, and maintain and promote the healthy development of the information network industry in an orderly manner. Meanwhile, he called for a legal framework that will make government affairs more transparent through the use of information networks, and expand the channels for the public to participate in and discuss political affairs. (22)

2.3.3 Information Resources Policies

The Informationization Promotion Department under the Ministry of Information Industry (MII) takes charge of the exploitation and use of information resources and formulates information resources policies.

The copyright is an important issue in the digitalization of information resources. So there is a need to refer to the issue of intellectual property when discussing the information resources policies.

China became a member of WIPO in June 1980. China copyright law is also well developed. In 1992, the Chinese Government became a member state of Berne Convention and Universal Copyright Convention. But the piracy is always disturbing. Although the counterfeit of software narrowed the digital divide in China for its availability and affordability, it also damaged the Chinese software industry because the ROI was too low to continue its development. So the encouraging trend is that Chinese government and software firms increasingly support anti-piracy efforts. In addition to this efforts China is to strengthen its support of software industry in the next five years. To help software ventures to become share holding ones and get listed on stock exchanges, Chinese government will launch training classes for senior administrative personnel from software ventures.

2.4 Gender

The most striking digital gender divide relates to Internet use, with women in the minority of users in both developed and developing countries. China does not make an exception because only 38.7 percent of Internet users are women. This is partly because that female is not as good as male at machine by nature. But the more educated the more women use the computer and Internet. Hence the education and computer literacy are the most important factors in

Internet use for women. Then compared with others factors of digital divide the digital gender divide is a minor thing.

2.5 Education and learning

When the digital divide is discussed efforts often focus exclusively on issues of access. But overcoming the digital divide is not only a matter of achieving online access, but also of enhancing people's abilities to adapt and create knowledge using ICT. According to the survey report of CNNIC 70% users have the education attainment beyond the junior college, nearly 40% users held a bachelor degree. These figures are reasonable because little may be gained from access to ICT without adequate levels of education. Since the resultant of education is the literacy, the topic of literacy ought to be discussed. First of all the usual meaning of literacy that means reading, writing, and thinking skills are crucial for making effective use of the Internet. The computer literacy is the second prerequisite. This involved in effective operating computer. The information literary is the third level that means to find and sort information online with more complex reading, writing, language, and thinking skills. Education contributes to the Internet use meanwhile those who access to the Internet can obtain education from the network. Matthew's effect also exists in the Internet use. Someone called for learning the information technology through Internet (23) but for those who cannot connect to the Internet it is of no use.

Language is another contributor to the digital divide because nearly 68.4% websites are in English but only 10% people in the world can understand English. Language teaching is one area of education. Developing people's ability in major online languages such as English, Chinese, Spanish, French and Japanese is the responsibility of education. (24)

2.6 Economic Development

Almost 90% of all net users live in rich industrial countries. So it's not surprising that money is a major cause of the digital divide, because getting into cyberspace for any individual costs a great deal of money. Income is an important determinant of PC penetration and Internet access. Inequalities of wealth and differences in status offline are directly translated into tremendous inequities in the online environment.

Digital divide is a superficial phenomenon. In fact at the macro level it is the economic gap among countries. Therefore if the comprehensive national power is weak the digital divide will be widened though there is advancement in industries. Furthermore the digital divide is not directly related to the investment on digital industries, but has something to do with the enterprises' competitiveness and national power in a country. When the economy is improved the digital divide will be narrowed naturally.

Digital divide and its related issues have evolved into North South issue concerning the increase of wealth in the information age gradually. Hence if the problem of poverty in the

southern countries has not been solved, the gap between the south and the north has not been narrowed and the telecommunication infrastructure has not been constructed the digital revolution is only a prittle-prattle. (25)

At the micro level it is the disparity of wealth among individuals. The polarization of the rich and the poor had been a universal phenomenon since the private ownership was established. The digital divide in information age is the extension of the disparity of substantial wealth in industry age. Then will this disparity last forever? The theory of social capital, which refers to the benefits that one can potentially receive from participating in communities and networks, lightened our scholars. As the base of the economic order in information age the social capital promotes the economy to a sustainable development. From the sustainable development point of view, the digital divide cannot accord with the interest not only of the poor but also of the rich. If the poor were deleted from the digital earth the rich cannot keep their digital survival. The economic crisis is the best example. (26)
From this view the idea of the dividend, which means to provide technology to the poor of the world and use that technology to accelerate the process whereby the providers (the rich) and the poor participate in the fruits of development is brought forward. (27)

3. Overcoming the Digital Divide

The ILO's (International Labor Organization) "World Employment Report 2001: Life at Work in the Information Economy" found that ICT can have a far-reaching impact on the quality of life of workers in poorer countries if the right policies and institutions are in place and serve as important spurs to development and job growth. In some cases, the high mobility of ICT capital and its inherently knowledge-based nature may allow lower income countries to "leapfrog" stages in traditional economic development via investments in human resources. But for this to occur, three needs are most important: a coherent national strategy toward ICT, the existence of an affordable telecom infrastructure, and the availability of an educated workforce. (28) Chinese government recognized this in early times. So the informationization in China was started in 1993 and had been written into the outline of the 10th Five-Year (2001-05) Plan. The informationization can be seen as the effective means to eliminate the digital divide in China.

Bridging the digital divide and promoting the equal access to the information three main problems should be solved, that is the construction of information infrastructure, the allocation and exploitation of information resources and the training of information technology and skills to acquire information. (29) The U.S. ex-president Clinton also had talked about the ABC essentials to span the digital divide. A(access) represented the capability and channel to access technology; B(basic skills) represented the technological training and skill required by the information age; C(content) represented content of multimedia, multilingual and high-quality. (30) These two descriptions of the essentials to bridge the digital divide are different but have the same connotation. That is, the infrastructure, content and skills. Let us have a look at what we have done in these three aspects.

Infrastructure. The convergence of telecommunication networks, cable TV networks and computer networks will be an important progress in the construction of information infrastructure. Moreover the PC penetration and Internet penetration keep a steady increase.

Content. The National Library of China initiated Project of National Digital Library in 2000 and created an enterprise entity—Chinese Digital Library Limited Corp. As a part of the Project 863, which was a high-tech plan supported by the government, Project of National Digital Library will congregate the information resources from all over the country and digitalize them into high-quality multimedia repository. In addition Tsinghua University's CNKI Project (China Network of Knowledge Innovation, http://www.cnki.net) and Wanfang Data (http://www.wanfang.com.cn)'s databases both contributed to the development of information resources. CNKI website makes hundreds of full text Chinese scientific, engineering and medical journals available. Wanfang Data was a department under the Institute of Scientific and Technological Information of China. Now it changed to an independent enterprise and its goal is to be the number one in databases industry of China.

Skills. Ministry of Education appropriated 80 million yuan to support the long-distance education in the western area. In the past 2 years the central finance appropriated 1.6 billion yuan to support the compulsory education in the western area and appropriated 0.8 billion yuan again this year to support the poor and minority area in the western area. Modern long-distance project initiated by Ministry of Education aiming to build open network and lifelong learning system is also implemented. (31)

Initiatives to Close the Digital Divide in China

Digital Alliances. The High Level Annual Conference of digital economy and digital ecology 2001 was held in Beijing. As an outcome Digital Alliances was come into being. The Digital Alliances teamed up by industries, media, academia and industries' guidance institution together will launch an activity named *spanning the digital divide-- tour of China in the 21st century*. It commits itself to eliminate the gap in the network information and technology application between the developed countries and China, the eastern China and western China, different industries and enterprises as well as different social groups. (32)

The digital alliances will integrate resources to provide the knowledge and equipment of Internet connection for enterprises and to provide the technological assistance for community technology centers. It also will provide the information network needed by high-tech business as well as consultation and application solutions.

City Informationization. City informationization is being implemented in some metropolis such as Beijing, Shanghai and Shenzhen. The informationization in Beijing has made some progress, including public information platform and four application projects that are e-government, e-commerce, science and technology and education, social insurance and community service. (33) Shanghai has also completed a network platform and information exchange network, international trade EDI network, social insurance network, community

service network and credit card and collection system. (34)

E-Commerce. The Chinese government brought forward *the Framework of National E-commerce Development* in July 1999. Afterwards to joint with international economy the government encouraged small medium enterprises to connect to the Internet and take part in the e-commerce further. (35)

International E-Commerce Center of China under Ministry of Foreign Trade launched a plan to help the western 10 provinces (or municipality). This named *Western Information Service Project* aims to supply omnipotent E-commerce for all kinds of enterprises in the western area through the information network technology. (36)

In addition high-tech enterprises such as Legend and Founder have launched their own plan to participate in bridging the digital divide.

4. Conclusion

The digital divide is a new concept though the phenomenon has exists for a long time. The understanding of digital divide should be in a broad sense so as to study it thoroughly.

The current situation of the digital divide in China is both satisfying and to be satisfied. To say satisfying is because there was a rapid diffusion of ICT and Chinese government made efforts to support the informationization. To say to be satisfied means a wide digital divide exists not only between industrialized countries and China but also among the different areas and groups in China. So overcoming the digital divide is a tough task for China.

The research of the digital divide in China covered such topics as relations between digital divide and education and economic development, protecting traditional culture heritages and digitalization. The heated topic was how to bridge the digital divide. As a whole the researches in China are in initial stages. Compared with the studies done by foreign scholars our researches have some blind spots. For instance the roles of community technology center and community network in bridging the digital divide have not been recognized in China and the current situation of the digital divide in the minority and the disabled has not caught our scholars' eye. Moreover among the three essentials to bridge the digital divide the infrastructure got the most concern though it is a wrong understanding because the content and skills are more difficult to span.

In a word to tackle this ubiquitous and entrenched issue effectively requires a political inclination, high-quality education and social support.

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Addressing the Digital Divide in Southern Africa

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Abstract

This paper analyses the growth and impact of new technologies, especially the Internet in Southern Africa, excluding South Africa. The analysis is undertaken within a conceptual framework – An Impact Assessment Model of the Internet (IAMI, developed by the author in his research and development work on the Internet in Africa. The model can be used to analyse the nature and causes of the digital divide in developing countries. The abbreviation of the model by chance, is an ironic reference to human nature – people are what they are and some habits have been formed over time and are hard to change. Such behaviour mannerisms of not wanting to change no matter what, are an antithesis to the nature of new technologies, especially the Internet. IAMI is made up of three components. The first component is a descriptive analysis of the uptake of the Internet which looks at the telecommunications infrastructure, the ISP market and services, the utilisation of the Internet by people in different socio-economic sectors, the different ways to access the Internet, the nature of web content among other pertinent issues. The second component of IAMI focuses on the factors behind the growth of the Internet. This section will address the main reasons why the digital divide is growing at an alarming rate for most of the people living in Southern Africa. The impact of the technology and benefits accruing to the users of the Internet is also analysed in this section. A majority of people in the region don't have access to basic communication services like the telephone and illiteracy and low PC penetration levels are contributory factors to the slow uptake of the Internet. The last component of IAMI focuses on global developments of Internet, especially those technologies geared towards reducing the digital divide e.g. use of wireless technologies to provide alternative access to the Internet and how their implications on developments in the region. The paper will conclude by looking at strategies that can be used to widen access to the Internet in Southern Africa. Such strategies can be applied in other regions in Africa and other developing settings.

1. Introduction

The digital divide can be referred to as lack of Internet use between people within the same country or other countries. Another perspective to the digital divide is when reference is made to existing gaps in access to Information and Communication Technologies (ICTs), especially the Internet, between different socio-economic groups in the same country (*the domestic divide*) or other countries. The digital divide has come to be synonymous with disparities between the developed and developing countries – the *international digital divide* (Bridges.org, 2001). The rate of Internet developments is used as a barometer to measure the gaps.

The level of Internet penetration in any society is closely related to the extent of development or underdevelopment of the underlying bedrock of connected issues and infrastructure that are conducive to its fast uptake. Such features of an appropriate seed-bed to increase the impact of the Internet that also explain the causes of the digital divide include among others: the number of users of computers, the nature of the infrastructure, access speeds to the Internet, affordability, real access to the technology, the level of education and training, relevant content, the development of the IT sector and poverty i.e. the socio-economic circumstances of the people. These key determining factors to the quick growth of the

Internet in themselves reveal disproportionate disparities between developed and developed countries. For example, many countries in Africa are to embark on pathways that can create conducive environments necessary to reap the benefits of Internet technologies like liberalising the telecommunications sector that has seen the cost of making national and international calls greatly reduced for people living in developed countries, consequently making the cost of accessing the Internet affordable, exciting and useful both for business and social reasons. The development of the IT sector in many developed countries have fostered innovative adaptation of the Internet to suit people and meet their sophisticated demands e.g. shopping online. Other related sectors that have developed the necessary infrastructure that is not in existence or is poorly underdeveloped in many developing countries include the banking industry and policy making institutions. Many countries in Africa are still not ready for the new technological developments and they still have not woken up to the realities of living in a fast moving technological world. Change is happening, but very slowly.

One of the major keys to a speedier integration of new ICTs i.e. their adoption and adaptation, is people's readiness to accept these changes. Throughout the world, young people have shown to be fast receptors of new technologies than any another age group. This generation of users, especially in Africa is likely to influence and demand sophisticated and state of the art new technologies. It is possible that in 10 to 20 years time, a majority of these young people growing today will be pace setters in the use of new technologies in their societies and will certainly force the reduction in the digital divide that currently exist. The nature of the Internet is about change – accessing information and communicating in a unique way. This has irrevocably changed these two processes that permeate through every key socio-economic activity – whether in a visible or invisible way. The technology forces change and unless people and organisations are prepared to consciously adopt and adapt this new technology in their lives, the international divide is going to be highly disproportionate. The Internet is regarded as the highest pinnacle of modern technological development in the field of communication. It took radio 37 years to reach an audience of 50 million, television 15 years and the Internet just three years (Uimonen, 16 July 2001).

According to NUA, the estimated number of people that were online as of November 2000, was about 407.1 million. Africa's share was a mere 3.11 million people, which is less than 1% and distributed among an approximate total population of about 738 million in the Continent. Southern Africa has the highest number of Internet users in the whole of Africa, the number being swelled by users in South Africa that make-up three-quarters of the figure. Even after excluding South Africa, countries like Zimbabwe and Botswana are lapping up new technologies at a much faster rate than many other regions in Africa. Despite this promising news, the number of people with access to the Internet – which is now seen as a yardstick to measure a society's move towards information and knowledge based socio-economic activities, is still very low when compared to developments outside the region and the rest of Africa.

2. A Descriptive Analysis of the Uptake of the Internet

2.1 Background and Foundation of Internet Developments - Wind of Change

It is trite that technological development forces change. They 'proffer solutions' as they equally create problems according to Cronin (1985). The former Secretary General of ITU - Dr Pekka Tarjanne emphasised the need for African countries to improve the telecommunication infrastructures - a major key to the growth of the Internet which is shaping global communications in a radical way. He correctly pointed out that one of the biggest obstacles to change is people. He put it succinctly by saying:

"The human animal does not embrace change easily or willingly. We are by nature conservative creatures, who often prefer to live with familiar methods and frameworks, even if they are difficult or disadvantageous, rather than take the leap into the unknown." (Dr Pekka Tarjanne, 1998)

Finland and the United States are now leading the world in the penetration of new ICTs in the homes and workplaces. Most Finns are just technologically savvy that is a contrast to their former industry – the paper industry. They have moved to the opposite direction by becoming a high tech driven society.

Many African countries are faced with the daunting task of improving in many areas of human activity if they are to be at par with the rest of the developed world. There has been too much emphasis on land ownership by a majority of people in Southern Africa that has resulted in a blinkered approach to human development. Most of these societies are agro-based and to talk about reducing the digital divide without addressing such hard-nosed assertions that land redistribution will bring about change would certainly fail to create technologically friendly environments. There is no trade-off between technological development and agricultural development. The two should go hand in hand. In fact technological developments will positively impact on all socio-economic sectors. The politics of change should start with governments being exemplary by translating ICTs policies into reality. Most of the leaders are generally not technologically wise and hence are not in ideal positions to take their societies forward into new paths of development. Where governments in other parts of the world have played a pro-active role in championing the uses of ICTs, the rest of society has painstakingly been conscientised to the advantages offered by new ICTs whether in the workplace or for purely social reasons. These societies are on the move and are innovating much faster than many African countries that will for a long time play the catching up game.

While the rest of the world has been taking advantage of advanced telecommunications infrastructure - one of the fundamental keys to the growth of the Internet, it was only in 1998 that the Internet finally arrived in Africa (Jensen, 2000). There were more than 20 countries with Internet access in at least the capital city and a second major city.

2.2 Number of Internet users - Internet Status Report in Southern Africa

The last few years have seen a phenomenal growth of the Internet in Southern Africa. It has already led to transformations in the lives of a number of people and is fast changing the way organisations communicate and do business. What is noticeable when one looks at what is actually happening on the ground, is that there is now a full awareness of what the Internet is and what it can do. Many people are aware of the changes it has rung outside Southern Africa. Of particular note is the fact that large organisations (both in the public and private sectors) now have an information policy that centres on the Internet as the main vehicle for communication and the dissemination of information within the organisation and with other organisations. Many of these organisations especially SMEs (Small to Medium Sized Enterprises) are still to translate that policy into practice and devote a reasonable budget for a dedicated in-house web development team. Internet cafes have made an appealing presence as the latest thing in town. What is apparent is that there are distinct and varied groups of Internet users in each country. There are a number of stumbling blocks preventing the realisation of the many hoped for Internet dreams and at times the Net experience is frustrating as access speeds are notoriously slow.

Most Internet services are confined to capital cities and in some countries the services extend to secondary towns. Countries like Botswana, Mozambique Namibia, Zambia and Zimbabwe have established Points of Presence (POPs) in some locations outside the capital city.

The following readily available statistics reveal the differences in the rate of Internet use between the countries in the region:

Country	Month	1998	Month	1999	Month	2000
Angola	May 1, 500		May 12, 000			
Botswana			May 3, 000		July 12, 000	
Lesotho	May 600				July 1, 000	
Malawi			May 6, 000		July 10, 000	
Mozambique	Jan 3, 500		May 12, 000		July 15, 000	
Swaziland	Jan 900		May 2, 700		July 3, 000	
Zambia	Jan 2, 000		May 9, 000		July 15, 000	
Zimbabwe	Jan 10, 000		May 30, 000		Author estimate 90, 000	

Source: http://www.nua.com/surveys/how_many_online/africa.html

These statistics according NUA show the number of adults and children that have accessed the Internet three months before the survey. Where Internet user account information is available, the figure is multiplied by a factor of 3.

On a recent field trip to Zambia and Zimbabwe (July to September 2000), the author noted that a standard dial up account services three to four people in the immediate family as well as relatives and teenage friends. The actual number of Internet users for one single Internet account could be up to 5 to 10 people and this gives a totally different picture. The young local educated population is increasingly finding that having an Internet based email account and using the Internet for getting information is by far, more efficient and less time consuming than traditional media. It's actually trendy to be an Internet user and the message is spreading fast and many young people are being hooked to the technology despite not having their own personal computers and subscriber accounts.

A new feature in Southern African countries, such as Zambia, Botswana and Zimbabwe is the installation of PCs with Internet access in hotels and lodges. Customers pay so much to send and receive email and surf the web. These facilities are also found in many shopping malls and there are always in demand, especially in Zimbabwe. These other alternative ways to access the Internet in the region has gone unaccounted for by organisations such as Network Wizards that count the number of Internet users based on dial-up accounts.

2.3 Spread the Message - General Applications

Most ISPs are responding to customer demand by making available to them low cost email services. Most people use Hotmail, Yahoo and Excite. They are also expensive to use, as connection to the remote site has to be maintained. Those that can afford to have Internet access charge people for using their dial-up account to surf and use web-based email.

Email is the facility that has made the greatest impact in Southern Africa. It is being used both for personal and business purposes. It is becoming by far the best means of communication between researchers, businesses working with overseas clients and suppliers. The web is still not used as a main source of new information largely because most users are not yet adept at searching and the cost of Internet access and download time of web pages discourages both novice and experienced users.
The UN Economic Commission for Africa, which has been instrumental in accelerating the growth of the Internet, points out that there is about one incoming and one outgoing email per person of an average of 3 to 4 pages. These are mainly communications with people outside the region. A recent survey by ECA (2000) indicates that 25 % of the email is replacing faxes, while 10 % are replacing phone calls and the other 65% represent new communications that would not have arisen without the email system. NGOs, private companies and universities have the highest number of users. The majority of users are nationals although their representation varies from country to country. In Zambia for example 44 % were nationals. Most users are male. In Zambia, the approximate number of male users was about 64 %. Just like in most developed countries, the largest number of users are very educated. In Zambia about 87 % of the users were educated up to degree level. This pattern is reflected throughout Southern Africa.

2.4 The ISPs Industry and Market Conditions

Internet Service Providers are mushrooming throughout Southern Africa's capitals. Countries such as Zimbabwe have 10 or more Internet Service Providers. There is a growing trend for PTOs (Public Telecommunications Organisations) to enter into the lucrative Internet market. Most PTOs have established the international Internet backbone. Some of the biggest ISPs include Africa Online (http://www.africaonline.com), which has operations in Zimbabwe. Other multinationals like UUNET, have branches in Swaziland, Zimbabwe and Namibia.

The slow access to Internet services is still a major constraint to the effective and efficient running of the technology. After all, the Internet is all about immediacy. This is largely because of the high tariffs on international calls and the poor circuit capacity of the telephone lines.

The cost of hosting web sites locally is very high and subscribers are encouraged to take advantage of free overseas hosting services. A web site development company in Zambia, Dispatch Ltd builds web sites for its local clients and if they can't afford to pay for web space from local ISPs, they upload the web site to overseas-hosted free web spaces. These free web spaces usually insist on the site carrying its banner adverts that are not relevant to local African users and add on to the information deluge that has come with the Internet.

Establishing a regional Internet backbone would be one way to reduce dependency on Internet backbones located outside Africa. This would result in a regional hub being used by ISPs in different countries. Sharing of equipment costs would result in better services to customers. At the moment this is not possible because the international tariffs charged by local PTOs discourages ISPs to establish multiple international links.

Telecommunication developments that are underway to improve the speed of accessing Internet services involve the setting up of VSAT (very small aperture terminals) that will establish direct links to Europe or US. Such countries as Zambia and Mozambique are developing positive regulatory environments paving the way for the deployment of innovative telecommunications technologies geared towards speeding up Internet traffic.

2.5 Content - Communicating What?

A web site in many Southern African countries is now a constant feature of large organisations' information service. The web site is increasingly seen as an effective way to disseminate and access information in such key areas as health, education, business and government. Most of these web sites are accessed by educated professional people and is another example of the domestic digital divide.

There is an increasing number of web design companies using sophisticated and state of the art web building tools. Such companies include among others Cyberplex Africa in Zimbabwe and Dispatch Ltd that are at the forefront of designing and developing web sites for their local clients. There is however a need for organisations both in the private and public sector to be involved in using the web to provide and access locally relevant information.

The tourism industry is by far the only sector with the largest representation of locally generated web sites. It is the most overtly leading sector in ecommerce activities in the region with holiday bookings being made online by overseas clients. The local craft and music industry (Africa art and culture) has also taken advantage of web technologies by selling their products and services via the Internet. All the major national newspapers throughout the region have an online presence and these newspapers also cater for the information needs of nationals living abroad. The newspapers, because of the nature of their product, timeously update their web sites – a habit that other organisations should follow if at all their web sites are going to add value to their services.

It has been noted in a conference paper, (Chivhanga, 2000) that African based organisations have to be involved in the production of web content if the technology is to help reduce the information gap found in many organisations and different socio-economic sectors. Most participants noted in a workshop that access to information using traditional sources of information was a problem. The workshops took place in Zambia between July and August 2000. They were organised and facilitated by the author as part of an International Institute for Communications & Development (IICD) project in partnership with the Internet Studies Research Group (ISRG) at City University (http://www.soi.city.ac.uk/research/isrg/papwec.htm). One participant noted that there is a 'syndrome of institutional selfishness when it comes to sharing information'. People and organisations are not in the habit of sharing information. This largely explain why traditional information resources are poorly maintained and not kept as national assets for all to enjoy.

The result has been that people place less reliance on local information resources preferring to use externally generated sources. A researcher interviewed prior to the workshop pointed out that he would rather use a market report produced by an external agency based in the UK – Economic Intelligence Unit (EIU), as such a comparable resource is not available locally. Government departments increasingly refer to overseas sources of information about local conditions.

An online discussion forum initiated and moderated by the author from November 1999 has dwelt on various issues primarily aimed at increasing the quality and quantity of African web content. The Africa Web Content Online Discussion Forum has revealed some poignant facts on the true state of African web sites. A working definition of web content should help in elucidating the scope of the subject at hand. Web content is what is put on the web site, rather than how it is presented although it is important to pay particular attention to presentation as well as the content.

The key issues that have provoked the discussions to date are on information needs, accessibility, web development methodologies, technology, ICTs skills development, government and regulation and cultural diversity on the African Internet.

On information needs, participants were in tandem about the importance of presenting relevant web content. They noted that:

- the web content should be produced 'by Africans for Africans' rather than being produced from the North and fed to the South;
- if the web content was relevant across national borders, then the effort of developing it should be cross-national, although political barriers still hampered this;
- in general, content should be relevant to its target audience.

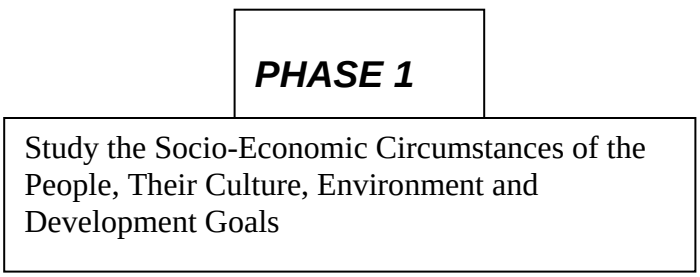
Towards the effort of increasing the impact of Internet technologies through web content, the author developed a participatory web design methodology in his PhD research at City University. The methodology: A People Approach to Produce Web Content (PAPWEC) consists of four phases namely Needs Analysis, Content Architecture, Authoring, Implementation, Evaluation and Impact Assessments. A brief description of each phase is accompanied by practical guidelines that can be followed in translating the underlying concepts and there are a total of 14 of them.

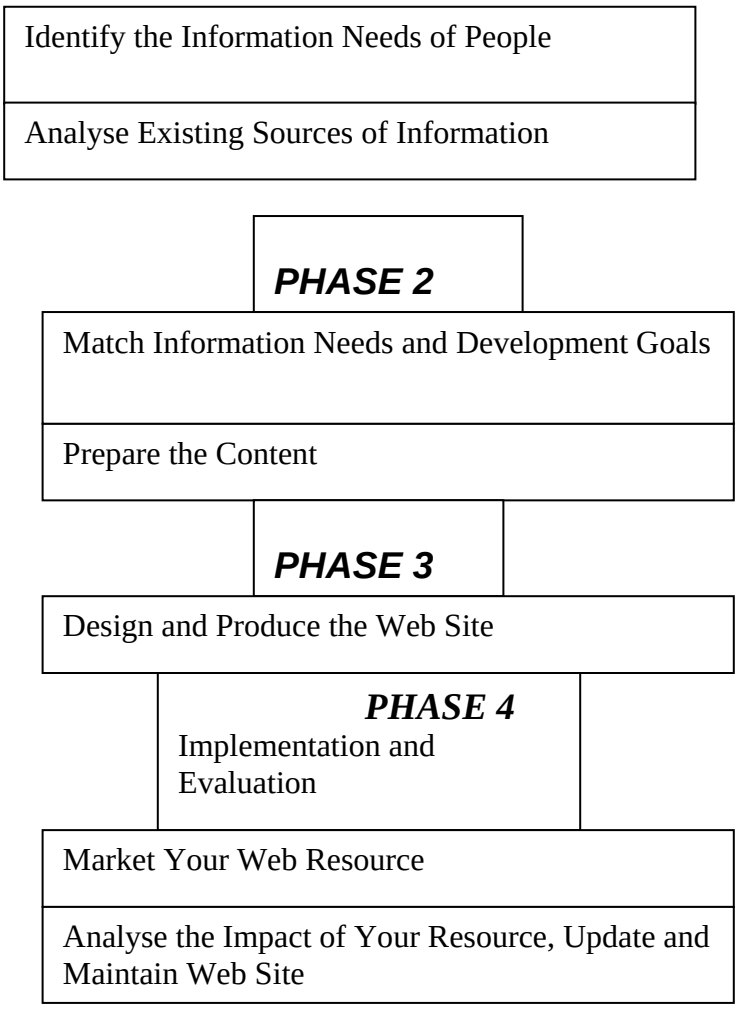
The key to PAPWEC is the recognition that web-building efforts should involve the eventual user. Such involvement can include defining the content of a site to a recognition by the web producers the unique socio-economic circumstances of the people that are going to use the resource. The methodology is a critique to the top-down approaches used in building web sites, especially for use by African people that have proved to be inappropriate for large sections of the community. Such inappropriate web content partly explain why the Internet is still an exclusive technology in many developing countries as web information services target those who are already advantaged in other areas e.g. they have computers in their homes, they are rich and can afford to use the Internet and are educated. A majority of web sites on key development issues and subjects originate from outside the African continent and the underlying philosophy behind PAPWEC is a need for a concerted and systematic way to reduce information gaps in key development areas such as health, education, science and technology, government and commerce. Further information about PAPWEC that has been used to build prototype web information resources for agricultural exporters in Zambia can be accessed from the web site:

http://www.soi.city.ac.uk/research/isrg.

PAPWEC can be adapted for use in building new online information resources or revamping existing web sites that have failed to deliver an effective message to its target audience, especially if the audience resides in developing countries and come from deprived socio-economic groups. The approach seeks to show how to make information impact on development. That impact can be activated by people accessing and utilising the resources to bring about noticeable and measurable socio-economic benefits. These benefits such as increasing the sales turnover of an export oriented organisation through using online trade and market information can accrue over a period of time.

Lack of locally prepared web content has certainly not popularised web based information services. Nearly all the web sites are in English and there hasn't been a concerted effort in many South African countries to use local vernacular languages spoken by a majority of the people. There are other factors that explain why the Internet has slowly been growing in the region.





A Participatory Web Design Methodology (Chivhanga, 2000)

3. Factors Behind the Growth

There are significant country differences in the number of Internet users. Zimbabwe clearly has the highest number of Internet users – both those with their own subscriptions and those who have access to the Internet via their work or other public access points such as cybercafes. There is a gradual increase in the number of user in countries such as Zambia, Botswana and Mozambique. The highest number of users in all the countries are located in cities. Generally within the cities, home users with Internet access are the rich and middle classes whose houses are located in the lower density suburbs. In rural areas, where most poor people live, the use of the Internet is certainly beyond their reach and it is even ludicrous to promote its use without addressing urgent problems like poor accommodation, health and lack of telephone connections. These people will for a long time be excluded from this fast moving digital world.

Some of the key factors behind the slow growth of the Internet and hence the growing digital divide in most Southern African countries is the poor telecommunication infrastructure, high Internet access costs, expensive computer and telecommunications equipment and skilled manpower shortages in all ICTs industries. There is also a need to remove the political and economic barriers to the growth of the Internet. Development of infrastructures such as roads and electricity are tied to the creation of a healthy

environment to attract foreign investment not just in the ICTs industries, but other sectors. These new groups of users will create sophisticated demands that will drive innovations and an improvement in Internet services (Steiner, 2000).

Basic telephone infrastructure for a majority of the people who live in rural areas is not available. The tele-density is about 1 per 200 inhabitants. The rural communities have the lowest telephone connections and worse still they don't have electricity. The installation of digital infrastructures is now a national priority. The inevitable result of the use of analogue lines is that telephone costs are exorbitantly high and this consequently leads to a high cost of Internet connection. It means that most ordinary people can't afford to use the Internet. Apart from those using the Internet at work, of the ordinary users, only the elite can afford to use the technology. It becomes a luxury when it should be nurtured to make it accessible to a majority of people if its full benefits like access to information and an improvement in communication are to be realised.

Compared to Europe the average cost for 5 hours of Internet access in Southern Africa is about 4 times more expensive. The monthly cost is about US$60 (usage fees, telephone time included, excluding rental of the telephone line). These costs are unevenly distributed (between $10 to $100 per month) – pushing the technology further from within the reach of the majority of people who have other more urgent financial needs and a majority of them live below US$1 per day. Owning a computer in itself is a luxury and only within the reach of a few people. In consequence, the route to widening Internet access lies through the provision of cyber cafés, kiosks and telecentres.

There are concerted national and international efforts to build information societies driven by these new technologies in many countries in the SADCC region. There are a number ICTs projects in progress initiated by both national and international organisations. These projects have been driven by the underpinning belief that new technologies in particular the Internet have the potential to bring about socio-economic developments. The flow of information across every sector can bring about untold changes as these societies now acknowledge its value in every human activity. Information and new technologies are engines to development and it is their strategic uses that can result in changes in the continent.

Government departments are not always keen to freely publicise their activities and there is a general reluctance on their part to keep their citizens fully informed. This is more serious in rural areas where the majority of the African people live. Most of these people are illiterate and sometimes their level of ignorance about basic health issues for example, has undermined any socio-economic progress in urban towns. Most politicians derive their support from the rural population and it is in their interest to keep them uninformed about the real issues in the country for that will erode their political power base. From the author’s own observation while on the field trip in Southern Africa, political institutions are very wary of the power of the Internet to disseminate information freely and independently. It is the author’s firm belief that proliferation of the Internet in Southern Africa will greatly improve people’s understanding of many issues affecting them and it can prove to be a powerful educational tool, equipping people with relevant information that can strengthen their knowledge base. It can be a costly exercise to spread the Internet right to grassroots levels but a nation that has a deliberate policy to keep its citizens fully informed on national issues – social, political and economic, will reap the benefits in the long run.

Impact and Benefits - The Internet Effect

As one can surmise from the foregoing, the Internet is still to make a major impact in Southern Africa. What kind of impact is expected to result is still a subject for discussion and the strategies being followed have not yet resulted in the proliferation of the technology. There are other more vexing questions like for example which components of the technology are being developed to achieve what socio-economic

changes. Is it the email facility, video conferencing, bulletin boards, web sites making more impact on people and development? There are no clear standard guidelines in place to inform policy-making and interested parties that can be followed to use the new technologies to their maximum potential. Most of the activities end up being shrouded in a lot of talk and when one goes to the ground, there is very little happening. The presumed 'leap-frog' or impact will take much longer than expected – maybe another 10 to 20 years and by then the world of the Internet will have advanced so far ahead, increasing the growing digital divide between Africa and the rest of the world!

The two key Internet features that are already impacting on communication and information services in many developed countries are email systems and web sites. These two Internet services have become a major vehicle in exchanging and accessing information. In Southern Africa, just like elsewhere in Africa, traditional sources of information have proved not to be reliable, they are not kept up to date and inaccurate when compared to information services in many developed countries (Chivhanga, 2000). The information could be there, but it is not in a readily accessible format as it is scattered in many different localities. The culture of cataloguing, archiving and maintaining library resources generated from within the countries has not been fostered. This has greatly undermined traditional information services and only private sector organisations have for many years collated and maintained their own in-house publications and they usually don't share that information with outside parties.

The individual country statistics in Southern Africa clearly show that only a tiny majority of people's lives has been changed by the new technology. At an individual level, there is a small impact. At community or national levels there is no impact as the uses (application) of the technology are just benefiting a few – the elite. The technology has however moved from being a 'novel object' (Menou, 2000) i.e. people know about the technology and all Southern African countries have dial-up Internet access in at least two cities. There is still another level of penetration needed on a national scale. Behind the smokescreen there is very little change. The Internet hype goes on and this is the danger posed the media coverage on issues pertaining to the technology – a lot of talk without major transformations taking place in the lives of a majority of people.

4. Global Developments of Internet Technologies and Emerging New Technologies

One of the major keys to the spread of the Internet is an improvement in the telecommunications infrastructure. Liberalisation of the PTOs is a must where the private sector is seen partnering with the public sector to improve the services. An even more interesting development saw the establishment of a regional telecommunications company – COMTEL, in November 2000. Five National Telecommunications Operators (NTOs) – Zambia and Malawi are part of the group and the Common Market for Eastern and Southern Africa (COMESA) established the long-awaited COMESA Telecommunication Company (COMTEL). The formation of this company will see a reduction in payment to European and North American companies to the tune of US$100m per year on transit charges alone on international lines. It is hoped that COMTEL will improve the telecommunication services in the sub-region, extend telephone services in rural areas and provide Internet services in both urban and rural areas.

The growing popularity of mobile telephones in Southern Africa is already solving voice communication problems. Mobile phones are still a luxury for the urban upper and middle classes, but they have penetrated Southern African societies tremendously faster than the Internet. WAP phones are still to appear on the market and one hopes that mobile phones designed specifically for use in the Continent and powered by a hybrid of Internet applications that will facilitate access to servers first within the national borders and later the region and overseas. It is hoped that basic and generic nationally combined Intranet services with their own unique Local Wide Web (LWW) servers will bring a taste of the technology to a majority of people that are Internet illiterate (Chivhanga, 2001). The basic features of this strategy geared

towards democratising access to the Internet at grassroots level, is explained later in the paper. Internet illiteracy is not just limited to the uneducated, there are a lot of university graduates and many office workers that have never used the Internet.

Mobile Telephony – the 'Tiger' in Communications Technologies in Africa

A statistical analysis of the status of telephone and cellular networks will reveal a full picture of the challenges and opportunities on the Continent. New cellular networks in Sub-Sahara Africa have considerably improved personal and business communications reflecting global trends in that market.

The penetration of GSM (Global Systems Mobile) has moved from 0.5 % to 5 % in a four year period in the whole of Africa – from 1997 to 2000. GSM covers the whole of Southern Africa and is growing by 30 000 per month. Roaming services are also available from the most popular Mobile Service Providers. In most households, the Pay As You Go mobile phone model has come as a permanent and quick solution to voice communication problems.

Another global development that is predicted to increase the uptake of the Internet are WAP phones and if well adapted to Africa's telecommunications and computer infrastructure may turn out to be one major key to make the *Internet affordable, fast, relevant and practically beneficial* to ordinary people.

It is very clear that the number of mobile telephone subscribers is increasing faster when compared to main telephone lines. Mobile telephony presents an unparalleled opportunity for many African countries to leapfrog telecommunications development. The challenge is to make the service easily affordable to a majority of people. The pay as you talk mobile business model has been well received by the market – there are no monthly bills and more importantly no chance of rigging the bill by unscrupulous telephone operators. Reducing the cost of handsets and both national and international calls will increase the number of subscribers. This can be realised through opening up the market by granting licences to more private operators – a move that has been resisted by many PTTs and remains a stumbling block to many innovative business models being introduced by locally based entrepreneurs. A relaxation on the part of PTTs will reduce the cost of making telephone calls that is often passed on to the subscriber that can increase the communications bill adding to the overhead costs that will drive Small to Medium Enterprises (SMEs) out of business.

In Zimbabwe for example there were about 19,000 mobile cellular subscribers in 1998. This number has been projected to increase to 200,000 in the next three years. EcoNet (http://www.econet.co.zw) is now a major player in the business after winning a fierce court battle having challenged the PTC's monopoly over telecommunications services. It was finally granted a cellular GSM network licence and is a major competitor to NetOne, PTC's major cellular radio and trunked radio operator. Another major player in the business is Telecel (formerly Net Two) that has a GSM license and is privately owned.

Wireless Technologies – Potential as Information Platforms

The global demand for mobile communications has seen the development of new Internet related services and products and a new mode of transmitting data through the Wireless Application Protocol (WAP). WAP technologies have already entered the market in many developed countries like Finland – the home of Nokia, which is leading the world by bringing the Internet everywhere, anywhere and at anytime. WAP can be defined as a multi-layered protocol that is designed to deliver Internet content to devices such as mobile phones, palmtops, pagers and PDAs (Personal Digital Assistants). Mobile phones are fast becoming platforms of many information types. The term 'mobile phone' is no longer a correct description of the present and emerging functionality in the mobile industry (Mountain, 2000). We should

therefore be looking for a new term and for this reason the term 'mobile device' should be used and in these devices also lies Africa's possible solution to data and voice communication problems.

Lack of information leads to poverty – in fact there is a direct link between socio-economic stagnation and poor information services. If you don't know about it, there is no way you can make a proper decision and many businesses in Southern Africa don't grow because they readily don't have trade and market information on their fingertips. New technologies should therefore be used to provide such information that is critical to the survival of the organisation and one can see the potential of mobile devices designed with the African context in mind making huge impacts in the information and communication environments.

As recently as August 2000, Econet (www.econet.zw) – a Zimbabwean company, was the first cellular provider to market WAP phones in Sub-Sahara Africa, excluding South Africa. The launch of their WAP handset also coincided with its highly advertised portal site '? Ask Charlie' that can be accessed via its network. The web site brings to Zimbabweans sports news and events and access is provided to other leading portal sites such as the BBC and CNN. The price range of WAP phones is between US$625 and $1000. This is the cost of the handset only and there are no traditional subscriptions and connection fees to existing customers, but normal Econet tariff schedule applies, including peak, off peak and off-off peak (weekends). The market for WAP phones is steadily growing in very few African countries.

Mobile devices apart from the PC should be developed to widen access to Internet services, especially in Africa where such technologies can go a long way to improve communication and information services. Young people in many African cities are already using mobile phones and should be seen as the age group that can proliferate new technologies in most African settings with the consequent result of taking Africa out of the technological wilderness. Internet illiteracy is not just limited to the uneducated, there are a lot of university graduates and many office workers that have never used the Internet and an introduction of different and appropriate Internet technologies will make a huge impact on the information environment and people's lives in general.

What is however noticeable throughout many people in Southern African countries is that there is a genuine desire to use the Internet whether for business or personal purposes – that is highly positive for the future developments of the technology. There are still many negative and reactionary forces especially people that are still stuck in tradition and view any technological development as another form of Westernisation that is eroding cultural values. The hunger is there, but what is lacking is the food – the capacity. There is a high level of awareness in most of the countries, where there are a lot of people living overseas who use the Internet to communicate with their relatives back home. These people are also playing a major role in spreading Internet technologies throughout their countries with a spillover effect to neighbouring countries.

5. Internet Wise Strategies

The international digital divide between Africa and the rest of the world can be reduced through improving the telecommunication infrastructure, developing appropriate policies and regulations, increasing the number of computers with Internet access, educating local people so that they become Internet and information literate and use of wireless technologies to provide alternative access to the Internet. These concerted strategies among others will improve the Internet services. While people have a need to be part of the Global Wide Web (GWW), the author is suggesting another strategy to reduce the domestic digital divide i.e. the marginalisations between people living in rural and urban areas and further still, between the different socio-economic groups in urban areas. This strategy involves the development of a Local Wide Web i.e. a systematic conglomeration of LANs and WANs located within a particular

country. These WANs will be linked by Local Wide Web national servers that can be accessed via mobile wireless devices, PCs and other hand-held devices like PDAs.

A Local Wide Web (LWW) Infrastructure

It should be recognised that traditional information services in many developing countries are poorly developed. The Internet has indeed opened up a reservoir of information generated from outside the continent, yet local information is not accessible to a lot of people. It is proposed that alternative information and communication networks should be developed to bring the benefits of Internet technologies to a majority of people in Africa thereby improving local information and communication services. While attempts are being made to reduce the international digital divide through improving Internet services, the LWW can be an effective way to bring the benefits of Internet technologies to people at grassroots level. Most of these people will certainly not be interested in accessing web sites carrying the international body of information and knowledge. Where there is a need to access such information resources, the LWW could be used to distill such information and make accessible via its servers. The nature of LWW Internet services will be affordable, fast and exciting, meeting local information and communication needs without the hassle of accessing the GWW that currently is slow and expensive for a majority of these people.

The Local Wide Web will be a local Internet within the global Internet that can be accessed mainly through wireless technologies like wireless devices like mobile phones. The recently announced computer for the poor, Simputer (http://www.simputer.org) is a good example of a device that can be used to access local information resources quickly and at a cost affordable to local people.

The LWW will be supported through the development of web browsers that can search locally based servers. In fact, the existing traditional browsers can be configured to access local networks, akin to technologies used to access an Intranet site. The protocols for the LWW will still be based on Internet technologies. Instead of routing Internet traffic to the Global World Wide Web, the Internet traffic will be routed to a national backbone. People will still have the option to access the Global World Wide Web.

The technology is there for this to happen and the author is developing prototype Internet applications to test pilot a Local Wide Web server. Two access methods will be used in the prototype network. The first access to a Local Wide Web Server will be through the traditional landlines and PC and the second access method will be through a wireless device like a mobile phone.

The logic behind the LWW is that currently, it costs more to access local web content from many parts of Sub-Sahara Africa because the traffic has to be routed to hubs that are located overseas, yet it could be changed around to access national Internet hubs that can retrieve web content and services via the Local Wide Web.

The underlying reasons behind the LWW are the following:

- Its existence will show the benefits of using Internet technologies to deal with local information problems i.e. using Internet technologies to support local socio-economic activities. This will hopefully show a meaningful use of Internet technologies to people at grassroots level who due to lack of experiential exposure see the technology as far removed from their ordinary lives. Currently most users of the Internet are educated and well off and the ordinary people are already marginalised and the level of marginalisation is growing at a fast rate.
- The level of awareness needed to bring a majority of ordinary people to appreciate and use Internet technologies should also consider other new technologies that are appealing to most people in Africa.

Mobile phones are proving to be a popular and the new in thing and they can be an ideal vehicle to launch the LWW.

- Mobile phones can be specially used to support the LWW and local email systems i.e. people from within a national boundary can have email accounts that work within a particular country.
- A LWW and Local Email (LEmail) systems would be especially appealing to youngsters in Africa who already are keenly using mobile phones to talk to their friends in the same country.
- A LWW is a recognition that each society has to collate, archive and maintain its own information resources. The LWW should be used to comprehensively address some of the major information gaps in Africa. A LWW should be used to build information resources that local people can use specifically in their lives. The network is also a recognition that each society has its own national information resources that directly reflects who they are i.e. their socio-economic circumstances. The build up of a collection of such resources have traditionally been housed in a library i.e. a representation of a society's knowledge in the medium of print publications. Such a collection of books has strengthened many developed societies' information infrastructure and this has formed a strong basis for building electronic publications. Africa has for a long time been depending on print publications originated by Western based publishers and this dependency is gradually being reduced through many institutions printing and disseminating their own information to the international communities. The LWW should be used as a local network of information resources that can be shared by people within a particular country. There is a place for the LWW in strengthening local information services as it will encourage indigenous efforts to respect and archive local intelligence.
- LWW will be used to meet the information requirements of local people within a particular country and the GWW will in turn be used to publicise information that is targeted to the international community. This is a realisation of the problems arising out of accessing local web sites for use by local people for local purposes.
- The current Internet services are failing to endear themselves to a majority of people and while investments are being made to improve the underlying infrastructure, a LWW network can be designed and implemented much quickly and yield even profitable returns for local people than the current Internet network.

It is hoped that African need to adopt and adapt Internet technologies to suit the socio-economic circumstances of people and the LWW and a People Approach to Produce Web Content are contributions to Internet developments are contributions that should be considered by those keen to reduce the digital divide between developed and developing countries. Not one person can bring about change, it takes national and international efforts to make the Internet a truly democratic tool of development.

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THE DIGITAL DIVIDE IN AFRICA
THE SENEGALESE CASE IN WEST AFRICA

D3 DIGITAL DIVIDE DOCTORAL STUDENT WORKSHOP
Wednesday, AUGUST 1 THROUGH Sunday, AUGUST 5, 2001
THE UNIVERSITY OF MICHIGAN SCHOOL OF INFORMATION, ANN ARBOR, MICHIGAN

INTRODUCTION:

Internet is growing fast in this decade. Netsizer (www.netsizer.com) shows instantly the progression of the hosts and the users of internet in the world. In this site we find the position of Africa wich is always the same: the last place for the Internet development in the world (Africa, 304.473 hosts, 3 328 880 users (http://www.netsizer.com/daily/TopCountry.html, http://www.nua.ie/surveys/how_many_online/index.html; while Usa-Canada (167.12 million users) and other developed countries are increasing their advance (88 % of the world users are from the developed countries , 0.3 % are from the developing one).

> Dans le rapport mondial sur le développement humain publié en 1999 par le programme des nations Unies pour le Développement, les auteurs dudit rapport ont constaté le développement inégal de l'Internet dans le monde en défaveur des pays en voie de développement et particulièrement de l'Afrique.
>
> Ainsi selon, le rapport du PNUD, l'Afrique qui représente 9,7 % de la population mondiale n'abrite que 0,1 % des internautes alors que les Etats-Unis qui ne composent que 4,7 % de la population mondiale concentre 26,3 % des internautes.

The gap between those countries and the african continent is a part of the so-called digital divide. Indeed, the digital divide represents more than the number of users who go online. We go to see why in the body of our work paper. So, for this instant, we can give a simple definition to have a semantic convergence between us. This one is from the Digital Divide Network wich propose: « *we use the term "digital divide" to refer to this gap between those who can effectively use new information and communication tools, such as the Internet, and those who cannot. While a consensus does not exist on the extent of the divide (and whether*

the divide is growing or narrowing), researchers are nearly unanimous in acknowledging that some sort of divide exists at this point in time.» http://www.digitaldividenetwork.org/content/sections/index.cfm?key=2 . This definition is important by the fact it shows us the existence of others parameters to understand the digital divide. But, even if I have my position about this problem for this workshop I'm going to discuss as the organizers ask me about the technologic platform and the policies behind his building. But something is real, the gap is a reality and it is increasing while the challenge for african researchers is to understand in the same time how to realize a well-adapted technologic platform in their country and how will be the appropriation of these tools for their particular way to develop.

Coming back on our particular subject, the digital divide in our countries figures many situations because Africa is not still where the dynamic of the development of ICTs is the same.. Indeed, we can see in the litterature the diversity of the situation of african countries toward the involvement to the development of telecommunication infrastructures and particularly the Internet. South African Republic, Ghana Republic, Democratic Republic of Congo, Senegal, etc., aren't in the same level of development in the landscape of ICTs.

For example, the studies about senegalese way to bridge the digital divide shows how this country is gaining some digital dividends. (http://www.nua.ie/surveys/how_many_online/africa.html; when certain western african countries are trying to follow the train. I propose to study the senegalese case in Western Africa. If we consider the evolution of the Internet in West Africa, the space where is situated Senegal, we can see that certain African initiatives are well-oriented to bridge the digital divide. What we mean by that is simple: with the means from the private sector the african policies can help to resolve the problem african countries are facing actually.

After an overview of african policies by Gaston Zongo, *Information and communication technologies for development in Africa, trends and overview*, IDRC/ACACIA, Communities and information Society in Africa, April 2001 http://www.weforum.org/digitaldivide; http://www.aftidev.net/fr/ressourcesliens.html

I propose to study the senegalese case by the approch of Olivier Sagna who shows how the senegalese policies are right since a long time and how the government is proactive with the choices they did. This study is a draft which aimed to permit the scientists to understand the environment (policies and technologic choices) of the senegalese move in this new era. This study can be seen in the following site (http://www.unrisd.org/infotech/publicat/publ.htm: Les technologies de l'information et de la communication et le développement social au Sénégal: Un état des lieux, par Olivier Sagna, Université Cheikh Anta Diop de Dakar, janvier 2001 /cgi-bin/dnld1.pl?filename=infotech/sagn.doc:377.5k&thispage=infotech/publicat/publ.htm Information and Communications Technologies and Social Development in Senegal: An Overview, by Olivier Sagna, University Cheikh Anta Diop, Dakar (draft version translated by Paul Keller), August 2000.

We'll conclude our communication by a new proposition. We believe that the development of infrastructures in Africa has to be done with the development of the management of knowledge African people has to query in the Net. This problem is really important because the Northern countries are facing it actually. Indeed, the case of knowledge access is a real problem because the cost to connect to internet and the price of connection are high and the price of information can be expensive for the real or potential users.

II BRIDGING THE DIGITAL DIVIDE IN AFRICA: The report of Gaston Zongo, IDRC/Acacia

The choice of the report of Gaston Zongo as a tool to understand what is happening in Western Africa is related to the fact this report is one of the complete and new overview in the field of the development of ICTs in Africa. Zongo, http://www.itu.int/africainternet2000/speakers/bio.html#Gaston_Zongo, starts his study by showing the starting point of the development of ICTs: the African Information Society Initiative (AISI) wich is the central plan to set up Africa in this new era.

> L'initiative est issue du "Symposium régional africain sur la télématique au service du développement" ("African Regional Symposium on Telematics for Development") organisé à Addis Abeba en avril 1995 par la CEA, l'Union internationale des télécommunications (UIT), l'UNESCO, le Centre de recherches pour le développement international (CRDI) (International Development Research Centre (IDRC)), et Bellanet International. Le Symposium régional a instamment demandé à la réunion ministérielle de la CEA de considérer l'importance pour l'Afrique de la révolution mondiale de l'information.
>
> En mai 1995, la vingt-et-unième réunion de la CEA, réunissant les Ministres responsables du développement économique et social et de la planification, a passé la résolution 795 (XXX) intitulée "Construction de l'autoroute de l'information africaine" qui appelle à œuvrer à la constitution de réseaux nationaux d'information et de communication au service de la planification et des prises de décision, comme partie intégrante de l'autoroute de l'information d'Afrique; la résolution appelle également à la constitution d'un groupe de

travail de haut niveau composé d'experts africains des technologies de l'information et de la communication en vue de préparer l'entrée de l'Afrique dans la société de l'information. En mai 1996, à travers sa résolution 812 (XXXI), la vingt-deuxième réunion ministérielle de la CEA a approuvé le plan d'action préparé par le groupe de travail de haut niveau et intitulé ": Initiative Société de l'information en Afrique: un cadre d'actions en vue de la construction d'une Infrastructure d'information et de communication pour l'Afrique".

The objectives the whole continent has to reach are concentrated in these 9 points:

1. Developing national plans for building information and communication infrastructure;
2. Eliminate legal and regulatory barriers to the use of information and communications technologies;
3. Establishing and enabling environment to foster the free flow and development of information and communication in society
4. Develop policies and implement plan for using information and communication in the public sector
5. Introduce information and communication applications in areas of highest impact on socio-economic development at national level;
6. Facilitate the establishment of locally based , low-cost and widely accessible internet services and information content;
7. Prepare and implement plans to develop human resources in information and communication technologies;
8. Adopt policies and strategies to increase access to information and communication facilities with priorities in servicing rural areas, grassroots society and other disenfranchised groups, paticularly women and youth

9. Create and raise awareness of the potential benefits of African information and communication infrastructure.

This global african strategy, said Zongo, was conduct by PICTA (Partnership for information and communication Technologies in Africa) under the co-ordination of the United Nations Economic Commission for Africa (UNECA: http://www.uneca.org.

If certain government lead the development of their national plan by themselves, the thrue development of ICTs in Africa is the fact of private and NGOs. Indeed, as say Zongo:

1°) It's in the 70s when certain national telecommunication operators in the continent accepted to share the telecommunication segment with operators from the colonizer country (France-Cable &Radio from France for the African Francophone and Cable and wireless for the english part)

2°)In the 80s the « split of the Post and telecommunication corporations in two separate and independent management structures »

3°) « The third phase is the current privatization and liberalization of the sector » as we're going to learn with the SONATEL's case in Senegal. Arguing this way to manage by the senegalese Telco, Zongo shows how SONATEL is reducing the digital divide: « Senegal SONATEL's case is noteworthy. SONATEL is recording high profits , while decreasing the tariffs and expanding the network towards the rural zone and is recording leading values on the regional stock exchange of Abidjan where 17,7 % are floated (http://www2.sn.apc.org/africa/countdet.CFM?countries__ISO_Code=SN)

So, what is remarkable in this context is the place of the private mobile sector.wich are really creating a culture of competition in the telecommunication sector. Governments of west africa tend to sell the license and leave the market plays his role. It' is the reason why we assit to the decrease of the price of the communications and the increase of the subscribers (Senegal and Ivory Coast).

The biggest in the sector as say Zongo are (Telecel-ORASCOM, CELTEL, Vodafone and MTN).

Among these operators wich are participating to bridge the digital divide in Africa , Zongo shows the role of the satellites (INTELSAT,THURAYA, INMARSAT, ARABSAT, RASCOM (Regional African Satellite Communication Organization wich plan to launch its own satellite in the year to rejoin the rural part of western african countries), the development of FM broadcasting radio operators (Radio+Internet), call centers operators and private telecenter operator (10 000 in Senegal), cybercafés, the increasing of local private operators and services providers (Metissacana, Sentoo in Senegal).

But the development of the telecommunications in Africa is based on important project wich will surely project Africa in the Era of information. With Zongo we can mention COMTEL

> « The COMTEL backbone network has been configured to include a mix of optic fiber, microwave and satellite connectivity. The network will facilitate transmission of voice, data, and TV programs. In this way the network will cover the breadth of information and telecommunications technology, including both voice and data transmission of various brandwith, and is expexted to stay modern for a long time to come » (http://www.comesa.int),

SAT 3-WASC-SAFE wich is « a joint fiber-optic submarine cable project involving more than 40 operators globally », a undersea cable system, SAT- //WASC/SAFE « cable system will route between Dakar (Snengal) and Penang (Malaysia) » and landing in Côte d'Ivoire, Ghana, Togo, Benin, Nigeria . (http://www.safe-sat3.co.za/)

RASCOM (Regional African satellite Communication Organization) which role is to launch the western African satellite which has to help the regional integration by the

telecommunications, AFRICAN CONNECTION (http://www.africanconnection.com), AFRICA ONE will lay a fiber optic submarine cable around the continent.

For the others sides of the battle against the digital divide (government and policy and regulations, national regulation and policy authority, the initiatives existing in the field, the role of private sector) youcan to go Zongo's references.

So, Ipropose to study the senegalese case and his Telco operator (SONATEL) to illustrate a performant way to bridge the digital divide in Africa.

II HOW TO BRIDGE THE DIGITAL DIVIDE IN AFRICA: THE SENEGALESE CASE

The contry ICT profile:

http://www2.sn.apc.org/africa/countdet.CFM?countries__ISO_Code=SN

Quantatives datas synthesized the country situation can be found at:

http://www2.sn.apc.org/africa/countdet.CFM?countries__ISO_Code=SN or one of the best studies about the question in Africa: http://www.worldbank.org/html/fpd/technet/Miria.doc by Miria Pigato titled « *Information and communication technology, Poverty and development in subsaharan Africa and south Asia* ». But we'll go to analyse and comment the description of Sene wich is titled «*Senegalese internet operator* », a net-description who shows the dimension of the impact of ICTs in this country:

> Senegal, on-line since 1996, hosts a growing and competitive internet-based service sector. There are currently at least nine Internet Service Providers (ISPS), active cybercafes and cyber business centers in Dakar and other major cities, and a small, but active group of E-commerce companies. Blocks to further rapid development include outdated legislation and relatively high costs. On the other hand, SONATEL and the ISPS provide dependable, high-quality Internet Service -- a rarity in the region.

This shows us the proeminent place Senegal's Telco is printing to the national movement to insert the country amoung the African leaders of telecommuncation development. Actually, by this fact the country is mastering the dissemination of new technologies of information and communication through the whole country. The task is not, actually, to develop the infrastructure, but to enlarge to the rural zone. The governement ask to the institutional operators to follow the politic they decide wich target is to give to the country the opportunity to have a complete national telecom infrastructure. This task is SONATEL one by the mesure of the government. The Telco operator has a recognized know-how in this domain. Indeed, it's by their action Senegal began really to be a member of top online's nation. As confirm Mr Sene (sene@sonatel.senet.net) :

> Senegal went on-line in March 1996 when SONATEL, the National Telecommunications Company, leased a 64 Kb line with MCI. The first Internet Service Provider (ISP), telecom plus (which is an arm of SONATEL), began operations in 1996. In May 1997, SONATEL improved its bandwidth access through the leasing of two more 64 Kb lines through Teleglobe in Canada. Currently SONATEL has a total of 196 Kb in leased line bandwidth and access to two mega of bandwidth through VSAT.

The lanscape of telecom market in Senegal shows how the country is setting up a real telecommunication activity in a free market. The number of operators is growing and the part of population wich is touched by this movement is an essential digital dividends for a developing country. Formal sectors and informal ones are targeted by SONATEL and the providers to bring them in the digital market. The existence of this infrastructure push the

Senegalese industries capitains and the researchers to orient their imagination toward the creation of projects to bridge the digital divide. Indeed, we (a canado-senegalese consortium wich I'm one of the builders) is, actually, negociating with senegalese government to connect the business men of the country with the government services by a e-government program. One of my partners is actually in the country and discuss with the politic authorities about the electronic Vademecum for e-governance in Senegal). This example means the passed and actual work of the Telco in the country are central in the new way to do to Senegalese people.
SONATEL offers to the market what operators need to enter in this new economy. This organize in the same time the market. Indeed, the telecommunication market around the Telco as notice Sene is organized like that:

> Currently there are at least ten ISPS operating in Senegal, six of which are commercial operators. The providers rent bandwidth from SONATEL. SONATEL offers space in increments of 19.2 Kb, 28.8 kb, 33.6 kb and 64 kb for analog lines and 64 kb digital isdn line. SONATEL has lowered its access charges for special lines twice over the past year and now charges FCFA 600,000 per month (USD 900) for a 64 Kb line.

But the market stays underdeveloped because the rural population and the interiors cities are slowly following the movement. So, with the NGOs project in the country, in five years we can expect that an important part of the country will be connected. Sene shows the landscape of the dynamic move of the telecom in the whole country:

> The internet market remains relatively small in Senegal. SONATEL has estimated that the total number of "internautes" or frequent users to be around

> 11,000. Relatively few Senegalese can afford the equipment to maintain a home internet account and most do their surfing at the cybercafes or cyber centers or at work. SONATEL estimates that the various pay-by-the-hour establishments use more than 50 hours of internet connection each day. Many small and medium-sized businesses maintain e-mail accounts for business communication, but make little use of other net services. Internet usage is heavily concentrated in Dakar, but access is possible from throughout the country and there are small, but growing groups of internet users in secondary cities such as St. Louis and Thies.

The Situation of SONATEL in this free market is problematic because the Telco has a monopol. In fact one of its arms is fighting in the same level with the providers meanwhile the Telco is their same provider. This is the source of disagreement between the Telco and the others providers:

> The requirement, under Senegalese law, that ISPS pass through SONATEL for bandwidth access is a constant source of irritation and complaint for the ISPS aside from telecom plus. Telecom plus' competitors allege that SONATEL favors telecom plus in bandwidth access and that at peak usage hours their service suffers. SONATEL concentrates most internet traffic on the 128 kb of leased line with Teleglobe. The capacity is ample at most times, but at peak periods the system can slow to a crawl. SONATEL contends that it does not favor telecom plus, and that a major "slowdown" on the system is the increasing prevalence of voice by IP (internet protocol), which is very cheap, but bandwidth consuming.

So, even if the position of the Telco is not the best in regard to the new structure of the market, we can see the digital dividend SONATEL is offering to the country : doing the basic work, to organize and set up a modern telecommunication infrastructure in the country. As notice Sene one part of the population, one of the most important part of the economic group are taking avantage of this new infrastructure and tools to communicate quickly and to reduce the cost of their transaction: « Expatriates, Senegalese, and the large middle class Lebanese community have all begun taking advantage of the very low-priced international telephone service offered by the voice by IP companies ».

But if the senegalese market is far to be a perfect one as a free economic system, the author shows that the development of the sector is offering to the economic operators the tools they need to involve in the numeric market. We won't forget that the country was underdeveloped when the government engage the Telco in the development of the infratructure. Today we notice with Sene that:

> The e-commerce and Teleservices sector is young in Senegal, but growing. Currently there are around ten companies using the internet for e-commerce-based business. These include Interactive Musique Afrique (recording), Pictoon (animation), Teleservices SA (Teletranslation, Telesecretarial Services), ALPHACAD, Supmedia, Telesante, and quartz data systems. Trade point Senegal, an autonomous public institution, is using the internet to promote match-making between Senegalese businesses wishing to buy or sell products and international partners.

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ICT's world report
http://www.iicd.org/countries/

Inforiches, infopauvres: le fossé numérique
http://www.cyberhumanisme.org/repertoire/inforiche.html

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ANNEXES:

SONATEL IDENTITY CARD:

Address: 6 rue Wagane Diouf, BP 69, Dakar, Senegal

Tel: 221-839-2660

Fax: 221-821-4006

Contact name: Samba Sene, network director

Web site: www.sonatel.sn

ISPS: Company name: Telecomplus, Founded: 1996, Address: 20 rue A.A. Ndoye x Dr

Theze, BP 21, Dakar, Senegal, Tel: 221-822-9727

Fax: 221-823-4632

E-mail: telecomp@telecomplus.sn

Activities: Internet Service Provider, web page design, web page hosting

Web site: www.telecomplus.sn

Internet for All – Insights into a Changing German Media Landscape/Stefan Welling

Introduction

Internet utilization increasingly affects the various societal realms at least throughout the so-called industrialized countries. From the purchase of goods and services and administrative procedures to educational measures, entertainment and political decision making almost all spheres are affected. The increase of services, especially those who are exclusively available online, amplifies the risk of societal disenfranchisement caused by lack of internet access. This is true not only for the realm of employment and consume but also for the cultural practices of everyday life.[1] A basic precondition to participate on this development is access to the internet and its services.

E-democracy concepts, to get fully established and to meet the formal standards of democratic participation, must be accessible to all who are concerned with the possible outcome of such electronically mediated forms of participation. Therefore, but also to guarantee a basic standard of equality of opportunity and to avoid the risk of further social disenfranchisement, everybody who lives in Germany and wants to use the internet should find appropriate ways to do so according to their own perceptions and wants. Currently, about one third of the German population aged 14 and older uses the internet at least occasionally. Thereby, certain groups, compared to their share on the overall population, are strongly underrepresented. This gap is called the digital divide. There is an emerging basic consensus among various societal actors that this development should not be taken for granted for social, political, and economical reasons. This raises the question how and to which degree the divide can be bridged.

I will start with a brief summary of empirical data about internet utilization to illustrate who is concerned by the digital divide, what the reasons for non-utilization are and what the general interest in internet utilization looks like. Successful internet utilization is tied to certain preconditions which are discussed in the second chapter. What follows is the discussion of a basic theoretical framework internet utilization is embedded into. Next is an account of recent and current measures to improve the conditions of internet utilization in Germany. Eventually, I will discuss some basic aspects of how academic research should continue to better the understanding of digital divide issues and to contribute at least to the improvement of the conditions of internet utilization.

[1] In spring 2000, for example, 76 percent of more than 1.000 interviewed companies stated that they expect, among others, basic computer and internet skills from new apprentices to be hired (see Kendzia and Thau 2000: 178). New forms of computer-mediated communication (CMC) allow new ways of interaction, almost exclusively available to those with internet access. This is true for services but also for content.

Measuring Digital Exclusion

Since there are numerous studies of internet utilization it seems to be unproblematic to describe internet utilization in greater detail. But most of these almost unanimously quantitative surveys are market-oriented and focus on consumption issues. They only provide basic socio-demographic data about internet users on the basis of single variable analysis. They do not test correlations between single variables, which limits the explanatory content of these accounts. Strong methodological differences in survey design prevent the comparability of single studies and imfair the verification of existing results about internet utilization.[2]

However, calculations on the basis of two regularly conducted surveys provide evidence that a digital divide in Germany exists, which has been growing since internet utilization took off in the mid-1990s. Older people, for example, are today particularly less likely to be accounted as internet users compared to young people.[3] Even by taking cohort-effects and the recent increase in growth rates for older internet users into account, it would take several years until the gap would diminish significantly (see Kubicek and Welling 2000b:502-505). Also, the use of ICT is still strongly gendered. Despite the strong increase of female internet utilization in May 2001 48,2 percent of the male but only 31,4 percent of the female population were counted as internet users (see Media-Gruppe-Digital 2001b). One of the deepest divides occurs in the realm of education. Decreasing formal educational attainment seemingly goes along with declining internet utilization. Meanwhile, almost 90 percent of all college absolvents use the internet, but less than ten percent of people with a secondary school leaving certificate are accounted as users.[4]

This brief account raises questions about the reasons people have for using or rejecting the internet. Detailed studies of those reasons are rare.[5] Most studies only ask about the future interest in internet utilization. Two groups can be differentiated: (1) those without internet access but an interest in utilization, and (2) those without interest in internet utilization, no

[2] Surveys do not apply, for example, common definitions of utilization. They are based on different survey populations and different sample designs. Varying interview techniques may cause additional biases (see. Welker 1998; Wingert 1998: 512f). See also Kubicek and Welling 2000a for a more detailed discussion of these surveys.

[3] In April 2000 only 4.4 percent of the people aged 60 and older were counted as internet users. From the 13.2 percent of the population aged 14 to 29 almost 55 percent declared that they use the internet at least occasionally. Accordingly, the 'age gap' increased from 13 percentage points in 1997 to 50.2 percentage points in April 2000 (see Kubicek and Welling 2000a: 10-12).

[4] The *ARD/ZDF-Online Survey* shows that the share of secondary school graduates of the whole group with such a qualification only increased from 1.3 percent in 1997 to 7.5 percent in May 2000. At the same time, the share of the group with a college degree went up from 29.1 percent to 86 percent. Thus, the 'educational-divide' grew from 27.8 to 78.5 percentage points.

[5] Most results presented in this paragraph are taken from the *ARD/ZDF Offline-Survey 2000*. The small sample size of 272 people who used the internet in the past or had at least a perception about the medium causes an increased risk of biases and deviations. Thus, the results must be interpreted with care (see Grajczyk and Mende 2000).

matter whether they have access or not.[6] According to the @facts survey there were 40.9 million non-internet users aged 14 and older in February 2001. 10 percent of this group declared that they will definitely go online during the next six months. On the other hand, almost 60 percent stated that they definitely will not go online soon (see Media-Gruppe-Digital 2001a).

The majority of the non-users apparently simply do not need internet services, neither for their job nor for their private life. In April 2000 almost 90 percent of the ARD/ZDF Offline-Survey participants made such a statement (May 1999: 81%) (see Grajczyk and Mende 2000). Additional prominent reasons are the unwillingness to purchase a computer (71%) (indispensable for private internet utilization), a perceived lack of time and motivation to interact with the internet (56%), or missing confidence to use the medium (31%). Interestingly, most non-users can apparently rely on the help of others in case they need the internet for some use. Respectively, 78 percent of the non-users can ask other people for that reason and 55 percent can use the internet together with friends or acquaintances (see Grajczyk and Mende 2000).

Such standardized surveys only provide a glimpse about the reasons and conditions internet non-utilization is embedded in. But qualitative research, which could contribute to a better understanding of these issues is rare. To date, only a few in-depth surveys about the utilization of computer-mediated communication have been conducted (see for example Wetzstein et al. 1995). In sum there is a great need for qualitative and more detailed quantitative research on the various issues of internet utilization, respectively non-utilization.

From Wires to Literacy – The Mantraps of Internet Utilization

Using the internet is tied to certain inter-related conditions which can be located within a model-like situation which I call ‘successful’ internet utilization. Utilization is successful in case somebody who pursues a certain purpose by using the internet can meet her original expectations which caused the decision for utilization to a satisfying degree.

The first condition covers the requirements of physical access, which includes access to the telecommunications network, to an internet service provider (ISP) and appropriate hard- and software.[7] Secondly, the user must find content that meets her interests and needs. To locate this content guiding information based on content indexing tailored for different user

[6] Apparently, there is a growing group of people who used the internet in the past but quitted utilization because, in most cases, gained uses and gratifications were to low (see Wyatt 2000). People also may have access but do not use it. In early 2000 only half of the people who had access outside from home utilized such access and still 5 percent of the people with access at home did not use it (see GfK AG 2000).

[7] Access to analog telephone lines is almost ubiquitous in Germany and also many people have access to ISDN. However, in the future, broadband access like DSL will become increasingly indispensable to provide sufficient bandwidth needed for the utilization of many services.

groups are needed (e.g. portals or reference systems).[8] Eventually, the user must be literate enough to make use of the content and services available through the internet (see Clement and Shade 1996; Clement and Shade 2000; and Kubicek 1999 for a deeper discussion of these issues).

Literacy or media competence is a crucial pre-condition for obtaining information and processing them and is closely related to education.[9] Using the internet requires new knowledge (e.g. the ability to navigate through hypertext documents), skills that were rarely applied in media utilization, but also still basic components of functional literacy: the ability to read and write. A considerable part of the German population is considered as functional illiterate. With regard to the growing educational demands in many realms, a growing number of people may also be confronted with secondary illiteracy, meaning that they cannot keep up with growing educational demands and thus fall back to functional illiteracy.[10]

The ongoing diffusion of ICT contributes to the increasing educational demands. Using the internet requires a combination of inter-related skills paraphrased like the following: (1) competence to differentiate and select between different information genres to be able to decide what information is needed for a certain purpose, (2) orientation competence for the adequate utilization of different information genres, (3) and competence for evaluating single information by judging and criticizing them. A fourth point is competence to produce and create individual content by using the adequate form. Such knowledge is not central to the use of internet services. But because it is indispensable for people to express themselves and to make their own voice count, it should be available to anybody (see Baake 1996 and Meyrowitz 1998).

The opportunities of receiving such competences are distributed unevenly between different societal groups. Pupils and students probably find the most opportunities for gaining the described competences, because schools and universities have been in the center of the activities to integrate them into the digital world. Available equipment and

[8] This concerns, for instance, questions about which information should be freely available in the realm of basic service (Dutton 1994), but also the availability of content for different groups. (Winker and Preiß 2000), for example, found a lack of information aimed at women in online city guides and inadequate availability of existing content aimed at women. Additionally, sufficient content is also needed for people who's first language is not German.

[9] Education is of major importance because it is crucial to make sense of an increasingly complex world and to survive in today's society. The chances, for instance of finding occupation, sufficient to assure adequate conditions of material reproduction (e.g. in the realms of accommodation, health, leisure), are closely linked to formal educational attainment. Missing chances and opportunities to get educated early in life may lead to a risk of continuing disenfranchisement.

[10] There is no agreed definition of functional illiteracy. It may be understood as a situation in which the personal ability to read and write permanently underscores the degree generally required or regarded as granted (see Döbert and Hubertus 2000: 21). Approximately five percent of the German population were considered as functional illiterate in late 1998 (29).

educational programs in these realms are often not satisfactory but still better off than initiatives in many other realms.[11] Persons in work may receive internet training at work or find it appropriate to enroll for continuing education classes if they can afford it. This group of three probably finds the most paths to media competence to date. I will not consider what I call institutionalized education further on.

I will focus on those who only have limited access to the realms of institutionalized education. Those are, for example, people who are not in the workforce. This group includes, among others, people who spend much of their time on unpaid housework, which are, above all, women. In late 1999 this group accounted for approximately 6.7 million people. Together with the seniors (18.36 million) and the officially unemployed ones (3.94 million) they account for approximately 29 million people which equals about 38 percent of the German population aged six and older.[12]

It becomes apparent that different means are needed for meeting the varying demands for media literacy of different societal groups. I will introduce some of these measures in chapter 5. In the following two chapters I will outline what I think is an adequate theoretical matrix to better understand the reasons for non-internet utilization and to analyze the causes of decisions for or against internet utilization.

The Political Economy of Communication and Beyond

> "Studies of technical change and the innovation process are giving increasing emphasis to the importance of institutional change and, in consequence, the limitations of formal theories in examining the variety of deeper processes that influence the trajectories of technical, social, and economic development are becoming even more apparent" (Mansell 1996: 16).

Nowadays, capitalist societies are often praised for their alleged superiority over other forms of societal organization. These assumptions normally conceal the growing inequalities within capitalist societies as we find them today. Such uneven development is not coincidental, but rather a logical outcome of a society organized around capitalist principles (see Soja 1988). Inequality is inherent to the production, distribution, and consumption of the various resources available to a society. Consequently, there has always been a debate about how much inequality can be accepted within a democratic society. The political economy studies the social relations, particularly the power relations, that mutually constitute the processes mentioned before (see Mosco 1996: 25).

[11] See (Kubicek and Welling 2000a: 30-36) for an overview of activities aimed at schools and universities.
[12] This number was accounted on the basis of the statistical data provided by the *Federal Office of Statistics* (Statistisches Bundesamt 2000). The information should be read as a basic statement. It cannot be comprehensive. One reason is that the data was not conducted at the same time and many people may also not fit into a single category.

Consequently, the political economy of communication (PEOC) examines not only

> "how media (and communication) systems and content reinforce, challenge, or influence existing class and social relations [,but also] looks specifically at how ownership, support mechanisms (e.G. advertising), and government policies influence media behavior and content" (McChesney 1998: 3).

I will concentrate on the first dimension by using a research matrix of commodification, spatialization, and structuration, as entry points to the subject. Such an approach acknowledges "that social change is ubiquitous, that structures and institutions are in the process of constant change, and that it is therefore more useful to develop entry points that characterize processes rather than to name institutions" (Mosco 1996: 138).

The PEOC is only one entry point to the field. The sociology of technology, for example, concerned with the interrelations between technology and society underlines the importance of the social shaping and symbolic construction of technology and its framing for usage (see Rammert 2000 (1998)). Many sociologists have been concerned, above all, with the analysis of technology in institutional and occupational context. From the 1960s on using technology increasingly became a private and everyday life practice. But, according to Hörning, until the late 1980s sociological theory was neglecting the relation between technology and everyday life (see Hörning 1988: 52).

A main focus of cultural studies is to comprehend how people's everyday life practice is articulated through and with culture, how their action is enabled or limited by the structure and power which organizes their life in contradictionary fashion and how everyday life is articulated through and with economic and political power (see Grossberg 1997: 14f).[13] Various cultural studies analysis' on ICT utilization in the domestic realm have proven the aptitude of this school for a better understanding of how internet utilization is appreciated in the domestic realm or not (see for instance Haddon 2000; Silverstone 1991; Silverstone, Hirsch and Morley 1992). Cultural studies also remind the PEOC of the fact that

> "the analysis of communication, is rooted in the needs, goals, conflicts, failures, and accomplishments of ordinary people aiming to make sense of their lives, even as they confront an institutional and symbolic world that is not entirely of their own making and which, in fact, appears more often than not as an alien force outside oft their own control" (Mosco 1996: 251).

The options to deal with these forces depend on the capital provision. In this relation capital is not only economical but also social, cultural, and symbolic (see Bourdieu 1983; Vogt 2000) (see chapter 4.3. for a discussion of these issues). I assume that some

[13] Cultural studies are not a closed theoretical framework. The approach is rather interdisciplinary and transdisciplinary. In the center of inquiry stands the observable social reality of people, or in other words, their lived experience (see Mikos 1997: 165).

correlation exists between the availability of capital and the physical communities people live in (just think about the common differentiation between ‘rich’ and ‘poor’ communities). By paraphrasing, communities may be understood

> “as a thoroughly practical achievement, a lived reality that is realized (i.e. made real) by society members. Community trades reflexively on discourses of place and ties these to particular spaces (and times). This is the basis for both inclusion and exclusion where the community is and who should be regarded as a member” (Slack and Williams 2000: 314).

For two decades various initiatives were guided by the commitment of enabling communities with information and communication technology (ICT) like the internet to improve their material and social conditions. This is especially true for those who have been excluded from the possible benefits offered by the utilization of ICT. These approaches are commonly grouped around the concept of community informatics (see Gurstein 2000).

These approaches are appreciative, which involves theorizing, but also remaining relatively close to empirical data (see Mansell 1996: 16). The following discussion of the societal conditions which shape internet utilization around the entry points of commodification, spatialization, and structuration is also guided by such an approach.

Commodification

In chapter 2 I highlighted the importance of education for the successful utilization of ICT. Education, like most other societal aspects, has been increasingly commodified recently. Two points are crucial: (1) Education is increasingly viewed as a commodity and thus the ability to pay for it gradually affects its availability. (2) The differences between training, continuing education and education are constantly blurred. In this regard D. Schiller talks about an “intensifying vocationalization of the educational process” (Schiller 1999: 144). From such a point of view education is treated like an economic good instrumentalized to reproduce ‘human resources’, needed to maintain a highly competitive workforce. Personal education or aspects of education that do not appear as economical valuable are endangered of being subordinate to these ‘new’ educational premises (see Petrella 2000).

Commodification not only alters the meaning of education but also the process of communication. According to Mosco there are two general dimensions of significance in the relationship of commodification to communication. First,

> “communication processes and technologies contribute to the general process of commodification in the economy as a whole. Second, commodification processes at work in the society as a whole penetrate communication processes and institutions, so that

improvements and contradictions in the societal commodification process influence communication as a social practice" (Mosco 1996: 142).

These processes have been intensifying continuously during the last two decades. In the early 1980s the formerly public broadcasting landscape was opened to private competitors, which have been challenging public broadcasting ever since. The telecommunications sector has been exposed to growing commodification especially through deregulation, which began in the late 1980s (see chapter 5). From an economic perspective it seems that these developments actually improved the conditions of internet utilization. Prices for internet access have been falling permanently and thus the problem of access charges decreased.[14] Free e-mail, voice mail and other tools for unified messaging are widly available for free. At least the quantity of content that is available free of charge has been literally exploding recently. Most free services are financed, above all, through selling web space to advertisers. Providing free services is used to attract users (the audience commodity), thus creating a growing share of page traffic that leads to increasing advertisement prices and growing revenues.

The current stagnation of the so-called new economy replaces the overwhelming euphoria of its heyday with wide spread disillusion about the short-term potential of e-commerce. Companies have also become more critical about the benefits of online advertisement and start to spend money much more carefully. Thus, online service providers have been turning their attention to consumers as a revenue source and have announced that they will start replacing free with for-pay services (see Krempl 2001).

The same phenomena can be found concerning content. Indeed there has never been more information available at a fingertip. Again various developments foster the commodification of content. The current discussion about copyright law illustrates the continuing struggle about the availability conditions of content. There is also a tendency that the strong subordination of the whole media system under economic rationals leads to paradigms of content production, tailored along the principles of circulation, or page views and an advertiser-friendly publishing environment (see Meier and Jarren 2001).

Commodification also shapes the public availability of information and the conditions of access to them. Take for example the public library system. According to Schiller, this "long-standing custodian of the idea and practice, as information as a social good is tottering. Its function is being redefined and stripped of its social character" (Schiller 1996: 35). Admittedly, Schiller's account is based on the US-experience, but it can be adapted also to the developments throughout the German library system. Until recently fees were only taken for overdue books. Today membership fees and charges for all kind of services

[14] In that regard it is important to note that most people in the private realm use by-call ISP's which charge for the time spent online. Flat rate service is relatively new to the German internet market and still rather expensive.

like internet utilization are rather the rule than the exception. The German library association rightly comments on this development: Information access that is increasingly shaped by personal income contributes to the limitation of freedom of speech and information (see BDB 1996: 1).

In sum, safeguards are needed to assure that certain members of society are not cut-off from information, communication services, and literacy due to the commodification of these aspects. Viewing internet utilization from a spatialization perspective suggests that people in certain areas are often already cut-off from these aspects.

Spatialization

Mosco's approach to spatialization is predominately shaped by focusing on the continuing concentration process of communication industries, thus viewing space above all in relation to the institutional extension of corporate activities (see Mosco 1996: 173-212]. These developments are surely important to understand the changing power relations in the media sector and their influence on communications policy and practices. For most people a certain place is still the locus where they spend most of their time. Apparently, many of the resources needed for internet utilization are unevenly shared between certain places.

Indeed, it seems that in an increasingly networked society place has lost much of its significance to space, or, like Castells' calls it, the space of flows. Such space desribes the "material organization of time-sharing social practices that work through flows" (Castells 1996: 412). These flows are constituted by three layers: a circuit of electronic flows (e.g. telecommunications, microelectronics, high-speed transportation), the nods and hubs of an electronic network that links up specific places, and the spatial organization of the managerial elites. He acknowledges, that people still live in places, but function and power in society is increasingly organized in the space of flows (see Castells 1996: 412-15).

Such a space seems to be rather exclusive, beneficial above all to those who are already privileged. Castells' account of space is criticized by (Slack and Williams 2000) for its pessimistic and often rather deterministic analysis which does not leave much room for intervention and the exercise of choice. Building on this critique it seems to be more suitable to view spatialization as a process which shapes the constitution of place, spatial segregation, and the consequences emerging from this for the communities people live in.

Comparable low-income communities to those in the United States, measured along size and scope of deprivation, do not exist in Germany. This is due, among others, to the fact that it was always a prominent goal of German housing policy to avoid uncontrolled growth of low-income neighborhoods. However, the redistribution of public spending also caused a decline in public housing policy. Every city has its neighborhoods occupied mainly by socially disenfranchised people, (characterized among others by low income,

limited educational attainment,…), but more research is needed to see how the continuation of long-term poverty and the emergence of so-called 'poverty pockets' contribute to the emergence of lasting low-income communities (see Ronneberger, Lanz and Jahn 1999: 40-66).

Immigrants and people with a 'non-German' ethnic background, who are often confronted with disenfranchisement and live in low-income neighborhoods, are perhaps most likely to form closed communities.[15] However, many of them are probably less disenfranchised, at least in economic terms, than, for example, US-American immigrant communities. Most immigrants are generally workers with strong family ties that provide them with a strong support structure which may compensate certain poverty effects (see Castells 1996: 402).

Especially welfare organizations but also public libraries have been starting to deploy internet access and learning locations in low-income neighborhoods to improve the conditions of ICT utilization for people who live there. Accounts of the outcomes of such projects have been rare. Thus researchers are invited to take a closer look on these attempts to learn about the effects these ALL's have on the surrounding neighborhoods and the people who use them.

Last but not least it is striking that most critical accounts of spatial development predominately focus on urban issues (see for example Short 1996; Graham and Marvin 1997 and Ronneberger, Lanz and Jahn 1999). Even if rural regions apparently have lost much of their significance for societal development (at least in economic terms) it would be wrong to ignore them, because a significant population share still lives there. Data about internet utilization in rural areas are rare and are not very expressive. But it is broadly acknowledged that most rural areas face a lack of IT infrastructure supply.[16]

The last two chapters illustrated how commodification and spatialization affect the conditions of internet access and utilization. Turning the attention to the question of how ICT is appreciated or not by the individuals within their households opens the inquiry to the conceptual idea of structuration which addresses and incorporates the ideas of agency, social relations, social power, and social practice (see Mosco 1996).

[15] Especially in the metropolitan cities like Berlin people with a common ethnic background (e.g. people from Turkey) live in neighborhoods with an more or less exclusive cultural, economic, and social infrastructure.
[16] There is for example evidence that a smaller number of public libraries with professional staff exist in rural than in urban areas (although it has been become generally more difficult to find a public library anywhere, due to a strong decrease of branches especially during the last decade (see Welling 2000: 9). Behrens et al states, that there is an insufficient supply of rural with IT and multimedia technology (this is especially true for ALL's aimed at youth in general and disenfranchised youth in particular (see Behrens et al. 2001).

Structuration

The domestication process of technologies like the internet is constituted by multiple factors. The conception of structuration opens the field to the examination of these factors and the search for modes of explanation for utilization. Social class appears as an obvious starting point to the understanding of structuration. However the analysis must go beyond this because the whole process is constituted by multiple overlapping hierarchies (see Mosco 1996: 251f). These hierarchies are informed by gender, age, available resources, household priorities; but also by expectations as well as anxieties (see Silverstone and Haddon 1996: 56f). In this regard, deprivation should be better understood as a relative aspect and disadvantage might be seen as accompanied by forms of partial concernment (see Haddon 2000).

Instead of solely focusing on the single user or non-user, like most quantitative surveys do, an inquiry about the reasons for non-internet utilization should focus on the individuals within their household. Even though a growing number of households only consist of one person the majority of people still live in multi-person households. This is especially true for children and youth, who generally live within their families.

Using the internet is not a simple question of 'yes' (I want to use it) or 'no' (I do not want to use it). For many of the non-users the processes of ICT diffusion and adaption may be rather seen as impositions they have to struggle with.[17] The engagement with these processes takes place in the practices of everyday life:

> "crucially so within the domestic sphere, where the public meanings inscribed by and through commodities, beliefs and media and information consumption are similarly open to negotiation, a negotiation defined by and articulated through what […] [can be called] the 'moral economy of the household'" (Silverstone, Hirsch and Morley 1992: 17).

Accordingly, the household is a moral economy because on the one hand its members are involved in the productive and consumptive practices within the public economy. On the other hand the household is a complex economic unit in itself (18). What is at stake here, "is the capacity of the household or the family to create and sustain its autonomy and identity […] as an economic, social, and cultural unit" (19). Accordingly, the domestication of new technologies like the internet is a fundamentally conservative process "as consumers look to incorporate new technologies into the patterns of their everyday life in such a way as to maintain both the structure of their lives and their control of that structures" (Silverstone and Haddon 1996: 60). Thus, "[a]ccess and control, as well as

[17] People, for example, may feel forced to busy themselves with ICT if they do not want to risk unemployment. Only think about the reduction of manufacturing jobs, and particularly of low-skilled jobs that are the material basis for many people. To them ICT may rather appear as a threat than as a possibility and a means of enhancement.

denial of access and lack of control, are fundamental to an understanding of the use of communication and information technologies in the domestic, as in other, spheres (69).

For the purpose of describing and analyzing the different positions people take in society, how they get there, and what opportunities they have for improvements or change concerning their own life, the sociological conception of capital has been applied for almost 100 years, even if it is predominately related to Bourdieu's sociologic theory of capital (see Putnam 2000 and Vogt 2000). The theory provides an expansion of the common economic capital, introducing cultural, social, and symbolic capital (see Bourdieu 1983). This approach has been recently applied – by using single or several of the capital conceptions – to the studying of ICT utilization in Germany and elsewhere (see Alkalimat and Williams 2000; Rojas et al. 2001; Wetzstein et al. 1995; Winterhoff-Spunk 1999).

According to Bourdieu social capital describes the sum of current and potential resources which are available through the ownership of a stable network with more or less institutionalized relations of mutual knowledge and acknowledgement (see Bourdieu 1983: 190). The availability of social capital strongly correlates with the available economic and cultural capital, which consists, above all, of money, assets, and available time (see Vogt 2000: 84-6).[18] Cultural capital can be defined "as the possession of certain cultural competencies, bodies of cultural knowledge that provide for distinguished modes of cultural consumptions" (Rojas et al. 2001: 4). Both economic and cultural capital are convertible and contribute to the foundation of social capital.

Wetzstein et al has applied the 'capital approach' to early German online users. He demonstrates, how the available capital forms influenced the utilization of the new medium by the early adaptors. More than half (56%) of the interviewees stated that friends or acquaintances brought them into contact with ICT (social capital).[19] Participants also had high formal educational attainment (80% with a high school degree) (cultural capital) and great time flexibility, interestingly most had a very low income (economic capital), which is, above all, due to the large share of students within the surveyed group (see Wetzstein et al. 1995: 271-8).

The survey does not provide any information about the utilization of online media by migrants and people with an ethnical background other than German. However, there is evidence, that especially cultural and economic capital is unevenly shared regular between those who are German by passport and ethnic background and those who are not (vgl. Bender and Seifert 2000; Münz and Ulrich 2000: 80-124). Thus it might be assumed that non-Germans find it much more difficult to get online than their German counterparts.

[18] In this relation it should be noted that, according to Hradil, profession is most important for determination of social inequality (see Hradil 1999: 373).

[19] Note that the survey data were collected between 1992 and 1995, a point of time, where internet utilization was literally spoken in its 'infancy'. Today we would probably find a completely different socio-demographic group of internet user.

It is striking that about 95 percent of the survey participants were male. Indeed, women caught up on internet utilization quickly. Consequently, the gender divide is the 'smallest' of the 'popular' divides discussed today. To understand the factors which exclude women from ICT requires a gendered perspective on access to technology. Such an approach is concerned with questions about how societal gender relations are expressed with and through technology, how men and women use and experience technology within gendered everyday life practice, and how gendered identity is expressed through the adaptation of technology (see Frissen 1992; Klaus 1997; Shade 1998).

Even this brief account exemplifies that additional explanations for internet utilization or non-utilization are embedded into the conceptual framework of structuration. More research is needed for a better understanding of the diffusion of internet utilization especially in the private realm. Such knowledge could also contribute to the shaping of communications policy and developing means, suitable to improve the conditions of internet access especially for the currently disenfranchised ones.

German Communications Policy in the Digital Age – Towards Digital Inclusion?

National communications policy still matters, despite the popular assumption of the decreasing power and influence especially of the nation-state. Indeed, new players appear on the stage of policy-making involved to varying degress in the shaping of communications politics. These new players are, to name only a few, TNC's, the European Union, non-governmental organizations, unions, and economic initiatives like D 21 (see below). However, the state is still a major actor in the process of maintaining the regime of regulation, which includes the entire institutional forms, networks of explicit and implicit norms, and thus strongly guarantees the compatibility of patterns of behavior in the realm of the underlying regime of accumulation in accordance with the societal conditions and its conflicting characteristics (see Lipietz 1985).[20] The institutional forms and the regime of accumulation are correlated in so far as a stable regime of accumulation depends on lasting institutional forms which determinate the economical and shape the societal relations. These forms are formed by operation and activity principles like collectively agreed laws and regulations but also societal compromises and the value system of society (see Hübner 1989: 143f).

[20] The differentiation between a regime of accumulation and regulation is basic component of the regulation theory While this approach is useful to analyze the constitution and causes for transformation of Fordist society, it is limited for further analysis by what Mahnkopf calls a sociological gap, describing the fact that changes of group- and class-specific interests, every day behavior and the normative orientations of social actors are not covered by the theory (see Mahnkopf 1988). Continuing thoughts which are more concerned with providing systemic alternatives to the regulation approach by asserting more explicitly a turn to a post-Fordist period are provided, among others by (Castells 1989 and Harvey 1990).

Such an agreed law is the German constitution. Section 5, paragraph 1, for example, assures the freedom of speech and information. Until recently, this norm found its expression, above all, in the freedom of the press and the operation of a public broadcasting system. With the ongoing diffusion of internet services the discourse about the question of whether the scope of the section should be expanded to cover a right of basic access to internet utilization intensified (see Mecklenburg 1997 and Schulz and Held 2001). It is rather unlikely that basic internet access will become part of the constitution soon.[21] Thus the reconfiguration of the equality of opportunity in communication needs to be further negotiated.

However, after the change of the German government in 1998 significant changes in communications policy took place. During the period of conservative governance German Communications policy (1982 – 1998) was mainly supply-oriented (see Kubicek 1998). Such politics were based, among others, on the assumption that, above all, the deregulation of the telecommunications sector would lead to an increase of telecommunications services (quantitative and qualitative) paralleled by decreasing prices for such services. A main step to reach this goal was the passing of the new telecommunications law, accompanied by and interrelated with the privatization of the state-owned PTT (now Deutsche Telekom AG) and the deregulation of the monopolized telecommunication market in 1996. As a consequence prices for telecommunications services have been decreasing and more and better services are now available. However, the available statistics underline that privatization and deregulation are apparently no means in itself to achieve higher rates of diffusion (see chapter 2).

In September 1999 the federal government introduced its blueprint for multimedia politics with the action program *'Information and Jobs in the Information Society of the 21st Century'* (see BMWI and BMWT 1999). Actions to foster internet inclusion are grouped around the federal information and demonstration campaign *'Internet For All'*. Meanwhile several initiatives have been launched to foster inclusion (see below). In September 2000, during the annual meeting of the economic initiative *D21*, chancellor Schröder concretized the proposals of the action plan by introducing another 10 point program in the realm of the campaign *'Internet For All'* that is supposed to improve, among others, internet utilization.[22]

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[21] Another possible path to basic internet access for all is provided by universal service, which has been guaranteeing access to affordable basic telephone service to everybody. In late 1999 the *European Commission* already published a recommendation on universal community service, broadly available to everyone (see Europäischer Rat (Ministerkomitee) 1999). Eventually, in June 2001, the EU Telecommunications Ministers passed a guideline in which the scope of universal service obligations was agreed to cover, at least, narrowband access to the internet (see http://www.heise.de/newsticker/data/cp-27.06.01-000/).

[22] He proposed, among others, to make internet utilization part of the general education (e.g. through equipping all educational institutions with computers and internet access by the end of 2001), the

Thereby, the government closely works together with the business community on the basis of public-private partnerships. Those partnerships are a reaction to the continuing deregulation and reduction of state-based activities and allow the evolvement of program development despite reduced state-assets (see Heinz 1993). *D21* is to date probably one of the most far-reaching public private partnerships and therefore a good subject for studying the continuing involvement of public and private players. *D21* is a nonprofit registered association founded in 1999. It mainly consists of representatives from leading German companies and from federal and state governmental entities. The initiative's main objective is to "make a contribution to Germany's assumption of a top position in international competition in the application and production of information technology (Initiative D21 2001).

Besides governmental entities and private companies programs are also based on cooperation with other societal groups who can contribute additional funds, knowledge, expertise and staff for program operation.[23] To date the most visible single 'private-partner' has been the *Deutsche Telekom AG*. Nevertheless, especially projects on the local level regularly face significant difficulties to find companies to set up such partnerships. Thus, the often extolled developing business culture, shaped by philanthropy and corporate community engagement, has not yet arrived.

German communication policy initiatives are also increasingly shaped by the politics of the *European Union*. These politics are strongly guided by economic imperatives (see Bangemann Report 1994; Europäische Kommission 1997).[24] To accelerate the dissemination and use of ICT throughout all realms of society the *European Commission* launched the *eEurope* initiative in late 1999. The whole process shall be socially inclusive and shall, among others, strengthen social cohesion. It could be questioned whether these goals are contradicted by a policy, strongly shaped by an entrepreneurial culture (see European Commission 2000).[25]

A main focus of European funding activities has been on regional development (see Cawood and Simpson 2000: 154-56). Several single projects in different realms received support in the past. In Bavaria, for example, 24 telecenters were opened to foster the economic and community development in the respective regions.[26] Since facility-based

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improvement of computer sponsoring for schools, and the introduction of the unemployed to the internet (see http://www.findulin.de/initiative1.htm for further details).

[23] See http://www.bmwi-info2000.de/glob-invent-d/index_a.htm for a database of projects including governmental players.

[24] According to the *European Commission*, one of the main goals in ICT development is to make Europe the most competitive and dynamic economy worldwide (Europäische Kommission 1997: 1).

[25] See http://europa.eu.int/information_society/index_en.htm for an overview about the various European initiatives and programs aimed at developing the information society. See also (Cawood and Simpson 2000)

[26] The centers conduct regular telematic business activities to become sustainable and financially independent. Every center also runs al local information and communication system for citizens, tourists, and local businesses. The aim is to offer incentives to the people to engage more intensively with the internet. Another

solutions can always only support a rather small group of people (those who are in scope of the respective center) some mobile projects have been launched to improve ICT utilization in rural settings. Baden-Wuerttemberg, for example, introduced the mobile internet café to provide people with an on-the-spot opportunity to receive information about internet utilization and to receive a first impression of the possibilities of the internet through testing it. All the equipment travels in a pick-up truck and therefore can be set-up almost everywhere. Between October 1997 and 1999 about 35.000 people received information about the internet and could get first internet experience.

Another exemplary project is the *Webmobile für NRW (Webmobiles for North-Rhine Westphalia)* initiative. Launched in 1998 two teams of professional media pedagogues advise youth institutions throughout the country's rural areas about how to implement multimedia into their work.[27] One of the project's main purpose is to demonstrate the possibilities of multimedia in youth work not only to youth themselves, but also to youth workers. It is still critical to provide pedagogues with comprehensive multimedia competences, so they can pass such competences to youth.[28] In many cases, a workshop conducted by the *Webmobile* staff was followed by the implementation of a permanent ALL. Through its work the *Webmobile* teams also laid the foundation for a state-wide network where youth workers, researchers and educational institutions work together, exchange experience and thus improve the conditions of multimedia work, offered to youth in an non-educational setting (see GMK and JFC Medienzentrum Köln 1999; Schlottmann and Thomsen 2001).

As stated before, bridging the gender gap in ICT utilization is a declared goal of governmental actions. To introduce women to the internet and to provide them with basic media competence to begin utilization the initiative *Frauen-ans-Netz (Women to the Net)* was started in September 1999. Until February 2000 free one-day internet introduction courses were visited by about 33,000 women. The program is still under operation and twice a year introduction courses and cost-effective classes for advanced learners are offered. Demand for classes is high. The program is again a joint effort between the *Federal Ministry of Education and Research*, a popular woman's magazine, the *Federal Employment Office*, and the *Deutsche Telekom AG*. The measure is coordinated by the *Competence Center Women in the Information Society* which is overviewed by the association *Women Give New Impetus to Technology*. The association fosters the creation of a broad social dialogue aimed, among others, at improving the conditions for females

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main point is to provide people with opportunities to gain media literacy (see http://www.top-elf.de). Funding for the project comes, among others, from *Leader II*, one of the main European programs for rural development (see http://www.rural-europe.aeidl.be/ for further details).

[27] Therefore each van carries all necessary equipment to set up a temporarily multimedia studio.

[28] Until recently many pedagogues had a negative attitude towards multimedia in general and therefore opposed its integration into their work.

and technology utilization. Such activities follow the principle of gender-mainstreaming, that all European member states agreed on in 1996.[29]

Many current programs focus on youth. The most prominent case is probably the introduction of multimedia into the school curriculum. But activities go beyond the school system. This is important since youth institutions which offer after-school activities are an important resource for the development of young people. Additionally, especially disenfranchised youths need educational measures beyond the formal school system. They may not be, for instance, obligated anymore to attend school but still need strong educational support, due to existing deficits. Thus they are a main target group of the currently most far-reaching initiative to support the establishment of ALL's.

In the late-1990's starting with an initiative of the North-Rhine Westphalian office of employment, the initiative *Internet Cafés as a Means to Support Occupational Disadvantaged* (*Internetcafés in ihrer Funktion der beruflichen Benachteiligtenförderung)* emerged. Meanwhile, approximately 200 of these centers are under operation. They are based in partner institutions which already conduct educational measures financed by the employment offices. Main funding comes from the Federal *Immediate Action Program to Fight Youth Unemployment*. The stated goals of these locations are far-reaching: A main goal of the operation is to bring disenfranchised youth into occupation or apprenticeship. However, it is also agreed that the general support of competent media and technology utilization is an important goal. Thus the ALLs not only focus on occupation but also support the creative and communicative abilities of youth to enrich their leisure and spare time activities (see Behrens et al. 2001: 86-92).

Identifying the goals of the centers and evaluating whether these goals have been met is only one aspect of an extensive evaluation of the whole program, which was conducted in early 2000 but was published only recently (see Behrens et al. 2001).[30] However, recommendations, based on the results of the evaluation, to improve and sustain center operation were published earlier (Wienholz and Doefert 2001). Besides the successes of these centers (high capacity, intensive attendance by female users (>50%), involvement of groups which have been only rarely reached with 'traditional' means) there are also certain problems that need to be solved to assure sustainable and successful service in the future. Many of the identified problems correspond with the troubles, found during a first evaluation of ALL's in Bremen, Germany (Kubicek and Welling 2001). Prominent problems are: (1) insecure and scarce funding situations, (2) insufficient staffing

[29] By definition "gender mainstreaming is the reorganization, improvement, development and evaluation of decision-making processes in all areas of an organization's policy and work. The goal of gender mainstreaming is to make the perspective of gender relations part of all decision-making processes and enable all such processes to be used to ensure the equal treatment of men and woman" (Stiegler 2001: 8).

[30] The involved employment offices consider the work of the ALL's as very supportive for the work, especially, with disenfranchised youth and name several indicators for success. The institutions, which run the centers declared that they could meet their underlying goals to a high degree (see Behrens et al. 2001: 93-7).

(quantitative but also with regard to qualification), (3) deficits in curriculum development, and (4) a lack of ALL's in differently disenfranchised areas (see Kubicek and Welling 2001 29f; Wienholz and Doefert 2001).

One step towards solving these problems is networking the available resources which are likely to improve the overall situation of the ALL's with regard to program development and sustainability. Currently the Telecommunications Research Group at the University of Bremen builds such a network called the *Netzwerk Digitale Chancen (NDC) (Digital Opportunities Network*).[31] The network contains three main elements: The first is a nation-wide database accessible online and per telephone, where people can locate ALLs close to their place of residence. Second, the network will in cooperation with partners gather and develop a broad spectrum of useful information aimed at improving the service and operation conditions of ALLs. This will, for instance, help to provide a comprehensive overview about the many different projects, which exist to date. Third, the NDC will pool research about digital divide issues to contribute to a better understanding of the reasons for and consequences of the digital divide, which is an important foundation to develop measures likely to bridge the divide.

How to Continue? – Thoughts About Future Research

It already has been indicated that research and the academe have an important part to play in the support and development of means that are likely to benefit those people who are currently endangered of becoming additionally disenfranchised from the societal changes which are related to the ongoing diffusion of ICT throughout almost all spheres of society.

It was also mentioned earlier that such an approach has its roots in a passion for social practice or change. Apparently, many academics have been withdrawing from such an approach and, accordingly, "had turned away from empirical and critical research. They were lost instead in the dreams and speculations of what was now termed post-modern theory" (Philo and Miller 2001b: xiii). I do not doubt that the work subsumed under the label of post modernity opened new perspectives for social science (see Webster 1995: 163-92). However, Philo and Miller rightly reveal the limitations of these accounts and their inappropriateness to contribute to a needed debate about the current conditions of society and the perspectives for social change (see Philo and Miller 2001a). Such a discourse must be developed carefully to avoid one-sided views, which are likely to move the needed debate into a one-way street (see Saxer 2000; Schmidt and Westerbarkey 2000).

Critical academic thinking is also concerned with the commodification process of academe itself (see Schiller 1999: 143-202; Warde 2001). The intensifying collaboration between business and the university may lead to an intensifying shaping of research under the

[31] The network's web page is located at http://digitale-chancen.de.

aspect of economic usability, which may limit the available space for critical discourse because, simply put, who wants to byte the hand which feeds one?

However, as this paper tries to illustrate, there are many questions that need to be answered for a better understanding of the societal diffusion of ICT. To learn more about who is excluded from using ICT, we need more differentiated data than available today. Additionally, much more qualitative research is needed to illuminate, how the individuals within the household make sense of ICT, and how and why they integrate it into their lives. On the other hand, it is necessary to learn more about the factors that hinder access to ICT or motivate people to actively reject the utilization of such technology.

More research is also needed on the meanings, functions, and outcomes of the ALLs. To assure future funding and support it will be necessary to demonstrate the success and importance of these centers. Only little is know about who uses them, for which reasons and what the effects of these utilization processes are. Since it is often argued that ALLs are only a short- or mid-term phenomena, it will be important to point attention to the potential of these locations for becoming new learning and social places, which may establish themselves within the societal communication infrastructure.

If all these aspects are put together we may move forward to answer the question whether ICT really can foster societal inclusion and benefit especially the disenfranchised or rather it will increase existing inequalities.

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http://www.bmwi.de/download/english/innovation_and_jobs.pdf
The German government’s action program *Innovation and Jobs in the Information Society of the 21st Century.*

http://www.bmwi-info2000.de/glob_invent_d/index_a.htm
A comprehensive collection of governmental actions and programs on all levels related to ICT (only in German, English site still under construction).

http://www.frauen-technik-impulse.de/index_e.html
Women Give New Impetus to Technology tries to create a broad social dialogue to enable the potential of women to contribute to equal rights in the formation of the technological future.

http://www.digitale-chancen.de
The German *Digital Opportunities Network (Netzwerk Digitale Chancen).* Currently under construction by the Telecommunications Research Group. It will be a comprehensive collection of information about the digital divide and ways to bridge it.

A nation-wide database with internet access and learning locations have been already launched.

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Webmobils for NRW (Webmobile für Nordrhein-Westphalen) A project that brings media competence to the remote areas of North-Rhine Westphalia.

Non-profit registered German association of business and political representatives
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http://europa.eu.int/information_society/index_en.htm
Homepage of the eEurope campaign. Provides an overview about the various European initiatives and programs aimed at developing the information society.

http://www.rural-europe.aeidl.be
European rural development intitiatives and home of the *Leader II* program.

TOWARD THE SOCIAL CONSTRUCTION OF THE COMMUNICATION AND INFORMATION TECHNOLOGIES IN MEXICO. COFFE GROWERS AND TECHNOLOGICAL GAPS.

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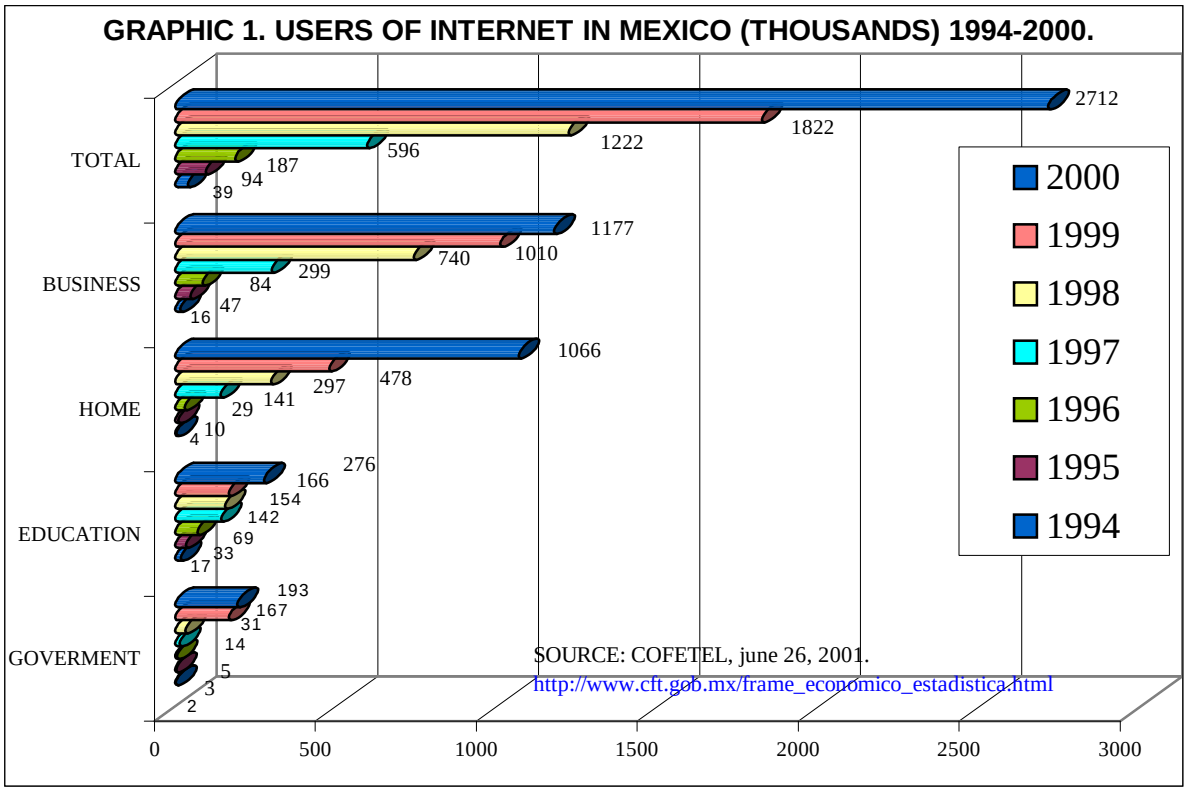
Summary
This article presents a panoramic view regarding Information and Communication Technologies (ICTs) in Mexico. Contrary to the quantitative approach that conceives technological development to be based on the introduction and expansion of access to digital devices, this essay emphasizes the need to focus on social and cultural contexts; a given project's success or failure is directly related to way these digital tools are appropriated and digital literacy promoted. The particular case of ICT use among the indigenous Oaxaca coffee growers´ organizations substantiates this anthropological perspective.

There is no general agreement about the advantages and disadvantages on using Information and Communication Technologies for social development within different cultural environments. Some authors argue that national elites are the only direct beneficiaries of any novel communication product that enters the market; simply put, it increases the barrier (and hence, power) that separates them from other citizens (Barducci, 2000). With this logic, ICTs serve, as noted by Román Gubern, "to increase and to perpetuate the dualism of societies" (Villalobos, 2000). In opposition to these conceptions of the issue, there are other viewpoints that positively consider ICTs as a set of potential development tools, mainly for groups that traditionally have been excluded from the economic growth process: peasants, indigenous peoples, students at public schools in rural and marginal neighborhoods, etc. (Cebrían, 1998). In this perspective, Credé and Mansell (1998) affirm that ICTs are effective routes to social transformation with future benefits for underdeveloped countries, involving new alliances among companies, government and civil society.

My concept is that ICTs can be instruments of change only if they are not applied or introduced in isolation; that is, the associated benefits and risks depend on the social, economic and organizational context where projects occur. In Mexico today, we can observe that ICT use, especially computers with Internet access, has impelled important changes in the way millions of young Mexicans are educated, the way they work, communicate with each other, inform themselves and enjoy their free time.

Although this process has not been consolidated, and in the last few years it has been accelerating considerably the number of people benefitting from these technologies, there remains a generalized backwardness in ICT access. The Federal Telecommunications Commission (Comisión Federal de Telecomunicaciones--COFETEL) data indicate that in the year 2000, there were only 2 million 712 thousand Internet users in Mexico. That means barely 2.8 percent of the population could take advantage of the new communication tools and information access (see graphic 1).

GRAPHIC 1. USERS OF INTERNET IN MEXICO (THOUSANDS) 1994-2000.



SOURCE: COFETEL, june 26, 2001.
http://www.cft.gob.mx/frame_economico_estadistica.html

It is necessary to highlight the fact that only 1 percent of these users calls are based in educational hosts (with the .EDU suffix), in comparison with those servers dedicated to entertainment and commerce. These numbers suggests a significant bias in the offer of the information that flows in cyberspace. We may call this condition “digital illiteracy" (see Appendix 1). These data stand out when we observe that while in United States more than 90 percent of the public schools have access to the Internet, in Mexico only 6 percent have access to these tools. While in the U. S., data indicate 71 percent of the educational facilities offer access to the net in their classrooms, whereas in Mexico access is limited to no more than 1 percent of the schools (Avilés, 2001).

As we can observe, a very significant technological distance or chasm exists between ICT and Internet access among the NAFTA trading partners. Mexico’s new federal government has addressed this problem rhetorically, and future government programs have announced. There is a risk these programs will be strictly market driven, or top down, thereby focused on a superficial or inadequate response to the problem. It is too early to tell, but the risk is apparent in public announcements to date that suggest these programs will scorn the many factors that intersect in this challenge. In order to explain and analyze this phenomenon in its complexity, I suggest a social anthropological perspective may reconcile the two central dimensions of this process: the technical and the sociocultural.

TOWARD AN ANTHROPOLOGICAL APPROACH.

Without underestimating the importance of the quantitative approach, it is useful to critique the literature that reduces the explanation of the technological breach, or the so-called “digital divide”, to a general description of user profiles (Trejo, 1996; Gugerli, 1997), or simply the growth net usage (Chauvet, 1997; Trejo, 2000; Sánchez, 2001), and those abstract concepts referring to hypertextuality of the web’s language and the supposed enhanced communication (Sánchez, 1997; De Kerckhove, 1999; Wolton, 2000). These perspectives have focused on the phenomenon with a high level of abstraction and generalization, but they have omitted the power context, local circumstances, contrasting cultural codes, public

action and reaction, community educational stratification. On balance, this approach considers all that is *virtual* to be automatically virtuous or beneficial, with an impact in the "real world".

One disciplinary perspective, among others, that may revitalize this discussion, is social anthropology which has always been analyzing the impact of technology in cultural contexts. For example, the field of study moved from thinking about technology as a measure of the degree of development of different societies (where, of course, the highest level has been reserved for western societies), conceiving it as another aspect of material culture, to today's view where technology is granted a central role in all societies, traditional and complex. Other colleagues share a position that considers new technologies to be intrusive, provoking negative impacts, undermining community solidarity, in accord with a technological determinism script, fed by development ideologies that divide our planet in "first" and "underdeveloped" worlds. In other words, the new tools will create digital rich and poor inside traditional societies, and new power relationships will evolve creating new differences among those peoples. Still others, myself included, consider technology to be a social construction in which the interests of different groups are key, focusing on the different and even opposed meanings of these tools as well as the negotiations and changes these devices bring about. In this sense, Pinch (1997:28) tells us:

> It would not be satisfactory for a social constructivist's analysis of, let us say, a satellite system based simply on a demonstration that the hardware and what it's supposed to do depend on a series of negotiations between a complex net of institutions and different groups of users. In contrast, a more satisfactory analysis would have to demonstrate the way in which the technical operation of the system is always submerged in a web of social decisions and negotiations.

In a similar vein, from the sociology of technology, Mackay (1997) argues that the effects and importance of technical systems are not inscribed in their design, which limits the different uses that can be assigned, but rather "technology takes a double life': one that fulfills the purposes of the designers, and another that works in the background, with unintended consequences". In this view, technological devices are not purely utilitarian or functional; rather, they also serve as cultural symbols, and as such, they provide the material for our language and our forms of

thinking; in other words, they are transmitters of meanings. This wider vision considers other levels of technology analysis (creation, mediation and reception or production, distribution and consumption), dimensions that have an influence on the recognition of the importance that consumers have in the development of technologies. This perspective is often overlooked or forgotten in the quantitative approaches crafted by governments and private corporations when planning and /or evaluating strategic options regarding what we may call “digital development” in Mexico today. This traditional approach only measures the progress and impact of ICTs in terms of the number of devices introduced, sold or delivered, leaving aside the sociocultural context that appropriates the meanings, perceptions, expectations and people's interests that impinges of whether they decide to adopt or reject these technologies[1].

GOVERNMENT POLICIES FOR TECHNOLOGICAL DEVELOPMENT AND THE SOCIAL SECTOR IN MEXICO.

It is necessary to point out that, in spite of the frankly unencouraging data mentioned above, there are government, private and Third Sector efforts to stimulate the use of computers and Internet access in Mexico. This is reflected in the increase of the Internet Services Providers (ISPs), legal reforms relating to digital information, the emergence of “informática” companies, the appearance of a trained labor force, new academic programs, and the creation of new government programs created *ad hoc*, such the case of "E-Mexico". In its first stage of development, this latter project would connect all the municipal seats by two way Internet by satellite service, and at the same time, by the introduction of “Community Plazas” in the marginal rural areas which would function as computer centers with traditional and virtual library services, distance education through Internet and a technology base for commercial projects[2].

[1] For a detailed discussion to see Apadurai (1991); Díaz (1997); Bijker et al (1987); Harris (1997); Kearney (1995); Pfafeenberger (1992 and 1997).
[2] For more information about "E-Mexico" Proyect to see *El Financiero* of December 11, 2000 and for the “Community Plazas” to see *El Nacional* of July 1, 2001.

Perhaps due to the new federal government's development strategies, emphasizing the creation of small companies in a context of free market liberalism with accent on the profitability and enterprise efficiency. These projects continue the quantitative logic noted above, and therefore their viability is threatened by ignoring the sociocultural aspect of technological innovation. This “forgetfulness” has been demonstrated in other government projects in progress, for example, “Trading Enterprises for Agricultural Programs and Social Development Programs” (PROFECA) of the federal Department of Agriculture, Livestock, Rural Development, and Fisheries (SAGARPA). This program, begun in 1999, supports different aspects of small companies dedicated to marketing coffee, corn, sorghum, and other basic commodities. A key feature of this program centers on technological support for agricultural producers, specifically focusing on the training of human resources and to provide technical help and equipment to the small, rural companies that request it.

While this PROFECA initiative has had an important role in supplying equipment and providing technical support for the associated enterprises, actions that do reduce the technological breach, I must say that this level of support is really insufficient, because the program only grants a portion (approx. 50%) of total costs. In addition, this program to date does not contemplate monitoring those benefited, nor is there a model obliging these rural enterprises to integrate ICT into their operations. When carrying out a brief field analysis of this program, and after visiting several supported organizations (in Guanajuato, Chiapas, Veracruz and Oaxaca states), I could see there are other obstacles responsible for attenuating the adoption of these technologies in rural Mexico, i.e., high equipment costs, a lack of specialized services (suppliers of affordable Internet access), high telephone rates, the lack of telecomm infrastructure in remote regions, and few qualified personnel to maintain systems. Equally, it should be noted that many of these organizations have priorities other than being “connected”, or they simply ignore the possibilities these digital tools provide.

Although the intentions of PROFECA are encouraging, when providing computers to participating rural organizations, it turned out that many had not used

the equipment to their full advantage. This took place, I think, because the computers did and do not make sense in the context of their perceived organizational needs, nor do they fit their vision of something useful ("..we are campesinos, why do we need a computer?"). In other words, they feel computers may be unnecessary for their activities as peasants, and certainly, due to the lack of knowledge about their usage; this tells us again about the problemmatic projection for the technological innovation when the sociocultural environment is ignored.

A recent diagnosis of ICTs use and information flows made for the Coordinadora Estatal de Productores de Café de Oaxaca (CEPCO) provided a choice opportunity to explore the way the social and cultural aspects of innovation are linked with the tools (hardware and software), as well as the importance of this process in organizational change (Pérez and López, 2001).

COFFEE PRODUCERS AND TECHNOLOGY.

The Coordinadora Estatal de Productores de Café de Oaxaca (CEPCO) is a social institution that join together about 23,000 indigenous coffee growers (mazatecs, mixes, zapotecs and mixtecs) distributed in each the seven regions of the state of Oaxaca3. The objective of the diagnosis we realized was to evaluate the conditions in what 45 affiliated organizations to CEPCO were, not just as a matter of technical infrastructure of communication but also of cultural capital so that, its valuation, allowed an integral solutions to its intercommunication necessities within the global markets field.

One of the main conclusions that came out from the diagnosis, was the fact that the organizations partners of CEPCO have followed a differential technological development conditioned by the following factors:

1. Because of the local and regional geographical characteristics where the organizations are located, they are very uneven places. People there, are generally living in the hillsides of the mountains and, although those are suitable places for

[3] Oaxaca is to the south of the Mexican Republic and, together with Chiapas and Guerrero, one of the poorest states is considered and with more presence of rural and indigenous population. The regions in that it is divided are: Sierra Norte, Sierra Sur, Cañada, Papaloapan, Istmo, Mixteca and Costa (to see map 1 and 2).

coffee growers on a appropriated temperate climate, they turn out to be an obstacle to microwave signs, necessary for transmitting television, radio and cellular telephony.

2. Because of the deficient equipment of public communication services into the same communities, just to mention one example, the phone density in Oaxaca is one of the lowest in Mexico with an average of 4.1 telephones for each 100 inhabitants in the urban areas, number still lower in rural areas, where in many towns there is only one pay phone. In this sense, more than 80% of the communities dedicated to coffee growing do not have open television but, for a few ones, there are close caption services, which costs are quite onerous (a proof that some of the inhabitants, just a few, of the Oaxaca State have access to this kind of service, is that only 1.1 percent of the total population has access to cable transmissions, see Annex 2 and 3).

3. Although it is true that an important part of the communication problems in those places are due to geographical conditions, it is also necessary to point out that there is not a political will to implement deep programs to create communication chains among each other of the communities in rural areas, it has been specially evident lately, with the presence of the able technology to overcome this obstacles, technology absent from those areas because, for example, the privilege that urban areas still have within government an private communication projects (that means in both, service and new infrastructure) such a situation, contributes to make it worse in a process known as the *digital divide*: which is a phenomenon that accentuates the technological breach among those that have the capacity to use and to usufruct the new communication and information tools and those others that stay out of this process because of their lack of economic and cultural capital.

Indeed, although the intentions for a public rural telephony program (in the beginning with the Mexican government on charge, through TELMEX[4]), they consisted on linking most of the Mexican rural communities. Yet, we should make notice that there was some kind of discriminatory side, because only towns with a

[4] TELMEX means Telephones of Mexico and it is the most important telephony company in México.

populations over 500 inhabitants, were able to accede to the programs, which means that a lot of smaller towns were left out of the process, that was the case of the coffee grower communities in Oaxaca. Now we got to add to all this matter, the conception that the communication services providers have about market considerations, they think that more than a investment in new markets, spending capitals on this, means a solidary help shown by the followed introduction policy (only one telephone per community), the equipment specifications (based on solar source) and the slackening of technical solutions, what has ended in the inefficiency and inadequacy of the service, in the installation of very sensitive to the environmental conditions devices (when it clouds or rains a lot, they don't work) and in their expensive maintenance when being located in remote places.

The same problems have been presented no matter of the new situation, where country's telephone company (now privatized), with the added difficulty that this has diminished their duty of endowing with the service the populations that had not still received the benefit (when TELMEX still belonged to the state), the company now argues that the communities have already been covered with those mentioned characteristics, argument that has rebounded on the terrible public rural telephone service we know now.

The abandonment of the rural environment, also presented on the federal and state government in charge of providing telephone devices to the places that don't fulfill the requirement to participate on rural telephony programs. A proof of this is the fact of that it has entered in an *impasse* a government project that provide satellite telephones to the *micro-villages*, retarding with it the entrance of these to the communication with each other and opening the doors to the private companies, which, although they are better endowed with economic and technological resources to provide the service, they also turn out to be more expensive for the consumers.

From here, then, it is not rare that one of the main problems that stood out in the diagnosis that we carry out on the technological infrastructure which many of the places where the organizations partners of CEPCO count with are located, be the one of having a faulty communication. Equally, it explains us that few of them

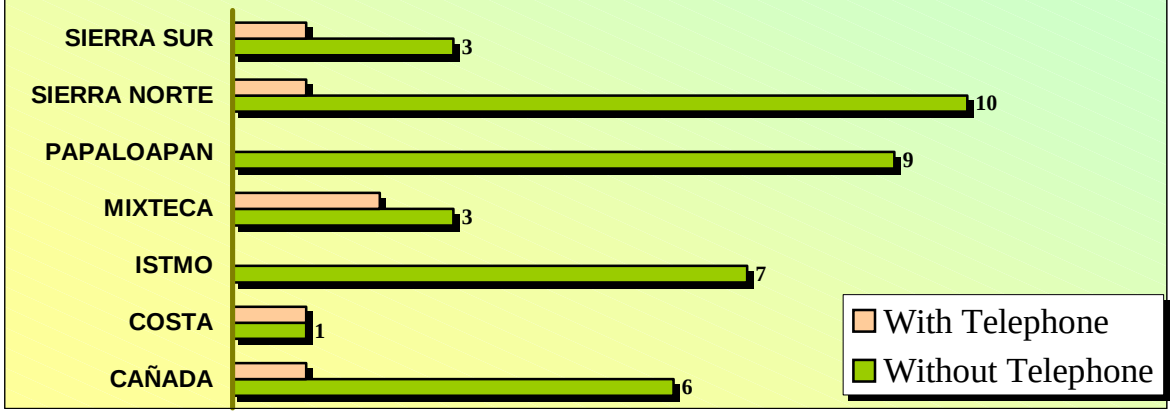
have communication problems to be located in urban contexts that represent bigger profitability not only for telephone but also for other kind of communication companies (computer enterprises and Internet, satellite or cable television, satellite telephony, radio communication, etcetera).

4. Another factor that has conditioned the differential development among the organizations of CEPCO has been the lack of human capital qualified to handle the different communication and information tools, matter that is surely related with the general educational backwardness in Oaxaca state (according to conservative calculations, illiterate Oaxaca population older than 15 years, constitutes the 27.64 percent).

So, we can say that the way in that all the mentioned elements have been conjugated is what explains that:

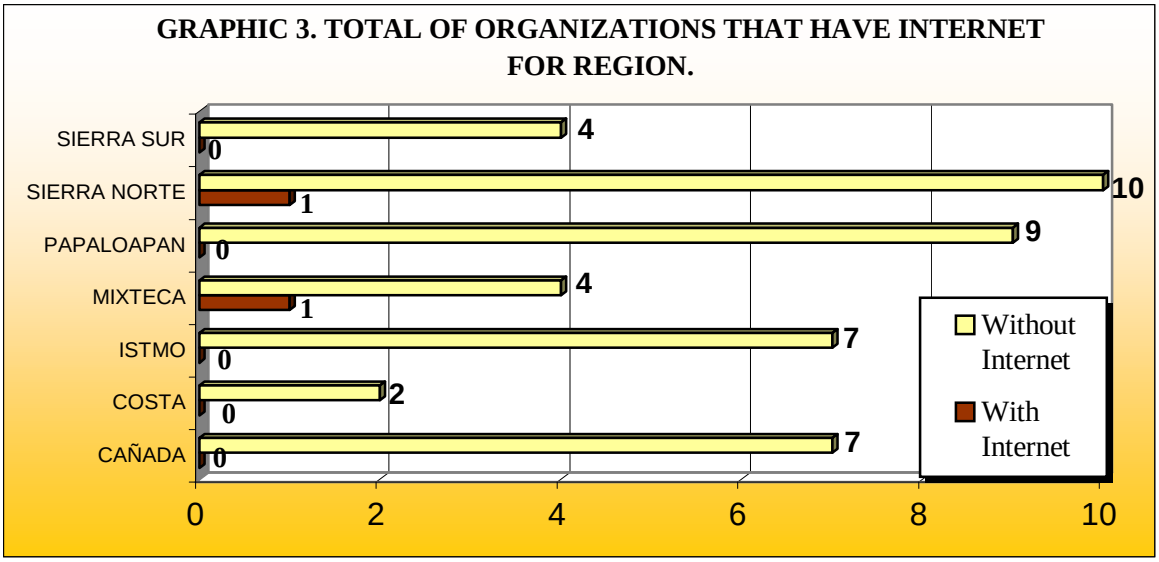
a) only 6 per cent of the organizations partners of CEPCO (in other words, 3 out of 45) they have a wired phone line, which is, at the moment, the cheapest option in communication and although other 3 organizations have cellular telephone, this doesn't minimize the problem, on the contrary, it only means that there, where this telephones work, the geography is less restrictive, nevertheless, it is more expensive because of the type of service (see Graphic 2).

GRAPHIC 2. TOTAL OF ORGANIZATIONS FOR REGION THAT HAVE TELEPHONE.



b) In connection with the computation equipment and related tools (regulators, printers and scanners, among others), we find that 19 out of the 45 visited organizations (that is to say, less than 50 percent), have one of them. On

the other hand, although the technical characteristics of the computers are good regarding the necessities of the organizations according with the type of information that is processed, it is to make notice that, in general terms, their capacity is not maximizing because only in 7 of them one can say they have qualified personnel (represented by those in charge of computer science area), because 4 have only received basic courses of calculation and scarce 2 have Internet (see Graphic 3), representing the extreme cases, those where the computer has kept, getting dusty or in other people's hands for not to have who



knows how to use it.

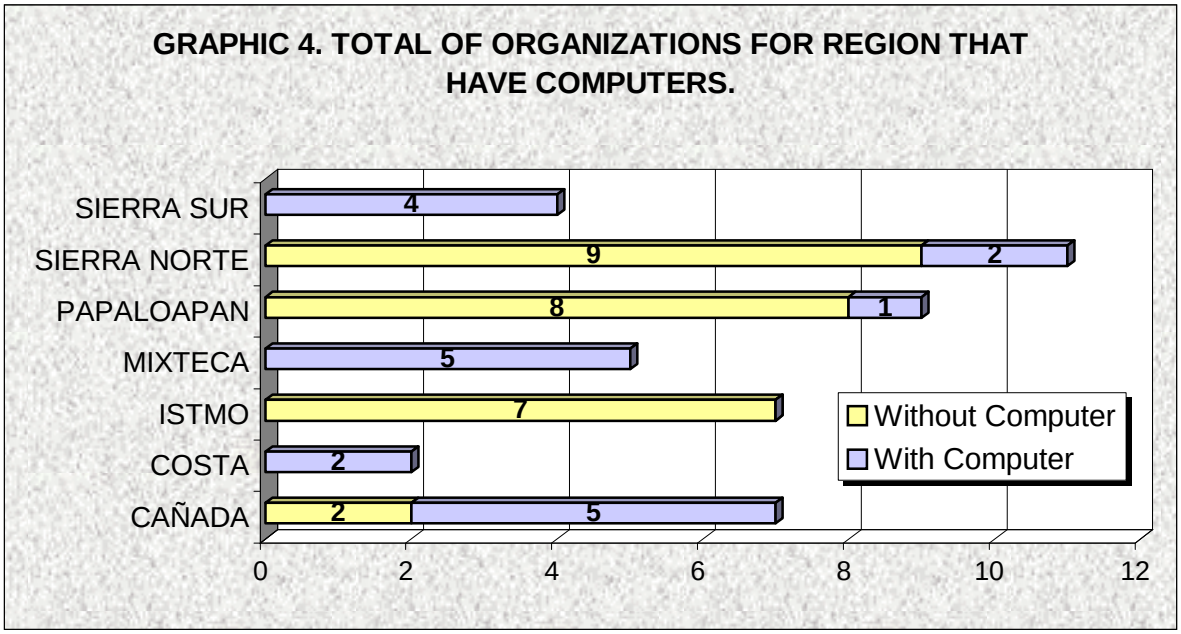
c) Saying about sources of information, we find that the entirety of the organizations is in a situation of deep stagnation because none of them receives or have access to general information and still less access to specialized bulletins of information about coffee business, or even the fact that in many communities, as we already said, television programming is not even received, decreasing the information offer to a few local radio stations.

d) By region, the Mixteca presents the best conditions of communication infrastructure since the organizations enrolled in it (5), 2 of them have phone service and all of them have, at least, one computer. Besides, some have Internet access and personal of computer science. Considering only the computation equipment, the organizations where all the partner communities possess it

(besides the region Mixteca), they belong to the region of the Costa and Sierra Sur, the last one however, doesn't have personnel qualified in computer science, only one of their organizations has had a basic course in computers and in two of them, they do not use the equipment. In Cañada, on the other hand, there are located two groups with more than one computer. In contrast, and taken on the whole, only 2 out of 13 organizations from that regions have telephone and one of these is a cellular phone, which is another confirmation of that mentioned about the importance of the geographical factors and telephony policies, both the public ones and the independent ones.

Contrary to all the above-mentioned, in the remaining three regions of the State of Oaxaca (Istmo, Papaloapan and Sierra Norte), where 27 out of the 45 CEPCO organizations are located (which means, 60 percent), only 3 of them have computers, constituting the extreme case the region Isthmus where none of the 7 organizations enrolled in it has this tool and the Papaloapan where only 1 out of 9 possess it (see graphic 4). Equally, only 1 out of the 27 organizations have its own telephone, and this is because their office is in the city of Oaxaca (capital city of the state). Another evidence of the biggest precariousness in these organizations is the fact that, it keeps the same negative correlations for more traditional items, related to information and data handling, for example: only 5 out of the 27 organizations mentioned have reported to be owners of mechanical typewriters, besides, among this group of regions we find the only organization that not even has a hut of public rural telephony nowhere in the community.

GRAPHIC 4. TOTAL OF ORGANIZATIONS FOR REGION THAT HAVE COMPUTERS.



e) In connection with the qualitative aspect of the problem, that is to say, on the appropriation, reception and opinion about the advantages and disadvantages of using and implementing new technological tools of communication and information, particularly computers and Internet, the interviews reveal that still when they don't constitute familiar instruments to use, they have an idea (although minimum) of what they are and what they would represent on facing different tasks in the organization, which is confirmed by the fact that only 8 out of 70 interviewed individuals, had declared not to be aware about computers at all (coincidently, three of them belong to Papaloapan organizations, one of the regions with smaller computer science awareness and communication resources of their own).

From the opinions that we can classify as favorable to new communication and information technologies they prevail those that believe in advantages on their capacity to store, to manage and to control big volumes of data, because they allow us to get more information, because they are good to interrelate us better and because they allow us to carry out different types of works with better presentation. Finally, among the disadvantages that the interviewees showed we find mainly a reference of training lack and high costs of ICTs maintenance.

CONCLUSIONS

In Mexico, now, one lives a period of vertiginous technological changes and their repercussions seem to have a differed effect for each social sector. The Mexican country, like a part of the same process, is not marginal from the rest of the transformations due to globalization and innovation of information technologies. An example of the revaluation of them considering the sociocultural context is the case of CEPCO, institution that nevertheless their efforts to aboard the “technological train”, had have serious problems at the technical infrastructure level to achieve the competitiveness, and still we got to add the inadequacy of government support to obtain accessible credits, inputs and technical consult, among other problems.

The emphasis in the paper of the State is not gratuitous because, like Castells says (1999), it is a decisive factor in the technology progress, since it

expresses and organizes the social and cultural forces that dominate in a given space and time. And, although the governments roll has been strongly questioned, it is necessary to restate that they still have social obligations, which should be channeled for a better impulse and support of social sectors that have difficulties not only to achieve communication technologies but to many other. Then, the government projects and programs should go beyond their quantitative position, since to endow with computers the rural communities and natives doesn't solve the problems of marginality if developing of socioeconomic and cultural conditions are not contemplated. It is necessary to implement integral policies that are not only palliatives but, over all, policies that contemplate the real possibility to involve private initiative in supporting the rural field (in the case that occupies us, for example, by creating attractive agreements so that telecommunication companies invest in it).

The social anthropology task to study and understand the problem, according with us, is important since it propose to understand technology as a social construction contributing with it to demystify any technological determinism and, at the same time, helping to revalue the sociocultural aspect where the necessities, opinions and meanings that people grant to the ICTs have the same importance that the own technical aspects. It is necessary, then, to meditate that the use of computers and Internet do not have only to do with better infrastructure conditions but also with the encouragement, access and forms of people's appropriation regarding technological tools.

Finally, in spite of the consent lack on the advantages of ICTs, from our point of view, we consider that they can help to diminish the existent social breach in Mexico, but this task should be taking into account the sociocultural context in all the levels: local, regional and states. In a few words and paraphrasing Llambí (1999), the possibilities and limitations of a communications technology are in the materiality of the equipments, as much as in their social, economic, political and cultural contexts.

APPENDICES

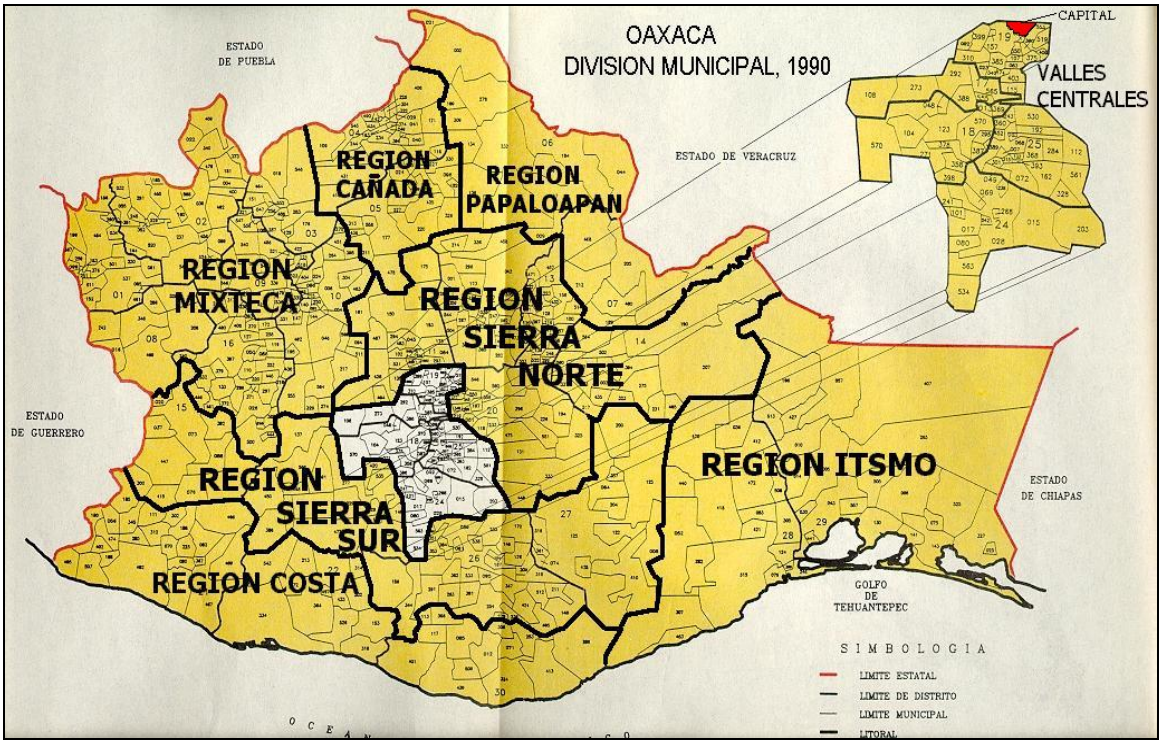
APPENDIX 1. HOSTS IN MEXICO

Date	com.mx	edu.mx	gob.mx	org.mx	net.mx	.mx	.com	.net	.org	others	Total
31-enero-1999	19,318	1,540	1,187	510	38,811	38,120	1,445	3,493	18	516	104,958
31-enero-2000	31,013	1,584	1,693	1,292	210,268	43,414	4,366	14,166	330	547	308,673
31-enero-2001	53,441	1,626	1,038	1,519	452,485	50,188	6,209	31,431	347	1,122	599,406

Source: http://www.nic.mx/nic/plsql/nic.nic_IniEst?X=0&Y=0

MAP 1. LOCALIZATION OF OAXACA STATE IN MEXICO

Map 2. REGIONS OF THE OAXACA STATE



APPENDIX 2: PAY TELEVISION

FEDERATIVE ENTITY	SUBSCRIBERS							PERCENTUAL PARTICIPATION IN THE NATIONAL TOTAL				
	JUN-1998	DEC-1998	JUN-1999	DEC-1999	JUN-2000 p/	DEC-2000	JUN-1998	DEC-1998	JUN-1999	DEC-1999	JUN-2000 p/	DEC-2000
NATIONAL	**1,762,455**	**1,899,975**	**2,069,416**	**2,339,647**	**2,420,978**	**2,595,072**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Aguascalientes	19,096	20,618	20,439	21,554	22,786	28,933	1.1	1.1	1.0	0.9	0.9	1.1
Baja California	65,834	67,896	70,020	72,200	74,560	81,556	3.7	3.6	3.4	3.1	3.1	3.1
Baja C. Sur	0	0	0	0	0	957	0.0	0.0	0.0	0.0	0.0	0.0
Campeche	17,417	18,177	19,107	18,957	19,305	18,990	1.0	1.0	0.9	0.8	0.8	0.7
Coahuila	51,607	54,694	54,900	48,973	49,259	79,680	2.9	2.9	2.7	2.1	2.0	3.1
Colima	24,073	24,006	23,863	24,963	25,027	23,641	1.4	1.3	1.2	1.1	1.0	0.9
Chiapas	14,429	21,013	21,617	22,970	24,658	26,812	0.8	1.1	1.0	1.0	1.0	1.0
Chihuahua	33,614	39,036	39,930	54,887	59,486	67,759	1.9	2.1	1.9	2.3	2.5	2.6
Distrito Federal	417,032	496,313	565,278	621,896	631,762	609,600	23.7	26.1	27.3	26.6	26.1	23.5
Durango	5,319	5,814	5,797	8,626	9,761	13,993	0.3	0.3	0.3	0.4	0.4	0.5
Guanajuato	81,812	89,038	98,193	112,349	116,303	126,916	4.6	4.7	4.7	4.8	4.8	4.9
Guerrero	28,596	44,340	46,581	48,735	51,159	55,482	1.6	2.3	2.3	2.1	2.1	2.1
Hidalgo	31,149	30,842	34,200	35,634	34,648	38,587	1.8	1.6	1.7	1.5	1.4	1.5
Jalisco	178,771	172,188	197,150	225,413	234,892	254,262	10.1	9.1	9.5	9.6	9.7	9.8
Mexico	36,108	37,585	42,238	54,876	71,791	82,981	2.0	2.0	2.0	2.3	3.0	3.2
Michoacan	110,770	116,068	115,300	138,179	146,566	153,840	6.3	6.1	5.6	5.9	6.1	5.9
Morelos	29,947	29,947	30,902	32,855	34,460	39,982	1.7	1.6	1.5	1.4	1.4	1.5
Nayarit	7,512	8,293	9,321	9,746	11,274	16,040	0.4	0.4	0.5	0.4	0.5	0.6
Nuevo Leon	102,623	84,429	97,804	129,244	130,316	132,607	5.8	4.4	4.7	5.5	5.4	5.1
Oaxaca	9,804	12,363	12,877	17,523	22,329	27,715	0.6	0.7	0.6	0.7	0.9	1.1
Puebla	51,153	55,284	66,437	68,347	74,769	78,769	2.9	2.9	3.2	2.9	3.1	3.0
Queretaro	29,185	26,371	33,514	45,332	20,717	55,328	1.7	1.4	1.6	1.9	0.9	2.1
Quintana Roo	23,454	30,942	27,463	31,224	29,235	34,016	1.3	1.6	1.3	1.3	1.2	1.3
San Luis Potosí	38,030	40,358	43,405	40,616	42,999	36,916	2.2	2.1	2.1	1.7	1.8	1.4
Sinaloa	47,975	52,748	51,156	63,887	62,646	65,392	2.7	2.8	2.5	2.7	2.6	2.5

Sonora	82,090	79,107	81,615	84,845	89,322	92,773	4.7	4.2	3.9	3.6	3.7	3.6
Tabasco	31,890	31,495	36,276	35,153	34,477	36,400	1.8	1.7	1.8	1.5	1.4	1.4
Tamaulipas	43,679	56,322	54,683	82,297	88,413	89,697	2.5	3.0	2.6	3.5	3.7	3.5
Tlaxcala	12,181	12,664	13,688	15,703	16,409	17,776	0.7	0.7	0.7	0.7	0.7	0.7
Veracruz	94,330	94,422	104,215	118,791	124,650	135,500	5.4	5.0	5.0	5.1	5.1	5.2
Yucatan	32,085	34,385	36,339	36,651	41,909	45,857	1.8	1.8	1.8	1.6	1.7	1.8
Zacatecas	10,890	13,217	15,108	17,221	25,090	26,315	0.6	0.7	0.7	0.7	1.0	1.0

SOURCE: COFETEL. http://www.cft.gob.mx
p/: Preliminary data starting from the mentioned date.
Note: It includes Television for Cable and TV via Microwaves (MMDS).

APPENDIX 3. PHONE DENSITY PER STATE. FIXED PHONE LINES PER ONE HUNDRED INHABITANTS 1990 – 2000

STATE	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000 p/
NATIONAL	6.4	7.0	7.8	8.6	9.4	9.6	9.5	9.8	10.3	11.2	12.5
Aguascalientes	5.7	6.8	7.7	8.3	9.3	9.8	9.1	9.5	9.8	10.8	11.9
Baja California	9.4	10.1	11.0	12.6	13.5	14.2	14.8	15.4	15.1	16.9	18.1
Baja C. Sur	8.6	9.6	10.6	11.6	12.7	12.5	12.0	12.5	13.3	14.6	16.6
Campeche	3.3	3.5	3.9	4.6	5.3	5.3	5.2	5.3	5.5	5.9	6.6
Coahuila	7.5	8.2	8.9	9.5	10.5	10.5	10.5	10.8	11.5	12.7	13.9
Colima	7.4	7.9	8.8	9.8	10.7	10.8	10.6	10.9	11.7	12.9	14.5
Chiapas	1.6	1.8	2.0	2.3	2.5	2.7	2.7	2.7	3.0	3.2	3.6
Chihuahua	7.6	8.3	9.3	10.1	10.8	11.0	10.5	11.1	11.6	12.6	13.6
Distrito Federal	18.3	20.7	21.4	23.6	25.6	25.9	25.5	26.5	27.7	29.8	33.4
Durango	4.4	4.8	5.7	6.2	6.8	7.0	6.8	7.1	7.7	8.7	9.5
Guanajuato	4.1	4.5	4.9	5.5	6.1	6.3	6.3	6.6	7.2	8.0	9.1
Guerrero	3.3	3.6	4.1	4.4	4.8	5.0	5.0	5.2	5.5	6.0	7.0
Hidalgo	2.8	3.2	3.7	4.1	4.5	4.7	4.6	4.7	5.1	5.5	6.1
Jalisco	7.8	8.7	10.0	11.1	12.1	12.3	12.2	12.6	13.3	14.4	16.6
México	4.7	4.8	5.9	7.0	8.0	8.5	8.4	8.7	9.3	10.2	11.4
Michoacán	3.7	4.3	4.7	5.1	5.7	6.0	6.1	6.4	6.9	7.5	8.1
Morelos	7.2	7.7	8.5	9.0	9.8	10.3	10.2	10.4	10.8	11.6	12.5
Nayarit	4.0	4.7	5.4	6.3	7.0	6.9	6.8	7.1	7.2	8.1	9.1
Nuevo León	11.6	12.7	14.1	15.4	16.9	16.8	16.5	17.0	17.8	19.6	21.8
Oaxaca	1.6	1.8	2.2	2.4	2.6	2.8	2.9	3.1	3.4	3.7	4.1
Puebla	3.8	4.2	4.6	5.1	5.7	5.8	6.0	6.2	6.7	7.3	8.1
Querétaro	4.1	4.8	5.5	6.8	7.9	8.1	8.1	8.5	8.9	10.0	11.1
Quintana Roo	5.0	5.8	6.8	7.5	8.1	8.2	8.3	8.2	9.0	9.8	11.4

San Luis Potosí	4.2	4.7	5.1	5.4	5.8	5.8	5.9	6.0	6.4	7.1	7.8
Sinaloa	5.5	6.2	7.1	8.0	8.7	8.5	8.0	8.0	8.5	9.4	10.4
Sonora	7.5	8.4	9.3	10.4	11.0	10.8	10.0	10.1	11.7	12.6	13.7
Tabasco	3.1	3.6	4.0	4.2	4.5	4.5	4.4	4.4	4.7	5.0	5.4
Tamaulipas	7.7	8.4	9.2	9.9	10.7	10.9	10.9	11.1	11.7	12.9	13.9
Tlaxcala	2.1	2.3	3.1	3.6	4.5	4.9	4.7	5.0	5.3	5.9	6.7
Veracruz	4.0	4.2	4.6	5.0	5.5	5.5	5.4	5.5	5.8	6.3	7.0
Yucatán	5.3	5.9	6.5	7.1	8.0	8.0	7.8	7.9	8.3	8.8	9.5
Zacatecas	2.1	2.3	2.8	3.4	3.9	4.2	4.3	4.5	4.9	5.5	6.5

Note: Starting from 1999, it Includes to the new concessionaires of local telephony.

SOURCE: COFETEL, with information provided by the concessionaires. http://www.cft.gob.mx

"Informationalizing" El Salvador: Issues and challenges for digital divide researchers

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Introduction

The term "digital divide" is a metaphor born in the United States, an evocative alliteration aimed at galvanizing into action all those concerned with inequality. It does not translate readily into other languages, losing both its ideological and linguistic appeal in nations where socio-economic disparities might require no alliterative metaphors to become even more apparent. In fact, in some venues, positing yet another divide may generate more weary resignation than stimulating discussion. Moreover, conflicting assumptions underlying its definition, among which predominate an emphasis on technological connectivity,[1] enhance the difficulties of investigating such a divide in a systematic fashion. Finally, developing countries perpetually face a more complex set of divides than do their neighbors to the North: inequalities vis-à-vis other nations are heaped on inequalities within their own countries (Bridges.org, 2001; Kagan, 2000).

To understand what a "digital divide" might look like in a developing country like El Salvador, the metaphor might better be translated into components that resonate in local policy and action circles. Those who seek to remedy local inequalities that are related to the worldwide digital revolution should identify areas in which progress can indeed be made, but in ways that are synergistic with existing development efforts. This paper reviews digital divide issues in El Salvador from the perspective of a national exercise held from 1998-99 to determine how both the nation and many of its socio-economic sectors could become "informationalized" (Castells, 1996). A participatory action research program, based on case studies, consultations, and focus groups, identified both problems and strengths related to the digital revolution and proposed a series of sector-based projects aimed at leveraging existing resources and producing sustainable change (Courtright, San Sebastián, & Menou, 1999a). This paper presents a description and critical assessment of the process and outcomes of the program, and raises larger research questions about international and local development challenges in a digital world.

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[1] Partial results of the author's in-progress content analysis of the use of "digital divide" in the U.S. press.

Digital and other divides

The "digital divide" might be better understood as the digitalization of existing divides (Menou, 2001). A vast proportion of the world's population goes without adequate food, housing, sanitation, education, income, or human rights, despite the advent of global markets and the Internet (UNDP, 2001). Many influential opinions hold that the lack of digital technology is crucial in maintaining those divides, and that therefore digitally-focused strategies can lead the way toward their eventual mitigation (e.g., Mansell, 1999; Rodríguez & Wilson, 2000; Talero & Gaudette, 1996). Although it may be true that the failure to adopt information and communication technologies (ICT) is likely to worsen a nation's development prospects (Mansell & Wehn, 1998), no systematic, reliable evidence exists to explain *how* introducing ICT will in fact help bridge existing divides (Heeks, 1999; Menou, 1999). In addressing "the digital divide problem," it may be more useful to shift attention from ICT-led analyses and strategies to a broader development perspective that seeks to leverage the digital potential in each context:

> The central point in the debate about the digital divide should not be what is the best way to bring ICT to the poor, but what is the best way for the poor to take advantage of ICT in order to improve their lot. (Menou, 2001:6; see also Gómez & Martínez, 2001)

In this view, then, digital divide questions should address traditional development problems in search of innovative ways to weave ICT appropriately into solution efforts, rather than start with ICT as an assumption. Using concrete development problems as a starting point will, in turn, shed light on *whether* ICT is even useful in a given context, and if so, *how*.

El Salvador

Socioeconomic statistics

Official statistics for El Salvador provide partial insights into the extent of its development challenges.[2] There are 6.2 million Salvadorans in a nation the size of Massachusetts (21,000 km^2). Over one-third of the population are under the age of 15; almost half live in urban centers, primarily in the capital and its outlying settlements; and one-third work in agriculture. The average income per capita is $4,344, but its distribution is severely skewed: the wealthiest 10% receive 39.3% of national income, while the poorest 10% receive only 1.4%, and 26% earn less than US$1 per day. Life

[2] Statistics primarily from the 2001 UNDP Human Development Report based on 1998-99 figures, with additional figures from the World Bank and CIA.

expectancy is 69.1 years, infant mortality is 35 per 1,000, and 26% of Salvadorans lack access to safe water.

The government spends 16% of its national budget on education, compared with, for example, 23% in Mexico and Costa Rica. Net primary school enrollment is 78%, and net secondary school enrollment is 22%. Adult literacy for women is 75.6%, and 81.3% for men. In all, El Salvador ranks 95 out of 162 in the 2001 UNDP Human Development Index, and has shown a gradual improvement over the past 20 years in comparison with other countries.

The nation's civil war (1980-92), Hurricane Mitch (1998), and a series of severe earthquakes (2001) have not only widened disparities but also produced a net outflow of migrants. Approximately one-fifth of all Salvadorans have left the country over the past two decades (Landolt, Autler, & Baires, 1999), and their family remittances totaled $1.75 billion dollars in 2000 —equivalent to 60% of export income, and covering 90% of the trade deficit (Banco Central de Reserva, 2001).

ICT and information statistics

In 1999, El Salvador had approximately 7.6 telephone lines per 100 inhabitants and 25 lines per 100 households (ITU, 1999). The national telephone company was privatized the previous year, and competition among land-line, cellular, and wireless service providers has only recently begun to flourish. By year's end there were 16 Internet service providers, with bandwidths ranging from 128 KBps to 4.5 MBps, and no interconnection among them (Ibarra, 2000)[3]. In 2001, the UNDP rated El Salvador a "dynamic adopter," ranking of 54 out of 72 countries assessed in its Technological Achievement Index (UNDP, 2001:45).

In terms of information distribution, in 1999 there were only 13 public libraries and approximately 125 "cultural centers" containing small collections of books, supplemented by dozens of specialized libraries in government and international agencies throughout the nation's capital.[4] There are five daily newspapers with a combined circulation of 48 per thousand inhabitants, 465 radio sets per thousand, and 677 television sets per thousand (UNESCO, 1999). A network of 20 community radio stations struggles to preserve its FM frequencies despite legislation that favors commercial interests.[5]

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[3] The lack of interconnection among Salvadoran ISPs means that messages from one to the other must all pass through the United States (Ibarra, 2000).

[4] Conversations with Salvadoran librarians, 1991-1999.

[5] Conversations with radio network leaders, 1999.

Development strategy for a digital world: the case of El Salvador

Statistics provide little indication of the gravity of El Salvador's development problems compared to other countries, or the strengths it can leverage in order to improve its prospects. However, a process approach was recently used in a national stock-taking and strategy-building exercise that sought to identify trends and compare existing reality with relevant goals. Traditional development problems were analyzed, then re-framed as information-related challenges, and projects were proposed.

Overview of the exercise[6]

In 1997, the World Bank and the government of El Salvador agreed to explore possible strategies that could help the nation become better-positioned to take advantage of the worldwide information revolution. This effort, a prelude to a future loan, was meant to complement an existing World Bank-sponsored program for enhancing El Salvador's competitiveness in the globalized marketplace. It also accompanied an incipient educational reform process, launched soon after the country emerged from a 12-year civil war that was settled by negotiations and democratic reforms. Two local coordinators and one external consultant were hired and given a budget, some oversight by the two sponsoring institutions, and broad discretion in terms of possible directions to take toward meeting that general goal.

Two key assumptions guided the program: 1) changes in development agendas do not only occur through government and international development aid, but also require a considerable "investment" by stakeholders at all levels affected by policy; and 2) the challenge El Salvador faced was not so much one of adding technology, but was rather a much broader question of how information and knowledge could be created, retrieved, shared, assimilated and utilized more advantageously in everyday activities.[7] Thus, the coordinators used a participatory action research framework to design a program of nationwide discussions and studies. The goal was to explore the real and potential uses of information and knowledge in the context of existing socio-economic relations, culture, structures, and practices, and the program was given an organizing name: *Conectándonos al Futuro de El Salvador.*

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[6] The overview, description, methodology, and outcomes of the exercise are based on the author's own experience as coordinator and are documented in Courtright, San Sebastián, & Menou (1999a); additional citations will be noted where appropriate.

[7] These assumptions were primarily grounded in the beliefs and experiences of the two coordinators, with strategic direction and assistance from an external consultant (cf. Courtright, 1997; Courtright, San Sebastián & Menou, 1999b; Menou, 1991).

Research design

After weeks of preparatory discussions with a broad range of policymakers and development practitioners, six areas were chosen in which a better utilization of information and knowledge might lead to significant improvement in El Salvador's development prospects: education, relations with emigrants, community and municipal development, rural development, micro- and small enterprise (SMEs), and public and private large-scale organizations. For each area, program coordinators invited 10-12 stakeholders from a variety of organizations, institutions, and perspectives to join focus groups, or "learning circles," led by an outside moderator and one of the two coordinators. The goal of each circle was to envision what a "learning society" might look like in that area or sector, identify and analyze critical obstacles to that vision, and propose small-scale, innovative projects to leverage strengths and overcome weaknesses. Although the worldwide digital revolution and its implications for El Salvador were taken as the general context in which the discussions took place (cf. Courtright, 1997), ICT was not the leading focus; instead, the role of ICT was located within a broader strategy of "informationalizing" development.

The work of the learning circles was complemented by concurrent action and research projects. The action projects were focused on designing sample ICT services that related to learning circle discussions, to serve as points of reference. First, with the assistance of telecenter[8] pioneers in Peru, stakeholders in El Salvador worked to lay out the blueprints for a national telecenter network that would respond to the issues and goals raised in the six learning circles; to this end, dozens of meetings were held with Salvadorans from all walks of life to discuss the concept of telecenters and their potential use in a variety of settings. Each meeting contained a "mix" of sectors to ensure varying opinions and stimulate broader discussion. At the same time, the coordinator of the community-development learning circle led workshops in two different towns, in which stakeholders conceptualized and designed the elements of a local Web site, based on their assessment of its purpose and intended audience.

The research studies were commissioned on a variety of topics to flesh out several of the problems identified in the learning circles: telephone density and Internet connectivity, government information policy and accessibility of its information resources, government ICT infrastructure and training, international migrant networking practices, technology transfer practices in local agriculture, environmental information resources, and institutional and legislative constraints on e-commerce. In addition, case studies of knowledge management practices in three important institutions (one bank and two ministries) were conducted to illustrate the challenges facing large organizations in El Salvador. Finally, once the learning circles had identified the critical

[8] The term used most commonly outside the U.S. to designate community Internet centers or community technology centers.

issues in their respective areas, and before they proceeded to project proposals, an international e-conference was held to solicit "best practices" used in other countries to address similar critical issues (Conectándonos al Futuro de El Salvador, 1999).

The results of the diverse activities were collated and drafted into a proposed strategy and specific projects, after which they were discussed further in an open assembly and finalized in a document presented to the government, the nation, and the World Bank (Courtright et al., 1999a). Although *Conectándonos al Futuro* was officially concluded, many participants continued their involvement in the issues it raised by participating in the incipient national network of telecenters, *Asociación Infocentros*.

Summary of principal outcomes

Instead of issuing sweeping recommendations, each learning circle devised one or more information-centered projects that could be piloted, evaluated, and scaled up accordingly. Each project was expected to have a demonstration effect and show how innovative ways of conceiving and addressing problems could re-channel development efforts with a minimum of funding. Many of the projects —but not all— were predicated upon the success of a telecenter network. In addition, several of the studies commissioned during the research program pointed to the need for broader policy recommendations at the level of the central government. Following are summary diagnostics and project proposals by sector and area.

Sector: Education

Principal issues: The educational reform, while highly promising in its philosophy (which is entirely consistent with "learning society" goals), has not gone beyond administrative changes; teachers have neither the incentive nor the means to learn new ways of teaching. The considerable foreign assistance allocated for building multimedia centers in secondary schools will be ineffective if teachers are not encouraged to become flexible learners, with or without technology.

Proposed projects: 1) Localized learning circles among teachers, preferable with mechanisms to encourage sharing outcomes more broadly. 2) Target telecenters in communities whose secondary schools have multimedia centers, so that both students and teachers can reinforce learning.

Sector: Networking with emigrants

Principal issues: Salvadorans who emigrate acquire new skills and knowledge that can assist businesses, communities, and national-level projects, and evidence shows they are anxious to maintain both cultural and economic ties while making a contribution to development. Yet an almost-exclusive focus on capturing remittances overlooks the multiplying potential of such non-monetary contributions.

Proposed projects: Incentives and encouragement for migrants and locals to create electronic information that would be valuable and interesting to both, to promote economic and cultural exchanges (link with telecenters).

Sector: Local and municipal development

Principal issues: El Salvador's 262 municipalities are relatively weak, although opportunities lie in gradual administrative decentralization, growing organization among mayors, and increases in mandated funds from the national budget. Although international organizations have often documented local conditions in great detail, this information has not been returned to local residents to help in planning.

Proposed projects: Inter-municipal programs to help local coalitions inventory their communities and utilize this information in planning, along with data already collected by international organizations; coordination and exchanges nationwide. Include cultural inventories; close coordination with community radio stations.

Sector: Rural development

Principal issues: The sector is characterized by excruciating poverty and lack of education, declining agricultural activities, deterioration of the environment, and depletion of natural resources. Two key components in this vicious downward spiral are the lack of critical information and the lack of adequate methods of technology transfer. Funding programs have not managed to reverse any of these trends due to institutional weaknesses and failure to target deeper problems.

Proposed projects: 1) Focus on knowledge creation and transfer within rural sectors; 2) incorporate administrative training into technical programs and create appropriate teaching materials; 3) focus on creating economic, social, and cultural information products by and for rural residents.

Sector: Micro- and small enterprise

Principal issues: Large informal sector which tends to follow trends until market is over-saturated, administrative obstacles to formalization, low skills levels, difficulty in obtaining credit. Strong points are creativity, adaptability, and persistence among entrepreneurs.

Proposed projects: 1) Knowledge-sharing among micro- and small-business owners through small-scale franchise operations; 2) reduce legal and bureaucratic obstacles to formalization.

Sector: Large organizations

Principal issues: Knowledge management is poor, and organizations are characterized by rigid, bureaucratic, or family-run structures that are highly resistant to change;

technology is often adopted yet not truly appropriated for more efficient use of resources.

Proposed projects: Incentive, matching grant, and competitive programs to reward risk-taking, innovation, and knowledge management in both public and private sectors; creation of an "innovation club."

Broader issue: connectivity, content, and training

Principal issues: Despite high levels of growth and competition since the recent privatization of the state-run telecommunications company, relatively low telephone density and widespread poverty make Internet connections a rarity, and not feasible for the majority of the population in the foreseeable future. But connections alone will also fail to address deeper problems of relevant content and skills. Even if Internet access becomes cost-effective, a chicken-and-egg situation develops in that few Salvadorans will find crucial information, and few will take the trouble to create that information based on the assumption that few are online. Informationalizing socio-economic activity in El Salvador will require the massive creation of relevant online content and transactional capabilities (e-commerce, government paperwork), as well as skill-building. A large-scale effort to combine Internet access with content creation and training can break through this logjam.

Principal project: Create a network of telecenters, with a gradual rollout, owned by a national coalition of non-profit, educational, and government organizations, with a focus on information creation and community outreach in order to build a critical mass of useful content, as well as the skills to create and utilize it. A long-term, interest-free loan was obtained from a the proceeds of the sale of the national telecommunications network. Telecenters are locally managed by interested individuals and organizations, and collect sliding-scale fees for connection time, Web site development, and other services. The national organization is non-profit to ensure reinvestment of income for expansion and improvement, while local telecenters determine their own management structures and pay a franchise fee to the national organization in exchange for capital equipment, training, advantages of scale, and quality control.

Broader issue: Government information and ICT policy

On the basis of detailed studies of government information management and internal ICT policy, several recommendations were formulated to encourage the government to become a "best practice" in technology and knowledge management and to promote greater efficiency and transparency in its operations: 1) design and publicize a national information policy; 2) promote electronic government transactions and publications (in telecenter context); 3) develop internal knowledge and information management practices; 4) rationalize ICT distribution, maintenance, training, and use in public administration; and 5) promote information policies at local government levels.

Conectándonos al Futuro suggested that the government's role in promoting the adequate use of ICT in development be one of leadership, not ownership:

> …reduced responsibility for direct management in many areas of society, transferring those functions to civil society and private enterprise when and if they are capable of taking charge of them more efficiently; in exchange, focus efforts on correcting market imperfections, and eventually creating those incentives necessary to generate capacity instead of dependence (p. 86).

Broader issue: Culture

Although a cultural focus group was not created, program members held discussions with many artists, cultural workers, and information professionals, and stressed the need to preserve and digitalize Salvadoran cultural heritage.

Update on program outcomes

Research has not been carried out to assess progress on the projects and programs proposed as part of *Conectándonos al Futuro de El Salvador.* Nevertheless, the author has maintained contact with several key actors involved in the program, through e-mail and during a recent visit. The following partial information is available, and will be address as part of the critical discussion in the next section.

Overall program

A new elected government took office at the same time that the above recommendations were issued. Although many of its members had participated enthusiastically in the learning circles and telecenter project, and had even incorporated many of the program's ideas into their electoral platform, they found their best intentions frustrated once in office. Political infighting, severe budget limitations and competing priorities, and bureaucratic inertia combined to make it impossible for the new government to commit to an overall program to implement the *Conectándonos* projects through a World Bank loan, although it would have been a comparatively small investment.

Nevertheless, the momentum and interest built up during the course of the research program —which was not premised on future funding for outcomes— helped many of its participants to focus on the challenge of informationalizing their ongoing activities. Informal discussions with former program participants working in areas of education, emigrant relations, government, small business, and local development show a growing concern with this challenge, and a willingness to count on the growing telecenter network to create synergies between its goals and their programs.

Asociación Infocentros

Due to bureaucratic difficulties, the promised funding for the telecenter network did not materialize until mid-2000, over a year after the *Conectándonos* program ended, and the first telecenters did not open until September. As of May 2001, 14 of the projected 100 telecenters have opened for business,[9] and Web site production is slower than expected. In addition, despite the original conception of the network as a non-profit member association run by a broad array of civil society organizations, there was a significant drop in organizing and outreach activities while waiting for funding to arrive and centers to open. The Board of Directors, made up mostly of high-profile civil servants and opinion-makers, has recast the association as more élite than originally intended, with little participation by original member organizations, and the individual telecenters resemble commercial cybercafés more than community information centers. The Association participates very little in a hemispheric network of telecenter organizations, *somos@telecentros*,[10] which hosts an active listserv and a growing Web site full of resources.

Nevertheless, there has been a significant growth of useful Salvadoran information on the .SV domain server, which by late 1999 had registered over 800 sub-domains and over 25,000 Web pages (Ibarra, 2000); figures for today are undoubtedly much higher. A brief review of Web pages indexed on the *Asociación Infocentros* portal[11] shows, for example, dozens of how-to sites for accomplishing government-related transactions, daily market prices for agricultural products, a cultural and artistic directory, news, and other useful sites directly accessible from the home page. The portal, however, has not inventoried and organized existing Salvadoran Web sites enough to give the casual user an idea of the range of information available, even though local technicians have devised a crawler that keeps track of all pages hosted on .SV servers.

Other relevant issues

The series of earthquakes that devastated El Salvador during the first several months of 2001 have exacerbated existing socio-economic inequalities and have put the nation on a crisis footing that overshadows the usual discourse of development challenges (cf. World Bank & International Monetary Fund, 2001). The long-term implications of this catastrophe for the outcomes discussed above could only be determined by on-site empirical research.

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[9] Five in major cities, and 9 in smaller cities and provincial capitals; see http://www.infocentros.org.sv/iboletin/boletin.html

[10] http://www.tele-centros.org

[11] http://www.infocentros.org.sv

Critical reflection on issues raised in El Salvador

The *Conectándonos al Futuro* research program did not generate a statistical understanding of many of the specific problems that have been mentioned elsewhere in the context of the worldwide digital revolution. In that sense, it is difficult to determine what El Salvador's digital divide might look like when compared with other countries. The program did, however, produce insights into key trends and processes, and the perspectives obtained through its broad-based, consultative, and action-oriented methods shed light on issues that may be fruitfully examined in many contexts. For example, even though Costa Rica has a much stronger educational foundation for bridging digitally-related inequalities than does El Salvador, and Guatemala's multiple languages and cultures pose their own unique challenges, any attempt to understand each country's specific problems may be well served by situating them within the broader issues discussed below.

Within-country and between-country challenges

Analysts of the digital divide have noted that disparities tend to exist both within countries and between countries (cf. Kagan, 2000). The case of El Salvador provides an example of the complexities involved in attempting to address both sets of disparities in an integrated fashion.

In the context of a globalized economy, with the growth of regional trading blocs and the disappearance of protectionism, the economic activities that traditionally ensure a country its particular market share (in El Salvador: coffee, cotton, sugar) become increasingly precarious. "Retooling" a national economy to meet these new challenges is a slow and painful process, provoking controversy and conflict among sectors, as job markets shift, traditional producers are overrun by duty-free imports, and inequalities deepen. Thus, a country that seeks to compete on a new footing in the world market faces internal struggles over how to ensure short-term gains while attempting to make long-term investments in both human and economic capital. The digital revolution may appear to offer solutions to both the long- and short-term requirements of globalization, particularly when new trading partners increasingly rely on ICT for efficiency. A "between-country" approach to the digital divide involves pressing for technology adoption in certain leading sectors, training high-level workers, changing laws to facilitate international electronic transactions, and perhaps even attracting investment in information industry activities. Many in El Salvador favored this approach.

But what effect will such a priority have on those who do not participate directly in internationally-focused activities? Do national inequalities deepen proportionately, or is there a "trickle-down" effect that benefits all? Since developing countries have strictly limited public investment resources, a decision to favor a between-country approach may undermine the possibility of devoting equal or greater attention to internal inequalities that could be mitigated —with and without ICT— by better education,

health care, production techniques, public administration, and environmental management. In what might be considered a "trickle-up" philosophy, *Conectándonos al Futuro* clearly favored a "within-country" approach, with its emphasis on local knowledge management and information creation, although many of the proposed projects also had favorable implications for overcoming between-country divides.

These two dimensions of the digital divide should be kept analytically separate when assessing problems and progress alike. It is also crucial to assess the implications of favoring one strategy over the other.

Technology-driven development

No matter how much emphasis is placed on the many aspects of development that are involved in efforts to meet the challenges of globalization, it is perpetually tempting to fall back upon an "ICT fetish" (Heeks, 1999) and lead with technology. In this sense, the term "digital divide" does development practitioners a profound disservice, as it all too easily evokes technology-driven solutions without regard for a careful examination of underlying problems. For this reason, the El Salvador exercise persisted in analyzing problems of information and knowledge management within the context of existing development areas, and its approach to technology was always either hypothetical (what-if scenarios) or carefully situated within this broader context. Nevertheless, during the program's tenure, not a week went by without receiving a technology-driven proposal from a technology leader, a grassroots activist, a government policymaker, or an international consultant.[12]

The telecenter network has suffered somewhat from this focus. Although great care was taken during the *Conectándonos* program to frame it as "more than just" an ICT project, its subsequent roll-out appears to be hampered by a technology-led vision that has become disconnected from grassroots development efforts, at the expense of socially-grounded, content-rich centers. Further research is necessary in this area, preferably to compare telecenter models and practices in different countries.

An alternative to technological determinism may be to postpone discussions of specific technologies until socio-economic and cultural processes have been analyzed in light of desired goals, and only then attempt a conceptual integration of technology. Scenario-based walk-throughs involving technology can help spotlight underlying problems that might otherwise not become apparent, and decisions can be made on a cost-benefit basis (cf. Bishop, Mehra, Bazzell, & Smith, 2000; Carroll, 1995). For example, if artisans have difficulties ramping up production or getting goods to market, a loan to help them sell their wares on the Internet would have to be accompanied by business management

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[12] *Conectándonos al Futuro* staff facetiously referred to the suggestions as "solutions in search of the right problem."

training or improved roads. The introduction of technologies whose effects are assumed can lead to failures, cynicism, and lost revenues. Vulnerable populations literally cannot afford to experiment with expensive technologies if underlying problems are ignored.

Are-we-there-yet development

Another liability of the term "digital divide" is in the stark dichotomy it posits: a divide either exists or it does not; some are on one side and some on the other. Such a conceptualization may be setting the bar for change too high. Instead, the problems typically implied in digital divide discourse may be better addressed by setting in motion processes that gradually bespeak progress. The El Salvador exercise deliberately sought to identify processes and trends rather than static descriptions, and the projects proposed by the focus groups targeted those processes, in an effort to create positive dynamics by leveraging strengths. Outcomes, however, are extremely difficult to assess. To that end, the proposed projects were located within a general evaluation framework that included ground-zero assessments, on-the-fly corrections, stakeholder involvement, and replication and dissemination of partial successes. Nevertheless, it is always easier to measure, for example, numbers of households with running water than it is to assess social learning processes, with or without technologies (cf. Menou, 1993, 1995a, b; Menou & Potvin, 2000). Should the success of the *Asociación Infocentros* be measured by its usage statistics? the number of centers opened? the breadth of national coverage? the number of Web sites in El Salvador? This is an example of the evaluation challenge that all policymakers perpetually face. An end-product approach to development is simpler to assess, but sidesteps the complexity inherent in ongoing processes of change.

The content divide: What kind of information?

In the introduction to its 1998 report, the World Bank stated that developing nations "differ from rich ones not only because they have less capital but because they have less knowledge" (World Bank, 1998:1). The solution proposed in the report has two principal components: help developing nations access knowledge from industrialized nations, and promote more science and technology. The El Salvador exercise, however, came to a different conclusion, more in accordance with Cronin and Davenport's (1991) proposition:

> It is not simply that less developed countries have fewer and poorer quality information assets at their disposal; rather that so much potentially useful information… is not recorded, and often even when formally or systematically recorded, may only be available for local use and accessible within a controlled or restricted environment. (p. 3)

All the focus groups and case studies in *Conectándonos al Futuro* identified a grievous lack of available, useful information to resolve both simple and complex needs; thus, the creation and management of local informational content became a central theme of

proposed solutions. Of course, obtaining and interpreting international information was also seen as important , but participants in *Conectándonos al Futuro* —even in the "large organizations" focus group— placed a premium on building the capacity to transform and manage local knowledge as a foundation for the productive use of externally-generated information resources. In other words, the *production and organization* of Salvadoran information was seen as more empowering for both national and international development purposes than merely the *consumption* of international information, no matter how useful.

Even in El Salvador's science and technology sector, the fundamental obstacle to innovation and progress appeared to be more a question of human networking and knowledge management than of access to external knowledge riches. The problem is even more drastic for low-income sectors, who spend a disproportionate share of their time and resources attempting to obtain crucial information. In this sense, the findings in El Salvador complement the conclusions of a landmark study published last year in the United States on the lack of relevant content for the poor (Lazarus & Mora, 2000), and in addition raised the need for effective management of local information in order for it to be productive.

The most important tool to this end was to be the national telecenter network; as noted above, it has suffered many delays and modifications since its initial conception. The lack of widespread civic participation in the network has slowed its development, particularly in terms of its goal of producing a "critical mass" of Salvadoran information that would make the telecenters useful to both potential patrons and the nation in general. The lack of adequate local and national content, together with weaknesses in the organization of existing useful content, appear to constitute a widespread problem among telecenters in Latin America that merits further discussion (Courtright, 2001).

Sweeping programs or gradual scaling?

The project proposals that emerged from the learning circles and supporting studies had a significant characteristic in common: a commitment to implement them as small-scale pilot projects, accompanied by evaluation, and followed by dissemination of results, course correction, and scaling up. At the same time, due to its institutional origins, *Conectándonos al Futuro* was required to write a coherent program that could be funded by an entity such as the World Bank. To that end, the group proposed a loose coordination among individual projects instead of a new formal structure, with particular emphasis on a cross-cutting evaluation program. Due to reasons mentioned above, the full program was never adopted, and this failure, combined with extended delays in launching the telecenter network, no doubt caused the momentum generated during the program to ebb considerably. Two lessons might be drawn from this outcome: 1) no single entity should be counted on to implement new development programs; and 2) sweeping approaches to complex development problems will

probably lead to failures and future skepticism. In other words, it is probably a better idea to decentralize and scale down the initiatives and diversify the funding sources.

A different logic drove the decision to set up the *Asociación Infocentros* network as a large-scale project (albeit with localized management): there was a need to break decisively with the lack of online Salvadoran content in order for any telecenter to become socially useful. It is not particularly cost-effective to build only one or two telecenters in a country, since the compelling mass of relevant online information necessary to attract a broad clientele simply cannot be built for one venue, and piloting would not produce reliable results. Conversely, a single Web site can equally serve one client or ten thousand. It seemed more realistic, therefore, to attempt a large-scale, content-led project as a way to build momentum. As mentioned, it seems that the Association has subsequently favored infrastructure over content.

However, it is still too early to assess the outcomes of this ongoing effort. Furthermore, the question remains whether the broad participation that characterized the *Conectándonos* program in general has resulted in a longer-term diffusion effect of the analysis and proposals discussed in so many sectors. To this end, it would be highly useful to conduct a five-year follow-up assessment covering the same sectors as well as the telecenter network.

Significant omissions in the El Salvador exercise

- *Analyzing in what ways the encouragement of local information and ICT industries could help build a stronger base for informationalizing El Salvador*. Would export-oriented information industries amount to significant improvements in local information management and innovation, or would they be little more than light-assembly factories? (cf. Trauth, 2000 for example of Ireland.) The coordinators' priority on a within-country approach left this area of interest to the World Bank-funded "Competitiveness Program"; outcomes are not yet available.

- *Linking information needs and behavior in the contexts observed with gender analysis and theory*. The coordinators did not place sufficient priority on this aspect, and were unable to obtain broader support for this focus within the advisory board.

- *More explicit treatment of environmental management and planning.* Although this area was addressed as part of the rural development learning circle, the gravity of El Salvador's environmental crisis should have qualified this area for a separate learning circle.

Research needed

The efforts analyzed above to "informationalize" development in El Salvador raise a number of questions for further research involving both specific contexts and conceptual definitions. The focus in this section is on systematizing experiences and knowledge for broader application. The following partial research agenda for ICT and development tries to highlight those areas in which focused research may be both broadly applicable and of long-term use.

Evaluation of processes and outcomes

Assessing progress in any type of development program may be one of the most complex aspects of the program itself, and the introduction of the information and ICT dimension is no exception (McConnell, 1995; Menou, 1993). Individual assessment indicators are devised to relate to the goals of each project, but efforts to determine in what ways ICT is "useful" to development must transcend individual projects and build conceptual definitions that can be applied to many situations. Examples of efforts to create conceptual frameworks for assessing the impact of information and ICT can be found in McConnell (1995), Menou (1993), Menou and Potvin (2000), and Daly (1999). Also needed, however, is a framework to help transcend the rather static concept of "impacts" and analyze processes of change that occur in ICT-connected development:

> Impact studies have a natural tendency to try and show the changes between an initial situation…and a new situation. And to do so as quickly as possible. The result is often disappointing. It is further useless, since it is the process of change by which stakeholders moved from one to the other situation which one needs to understand in order to learn from this endeavour and take more effective action in the future. (Menou, 1999)

In this effort, it may be useful to engage socio-technical, process-oriented frameworks (Edwards, 1995; Kling, 2000; Kling, McKim, Fortuna, & King, 2000) that can guide comparative, qualitative, and context-rich analyses of different ICT-related programs. This is particularly important to understanding *why* some projects "work" and others do not.

Inventorying and understanding projects that "work"

Critical assessments of problems and failures constitute an essential but insufficient component of planning. Underlying the need for robust evaluation frameworks and practices is the additional need for inventories of projects that appear particularly promising for locally-determined development goals. A careful look at successes and strengths can reveal leverage points for action. One example of a first step in such an inventory is the ICT Stories Project (IICD & Infodev, 2001) that collects narratives and lessons learned from successful ICT-related development efforts, written by project members themselves. Additional study and analysis, including comparisons among

projects, should be applied to narratives such as these in order to determine what socio-technical factors might differentiate one context and project from another. Such an understanding is crucial before attempting to prescribe one project's successes for an entirely different context.

For example, the relationship between ICT and the preservation and enrichment of cultural heritage is insufficiently understood. Although examples can be found of how endangered cultural and linguistic resources are preserved on the Web,[13] others fear that cultural resources may gradually be extinguished as they become less "relevant" for the marketplace (Hirsch, 2001). Under what circumstances can the Internet be useful for cultural preservation?

Another interesting use of outside examples involves transnational networking with migrant populations for net gains in knowledge-sharing and skills. Many emigrant information networking initiatives exist worldwide, both government-sponsored and informal (Andrade-Eekhoff, 1999). Which are providing benefits to both migrants and home institutions and organizations? Why and how?

Understanding telecenters

A context-specific subset of evaluation research involves telecenters as ICT tools that distribute the cost of ownership, and that can be linked easily to a multitude of local development initiatives. Further research is necessary to conceptualize and compare not only outcomes, but also the relationship between those outcomes and contributing factors: ownership and control of the centers, their business and management models, online content production, frequency of use, training and outreach, and others. Many questions come to mind: When and how are telecenters socially sustainable and economically self-sustaining? Do they contribute to a building a "culture of information" in their local areas, and if so, how? What differences in Internet use and online participation can be found between users at home, at work, and at telecenters? Telecenters appear to be attractive solutions to the problems that the digital divide appears to evoke, but existing literature covering the enormous variety of telecenter models and contexts (see Appendix) is still inadequate for a systematic understanding of the role of this tool in development.

Social appropriation of ICT

Does ICT use, even if frequent, help sustain development efforts? The discussions held in one of the learning circles of the *Conectándonos al Futuro* exercise cast doubts on this hypothesis, contrasting the notion of *adoption* with actual *appropriation* of technology.

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[13] See, for example, http://www.rcp.net.pe/ashaninka/ for Peru's Asháninka Indians, or Warschauer & Donaghy (1997) for native Hawai'ian. A clearinghouse for language preservation can be found at http://cougar.ucdavis.edu/nas/terralin/endlangs.html .

Gómez and Martínez (2001) propose “social appropriation” as a measure of the usefulness of ICT in development, yet their conceptual definition closely resembles externally-measured social and economic outcomes of ICT-related processes. For that concept, “socio-economic impacts” may suffice. Instead, “social appropriation” may be better conceptualized as a process-based measure that is closely related to everyday social practice, and a potentially critical ingredient in the sustainability of ICT initiatives. For example, the difference in ICT use between a secretarial and a professional work group in the same company showed how the latter shaped a new software system to meet their needs, while the former merely utilized it to perform repetitive tasks (George, Iacono, & Kling, 1995). Social informatics research focusing on the “social shaping” of information technology at the point of adoption (e.g., Avgerou, 2000; Cranmer, 2000; Nardi & Miller, 1990; Orlikowski, 1992; Waller, 2000) provides promising insights into components of social appropriation that could direct research efforts in developing countries.

Conclusion

The case of El Salvador illustrates a participatory, process-oriented, within-country approach to strategizing for change in an “informationalized” world. Salvadorans from many sectors worked together for over a year to understand critical problems in traditional development areas, and designed ways in which information creation, knowledge management, and ICT use could help leverage new processes. Although the plans were not adopted in a comprehensive program, a national network of telecenters was created and continues to grow, and the themes widely discussed throughout the exercise continue to appear on many agendas. It remains to be seen, however, in what ways the telecenters and related initiatives are contributing to development in El Salvador, and how their benefits are distributed. Although the lack of ongoing assessment weakens any possible claim to progress at this time, key questions for exploration and testing in future research have emerged from the exercise, and are applicable to many developing nations.

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Appendix:

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"Informationalizing" El Salvador: Issues and challenges for digital divide researchers

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Title:

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July 2001

SUMMARY

The paper **"Informatization and Information in the Cuban Social Project from a Professional in Information's Point of View"** consists of two parts: the first part's objective is to analyze the causes that have resulted in the introduction and spread of these technologies, which began during the **"Campaña de Alfabetización" (The Literacy Campaign)** in 1961. This campaign eliminated the illiteracy that prevailed in Cuba and served as the basis for the consistent training of its people along with excelling education and culture. This was done in coordination with **Sistema Nacional de Educación (The National Educational System)**. Nowadays, under a **Governmental Strategy for the Informatization and Information of the Cuban Society,** efforts are focused on the infra-structure and the info-structure necessary to continue developing society as a whole.

In the second part, based on the **informational hyper-inflation**, a **"Technology for Analyzing the Integral Development of a Specific Theme" (TADITE)** is proposed. This technology is based on the theory of **"Information Production Processes" (IPP)**. One of its elements is the **Meta - Analytic Methodology**. Besides this, the study of **the a Posteriori Analysis of the Statistical Power** is used as a **clustering criterion** of the information's methodological quality in order to analyze, synthesize, and synergic-integrate, later on, the information. This part also analyses the **Information Professional's Role** in this technology.

Conclusions: The results reached in the processes on Informatization and Information of the Cuban Society have their basis in a network of literate people. This has been possible due to the rapid introduction and availability of technology. Cuba, different from many other third world countries, has **a knowledge net** that makes it possible not only to consume but also to produce information. This includes monitoring, analyzing, and evaluating international scientific and technological advances, and use those advances that work best for the country at each of its stages. The purpose of **The Technology for Analyzing the Integral Development of a Specific Subject** allows one to do a systematic and complete analysis of public information to obtain very valuable data.

In this era of proliferation and abundance of publications…, personal capacity of reading and absorbing information continues to be the same. To reduce this huge abundance of information to chewable pieces is essential to digestion.

Mulrow, Cynthia D.[1]

Part I. Education in Cuba. A necessary introduction.

In Cuba, the educational system from the first to the fourth level is entirely free -this is just one of the social achievements attained in the last four decades. From an organizational point of view, there are two ministries: El Ministerio de Educación - MINED- (The Educational Ministry) which is responsible for education from kindergarten to high school, in addition to technical specialization, and El Ministerio de Educación Superior -MES- (The Higher Education Ministry) in charge of the methodological guidance for teachers´ curriculum in which all the Cuban universities are subordinated.

By 1961, illiteracy was eliminated in Cuba through **La Campaña de Alfabetización (The Literacy Campaign).** This campaign reached the whole nation where tens of thousands of students and workers, as voluntary teachers, participated. All of them helped create the basis for the later educational and scientific-technological development of Cuban society.

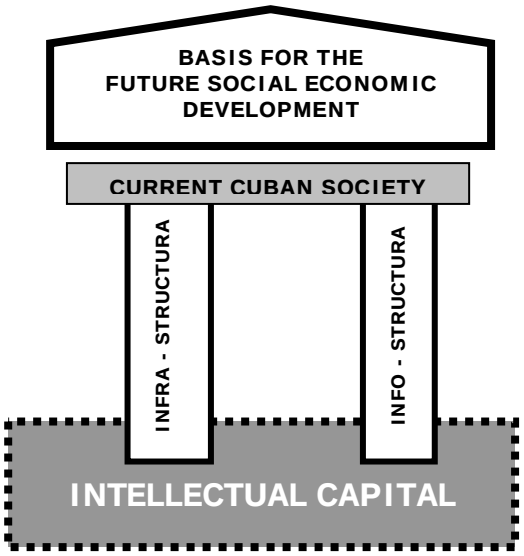
As an example, of the 6,000 doctors that were in the Cuba before 1959, only 3,000 remained, the rest immigrated to other countries; however, today, there are more than 60,000 doctors in Cuba. They have risen the sanitary standards in the country, which means, a better quality of life. This has been done to the point where Cuba even educates doctors from other countries (including ethnic minorities from the United States) through the Universidad Internacional de Medicina (International University of Medicine) where there will be future doctors from more than thirty countries.

From an estimated population of more than 11 million in 2001, all children and adolescents (of school age) are registered in some kind of educational studies (there are artistic learning, technical, professional, specialized -for handicaps- and so on). In order to accomplish this, despite economic difficulties, the Cuban government makes available many resources (whether they are human, financial, and/or material) as part of the strategy to increase the population's general culture. These opportunities are available to any citizen that is interested in a higher education, whether it is technological or the university, through the many options available (regular day classes, classes for those who work, and so on), without having to pay for them.

This strategy creates the necessary foundation for the process of Informatization and Information in the Cuban society. The government supports these initiatives by keeping in mind the citizen's information literacy. The technologies are available through the

[1] **Mulrow Cynthia.** Review article in the current medical literature. Bol. Of Sanit Panam 114 (5), 1993. 437-445 pp.

campaign **"Universidad para Todos" (University for Everyone).** Through various means of communication (national television, as the main driver; videos; printed material in traditional format at a very low cost and accessible to everybody), the necessary knowledge is made available to the people. This makes it easier for them to use the different information sources, including the Internet. This is part of the national program for **masificación de la cultura (mass culture).** This program includes the study of foreign languages (English and French) as another option besides the established language schools. The goal is to lower the linguistic barriers in literature, culture, scientific, and technological information from the highly developed countries.



In this way, Cuba created its indispensable and most valuable strategic resource: **capital intelectual (intellectual capital)** as a core base for the process of Informatization and information of the Cuban society, which strives to have equality in the use of technologies.

- **Some elements of Informatization and Information in Cuban society**

Maybe the beginning of Informatization and Information in Cuban society can be traced to the early 1970´s. For the first time in the country, a mini-computer, "The CID," was designed and constructed by Cubans; a plant was built for electronic components (thus proving that since that time the possibilities of the intellectual capital that existed); in addition, computers were also imported in massive quantities. Cuba also began the University Degree in Cybernetics, Computer Science and Scientific-Technical Information (called, nowadays, Library and Information Science).

As a way to perfect the national policy regarding the Informatization and Information in the Cuban society, the **Ministerio de Informática y Comunicaciones (Computer Science and Communications Ministry)** was created as the organization to direct policy. However, no input was blocked to this governmental strategy (of the Informatization and Information in the Cuban society); all institutions participated, governmental and non-governmental alike, in conjunction with Cuban society as a whole.

El Ministerio de Educación Superior -MES- (The Higher Education Ministry), is the institution in charge of methodology in Cuban Universities, has a national network (REDUNIV). This network facilitates the communication among universities along with the rest of the country's national organizations, connected to other networks. Additionally, every year it increases modern technology in order to have the necessary material for teaching, scientific production and research, thereby achieving a progressive better relationship between students and computers.

The teaching programs related to **New Technologies in Information and Communication** [2] **(Nuevas Tecnologías de Información y Comunicación -NTI&C-)** are an integral part of all University degrees. According to the needs of each of degree, technology spreads to the whole country the university studies that are absolutely necessary in creating the indispensable intellectual capital and sustain its continual development.

In each Cuban "Centro de Educación Superior" (Center for Higher Education) there is at least one Intranet, with pertinent information regarding the institution; additionally, all centers have access to the Internet as well. There are also national competitions related to **NTI&C** to increase universities´ process of Informatization and Information, as part of national policies, with huge repercussions for the country.

El Ministerio de Educación -MINED- (The Education Ministry) as the institution in charge of methodology in Primary, Secondary, and Technological Education, directs and supports pedagogical research in order to introduce **NTI&C** in an organic and scientific way. This is done since the first grade of school, considering among other things "students time in front of the computer" and "content and complexity level" according to students´ level and age. The idea is to make **NTI&C** part of all subjects using software designed in the country and as basis for the future development of the teaching-learning process. However, students as well as any other citizen, can participate according to their interests in independent classes offered by " Joven Club de Computación " (Youth Computers Club) that are all over the country.

Another important factor of this strategy is the "Programa Nacional de Electrificación de Todas las Escuelas Primarias" (the National Electronics Program for all Elementary Schools) that equips all schools with television, videos, and computers as part of the Informatization process of the Cuban society. There is a national computer science net from this ministry that is also connected to all other existing nets.

El Ministerio de Salud Pública -MINSAP- (The Public Health Ministry) actively participates in the Informatization and Information process of the Cuban society as a way to draw attention to good sanitary habits for the public. Its web **INFOMED** (http://www.sld.cu) -recognized by the United Nations General Secretary as an example of health net developed in a third world country- has all the Intranets of the Cuban Medical Universities connected, spreading the creation of local nets to hospitals, policlinics and family practices and their interconnection. It also allows access to different foreign and national biomedical net basis like CUMED, CUBACIENCIAS, and so on. This is very important because it facilitates the information necessary for the technical-professional advancement of all medical staff and paramedics. The access to this service as well as to all the other informational nets is completely free.

[2] **Note:** The term "New Technologies…" is used no because they are **NEW**, but due to their **constant development.**

The Project "Youth Computers Club" (Joven Club de Computación).

There is a net of institutions of **"Youth Computers Club"** that started in 1987. In these, any citizen regardless of age and scholarly level can take free classes related to Software (whether it is programming, use of different packages, etc.) or Hardware (maintenance, construction, and development). From its inception trough today, classes have been taught to more than 250,000 people.

Due to its distribution, there is at least one **"Youth Computers Club"** in each of the 169 municipalities throughout the country. All of them have fairly new computers hooked into the National Net (http://www.jcce.org.cu/). This institution, on a regular basis, organizes national contests to exchange experiences, and awards the best works (both in software and in hardware) that come from these centers all over the country. The most recent contest took place in May, 2001; **Infoclub** is the National Competition Convention of Youth Clubs.

Many national organizations directly benefit from these Clubs´ technological infra-structure, not to mention the results of their work, which is introduced and spread to general society.

- **Some thoughts regarding the current infra-structure and info-structure**

The national strategy requires important economic resources. The number of computers is still not enough for the current informational culture, which advances faster than the hardware available in the country. Furthermore, the band-width is not homogenous through out the country, therefore not all the links have the same speed, even though all the nets have access to Internet.

Based on the Intellectual Capital developed in the country (as the most strategic national resource), software is made for specific purposes. As part of an effort to continue the development of the country's Informatization and Information. Additionally, Intellectual Capital aids the creation and development of medical equipment to diagnose and treat illnesses; from the SUMA equipment (used for massive clinical analysis of the population) to the neurological surgeries, of minimum access, performed with the assistance of computers.

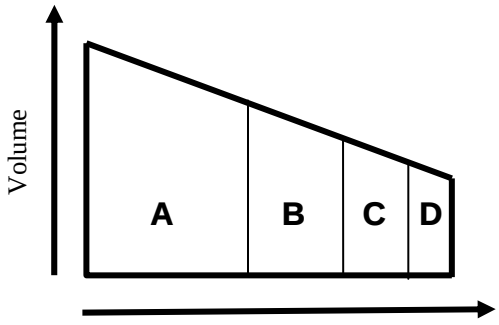
It is also important to mention as part of the Informatization, the creation of the national laboratory for date protection. This teaches Cubans about computer viruses and it develops anti-virus programs. There are various established warnings to alert people about different computer viruses in the country.

There are many other projects in each government institution and organization in the country that are also part of the national policy for Informatization and Information, yet, the Youth Computer Club, and how its infra-structure and info-structure is used, is an example of this policy

Part II. The Information Society from the point of view of an Information Professional.

A distinguishing feature in the development attained by humanity in the cognitive, investigative and decision-making processes is the importance given to information ***as a strategic resource for development***. From this, arises, perhaps, the term that identifies the current period: The Information Society [3] characterized by:

- √ the **overload of information**,
- √ **informational pollution**
- √ the **uneven quality of information** published or unpublished, and
- √ the **cumulative character of information and knowledge**.



The resulting **informational hyper-inflation** [4] (and its effect: **infoxication** [5]) constitutes one of the direct results of the accelerated progress of the sciences, also reflected in the **NTI&C** - and which is expressed in one of the characteristics of scientific information noted by Mikhailov, A.I., Chernii, A.I. and Guiliarevskii, R.S., (1976): Cumulatively **scientific information,** which is strongly related to the phenomenon of the concentration of same (scientific information) in time, by means of four stages in the production of information: **A-** the appearance of scientific facts; **B-** scientific theories, concepts and hypotheses; **C-** the body of theories, laws, concepts and hypotheses that constitutes the basis of knowledge of the sciences; and **D-** the scientific information on the nature of the conception of the world.

Beginning with the above, it becomes necessary to employ, in a coherent manner, the tools that permit a scientific reanalysis of the content of the information (white and grey literature). This is done with the objective of "*distinguishing the substantive information from the general", "identifying unknown public knowledge", and "the role and place of each investigating team". Consequently, a* **Scientific and Technological Monitoring**

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[3] **Note:** Although at the present time **INFORMATION** plays a decisive role, it is known that through out the development of humanity it has played and important role, but not at the present level.

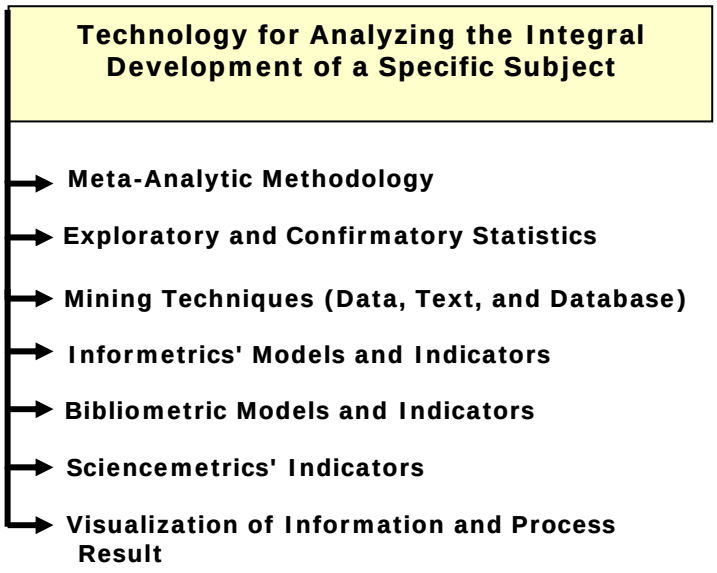
[4] **Note:** Informational hyperinflation a term proposed by the author to identify the present situation.

[5] URL: http://www.infonomia.com accessed in January 2001

Systems is designed, and it brings about the proposed "**Technology for Analyzing the Integral Development of a Specific Theme"**.

- ***Technology for Analyzing the Integral Development of a Specific Subject.*** **TAIDSS**

In the adjoining diagram are presented the tools that make up the proposed **Technology** (Figure A), of which only the **Meta - Analytic [6] Methodology,** will be analyzed on the basis of the theory of **Information Production Processes (IPP)** explained by Egghe, L. and Rousseau, R. (1990).



In this methodology, unlike the existing meta-analytic, ***the a Posteriori Analysis of the Statistical Power*** is included, as **a criterion for stratification (clustering**) of the **methodological quality of the information** (*research carried out*) with the purpose of increasing the consistency of the results of said process (analysis of the information). In this context the role of the Information Professional in the processes of the analysis of the information is analyzed.

As a computational tool for processing of bibliographic and content characteristics of the information sources, software with a specific purpose is used: bibliometric, informetric and science-metric, called **INFOCAM [7]** (designed and in use since 1994). As well as the usual functions of all data base management software, plus those of statistical analysis and production of graphics, it consists of the following modules: Data Base Management -DB (creates and facilitates the conversion to different formats of the DB), Informetric Models (Bradford, Lotka, Leimkhuhler, etc.), Analysis of the Quotations and Analysis of the Text. Said software has been used for processing large volumes of information on research, doctoral theses, master's theses, etc.

- **Information Production Processes (IPP)**

[6] **Note:** The Meta - Analysis was proposed in 1976 by the scientist Glass, Gene (1976) and Glass, G. and Smith (1981)

[7] Morales - Morejón, M.; Barquín Cuesta, J.P. INFOCAM: Software of bibliometric, informetric and sciencemetric purposes. Registered in the CENDA, La Habana, 1998

All processes of analysis of information, including the meta-analytic methodology, can be studied in the light of the postulate of L. Egghe and R. Rousseau (1990) on the theory of the Processes of the Production of Information.

An **IPP** is a triad of the form:

(S, I, V)

where:

S - represents the **Source of Information**

I - represents the **Items** (bibliographic and content characteristics),

V : S → I for **S = 0** (null or empty set) then **I = 0**

Consequently: **V(S,I) = V(0) = 0.**

V - Function that represents the relation between the Sources of Information **(S)** and the items **(I)** contained in these in the Process of Production of Information **(V)**

In the **Meta-analytic Methodology** the elements that form part of the **IPP** can be identified as follows:

S - constitutes the **set of jobs** (Doc.) recovered that satisfy the criteria for inclusion (*sources of information).*

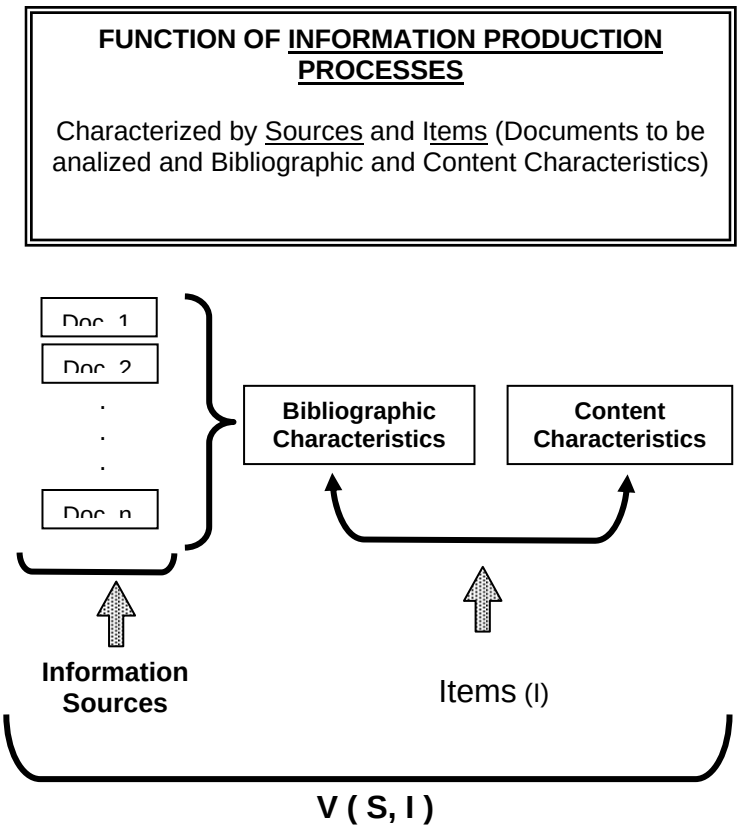
I - are formed by the **Bibliographic and Content Characteristics** (read *Methodological and Substantive Characteristics).*

V : S → I Function that represents the relation between the **set of jobs recovered** (Sources of Information) and the **bibliographic and content characteristics** (items) identified in the **source of information.**

The function **V(R, I)** (which represents *the process of production of information-revision)* depends on the **sources of information "S"-** jobs, the object of the analysis and synthesis- and **the items (I) - bibliographic and content characteristics** that are identified in the *sources of information.*

When S=0, then one says there are no sources of information. In other words, when the located and recovered jobs do not satisfy the criteria of inclusion, then it is not possible to identify in the null set **S** the **items** (Bibliographic and Content Characteristics), which renders it impossible to perform a meta-analytic revision, since **I** is undefined.

In the following diagram the function **V(S,I)** of the **IPP** is synthesized on the basis of the analysis of the information, using the meta-analytic methodology.



According to the authors Egghe L. and Rousseau R. (1990), the theory of **Information Production Processes (IPP)** constitutes the entire basis of the theoretical foundations of informetric laws, and more specifically the **IPP** as texts from the point of view of fractal theory.

Consequently the entire mathematical basis of the different methods and techniques of information analysis, i.e. information processing, is not unrelated to the modern profession concerned with the activities of library science, such as those of information. This undoubtedly opens new horizons for said professionals, and even more in the Information Society, as a preliminary step toward the Knowledge Society.

In other words, the intellectual labor of the reviews should be framed in the intellectual labor of the informational vigilance services as support for the scientific and technological intelligence by means of completely ethical methods and techniques, in the analysis of literature and available information (white [8] and grey [9] literature). Consequently, in this context one also analyses the **role of the Information Professional in the processes of information analysis.**

The production of literature and information reviews should not be considered solely as a formal process. This is also as a systematic and sustainable endeavor to the extent that this progress increases and requires the knowledge of what others are doing and how they are solving problems. In order to contribute to the optimization of the employment of resources and the assurance of attaining the anticipated results.

As a direct result of the use of the (NTI&C) as an irreplaceable tool in all scientific endeavors, specifically in Library Science and Information Science, it is possible to

[8] **White Literature** - That which is published in the form of article, book, monograph, etc. and be accessed by the public in a systematic way.
[9] **Grey Literature** - That which is a product of events, congresses, doctoral and master's theses, etc., which in general is not published in a systematic way.

access volumes of information never before seen by scientists. The **amount of information** that users of information confront, exceeds the individual possibilities of its analysis and assimilation. This leads to the search for methods and techniques that may make it possible to transform the **"Quantity of Information into Quality of Information".** This is done as a function of the creation of knowledge, to discover the unknown public knowledge by means of the logical, abstract process of thought, whenever it is desirable. As a result of the processes of analysis, synthesis and synergistic integration of the information [to ensure] that **quality of** i**nformation** may prevail over **quantity of information.** All the above, by a methodology that would make replication possible. Subject analyzed in the work "**Conocimiento basado en la evidencia informacional**" [Knowledge based on Informational Evidence] Avilés-Merens, Morales-Morejón (2000).

- **The Meta - Analytic Methodology with the a posteriori power analysis**

Beginning and development of the Meta - Analysis

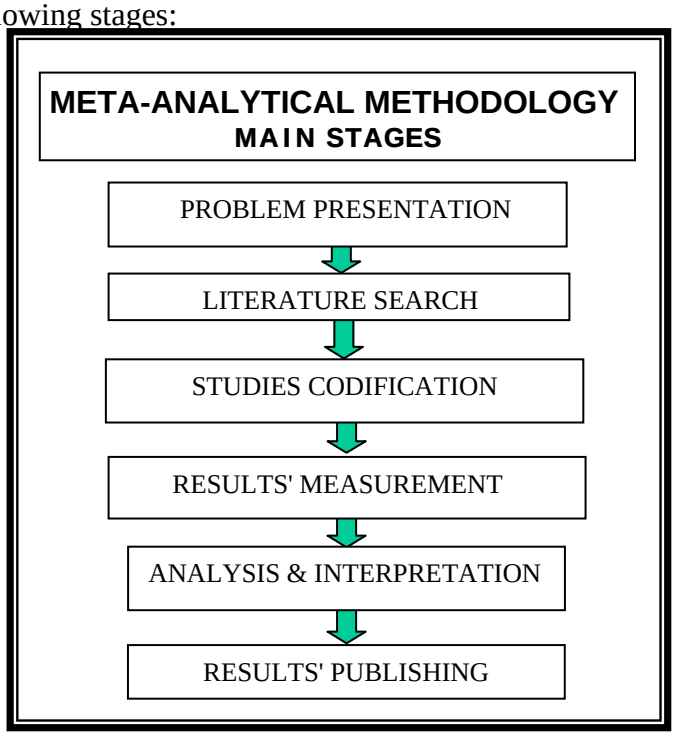
In the literature reviewed, there are different names to call the product of the meta - analytic information, some of them are: **Quantitative Review, Meta - Analysis, Systematic Review, Literature Review, Bibliographic Research-Revision, Bibliographical Critical Review, Revision Article, Integration Research Revision, Quantitative Analysis of Research, Quantitative Synthesis,** and **Reviews** (analytic, evaluative-analytic, depending of the kind of intellectual work done), among others. However, most of them use the term **META - ANALYTIC REVISIONS** (Revisiones Meta-Analíticas in Spanish).

The direct antecedents of this methodology, according to the literature consulted (Egger, M. and Smith, Davey, 1997), is one from 1904 by Pearson, Karl ("Report on certain enteric fever inoculation statistics"). This work is recognized as one of the first of its kind, which tries to use the quantitative analytic techniques in literature. These authors believe that Beecher, H.K´s work, "The powerful placebo" published in 1955 in the JAMA magazine is "the first meta - analysis". Dickersin, K. and Berlin, J.A. (1992), besides referring to Person, Karl´s work also mention Tippett, LHC´s works published in 1931 as "the methods for statistics". Fisher, R.A., in 1932, writes about "Statistical methods for research workers". Yates, F. and Cochran, W.G., in 1938, wrote about "The analysis of groups of experiments". Mosteller, F. and Bush, R., in 1954, mentioned the "Selected quantitative techniques" and Cochran, W.G., in 1937, about "Problems arising in the analysis of series of similar experiments" and "The combination of estimates from different experiments" in 1954. In addition, the Spanish professor Gómez, Benito J. (1989) wrote "The meta - analysis basic concepts have already been used by Thorndike (1933) and Ghiselli (1949), yet, it is not until Light and Smith (1971) that the problem of integrating quantitatively the results of different studies is specifically proposed".

In our research, we found Cohen, J.´s work (1992) done in 1962 in psychology as a pooling of published works from the "Journal of Abnormal and Social Psychology".

The revisions of the meta - analysis are structured from two main points, regardless of the techniques used: the qualitative and quantitative perspectives regarding handling of literature and information. Avilés-Merens, Rafael´s doctoral thesis (2001) deals extensively with this topic. Everything related to the different variables of the meta - analysis is presented in this work.

The meta - analytic methodology has the following stages:



1. **Problem Presentation:** Once **the problem** is precisely defined as the study´s focal point, then the general and specific **objectives** are defined and the **hypothesis** are elaborated. These hypotheses can be defined and re-defined at different stages in the process. Additionally, the variables **conceptual and operational definitions** are presented and the Observation Unity (ies) is (are) defined.

2. **Strategic Design to look for Information-Primary Studies:** It is important to have Glass, Gene´s idea et al.(1981) in mind at this stage: "**The way something is looked for, determines what will be found; and what is found, is the basis for the studies´ integration conclusions."**

At this stage, different Techniques to locate and recuperate information should be use simultaneously, as well as different criteria to include, exclude, and eliminate information. The later criteria have been proposed by Avilés-Merens in his doctoral thesis to specified current methodology regarding primary studies considered in meta - analysis.

The techniques and procedures to locate and recuperate information are constantly evolving. Some people believe that this could be done by those who use the information; however, since this stage is so relevant (as explained earlier), it is completely necessary for the Information Professional to participate in it. He will be able to organize and present information in a very valuable way. Furthermore, he has experience doing so, and substantiates the type of data (whether published or not) used. Avilés-Merenz in his doctoral thesis proposes steps that give the information professional the educational and scientific background from an info-economic point of view.

Here, it is relevant to mention information chaos currently in the Internet. This is not the topic of this paper, yet, due to its similarity and impact at this stage, it deserves, at the least, to be mentioned. The main problem currently with the Internet is the Information's

organization and digital representation due to the **initial absence of an Information Professional** in order to design and organize the Information Sources. This is the main criticism and/or limitation that the **World Wide Web** has.

When a search is done using the Internet, the limitations due to the lack of **Digital Organization of the Information** is manifested by the impossibility to identify a high percentage of relevant and important papers related to the topic in search. Moreover, there are many different software and thesauruses used in any specific science, thus the biggest limitation is the lack of an adequate Digital Documentation Process. This has as a consequence, only a small portion of useful information retrieved, while the rest is just **"noise"** to the research.

An Information Professional is able to find more documents compared with other professionals based on his knowledge and experience using bibliographic techniques, search engines, and retrievals by key words.

Gómez, Benito (1985) recommends as a temporary solution to use the following information identification and localization techniques: **-Ancestry Approach** (retrospective), **-Descending Approach** (prospective), **-Use of "key" or "descriptive words"** (control language), **-Use of "invisible schools or "invisible academies"** as sources of new or not published information, and **-Identification and later Exchange with institutions or centers leaders in the topic of study**, which enables access to very important material.

3. **Studies Codification:** At this stage, the goal is to evaluate if the primary studies´ results go hand in hand with the identification of characteristics (methodological, substantive, and extrinsic).

Hunter, J.E. et al. Cited by Scwarzer, Ralf (1989) states: "codification can be 99% of the work's integration process. This work can even be a complete waste"; "if the variation (heterogeneity) is done only by a sample error, all the codification's work has been useless".

The codification of the studies requires the creation of a "Codification Group". It also needs a "Codification Guide or Book" where it will specify the codification characteristics. The codification process should be evaluated in terms of validity and reliability.

It is proposed to organize the characteristics that are studied from the point of view of Library and Information Science in: **Bibliographic and Content Characteristics.**

Once the relevant and appropriate information has been collected through the meta - analytic process, **it is proposed to add to the current methodology the following: the a posteriori Analysis of the Statistical Power**. This is done with the purpose of achieving results with higher consistency. This is a **criteria to classify studies according to its methodological quality** (proposed by Avilés-Merenz in his doctoral

thesis) that brings about at least three meta - analysis with lower, medium, and high quality power, according to Cohen, J.´s classification (1992) of a posteriori Statistical Power.

4. **Result's Measurement:** This stage's goal is to find a **common metric scale** to measure **all the studies´ results**. The following are some used: **- Signification Level [10]** "p-calculated", **-Effect Size[11]** of each study.

Even though the use of each of them brings about different numbers and give different information, both measurements are related. Therefore, it is possible to change, for example, the effect size to its signification level and vice-versa.

Kinds of Effect Size: Different effect size measures have been developed. Some are parametric, for those variables that can be expressed in a quantitative or semi-quantitative scale, and some non-parametric, for those variables expressed in a qualitative (nominal or ordinal) scale. In the first group, the most common ones are based on the mean difference between two experimental conditions (treatments or interventions) and those based on the coefficiency´s correlation.

In 1984, Cooper cited by Sánchez Meca and Ato García (1989) referring to the use of one or another way to measure the study results (signification level or size effect) states: "The signification statistical level can only determine if an experimental effect is different from zero or not. On the contrary, Size Effect is able to answer: How is it different from zero?". He also added: "and consequently the information it provides has more meaning for the purposes of study."

5. **Data Analysis and Interpretation:** At this stage, once the studies´ results have been quantified through size effects or signification levels, to a common metric, they are synthesized to get a global and representative index of results. This should be accompanied by exploratory statistic's measurements, such as typical deviation, ranges, etc.

The results are rarely homogenous enough to state that the global measurement is representative of all studies. **It is precisely in these situations when the meta - analysis happens to be very useful.** This is done by looking at the causes that might explain contradictory results (if there are any) and finding knowledge gaps in a specific area. This implies future research at such topics with the goal of finding its causes.

The variability of the study results can be dealt with efficiently when the effects of specific characteristics such as bibliographical and/or content base (previously coded) are analyzed, since these characteristics influence the Size Effects. In this case, the size

[10] **Signification Level-** informs if the results have been achieved by luck. Strube, M.J. and Hartman, D.P. (1983)

[11] **Effect Size** - states the intensity of the relationship or the interested effect. Strube, J.J. and Harman, D.P. (1983)

effects act as dependent variables while the characteristics of the studies are the independent variables.

The meta - analytic methodology proposes different procedures (using statistical methods). Glass, G.V. et al. (1981) proposes using descriptive statistical to synthesize meta - analytical global results. Tukey´s exploratory methods like: the stem-and leaf and the Boxplot are very useful as well (Tukey´s exploratory data analysis).

6. **Study´s Publication:** As any scientific investigation, the last phase is the publication of the results; so it is how the meta - analytical revision ends.

The publishing of results is very important. In 1996, for example, a group of researchers-reviewers and users of Medical Sciences got together in the **"Conferencia sobre Calidad de Elaboración de los Informes de los Meta-análisis -QUOROM-"** (Conference about Quality of Reporting of the Meta - Analysis)" (2000). On that occasion, the topic discussed was how to increase the quality of the meta - analysis´ reports (specifically in the meta - analysis of clinical control essays). Also, during the conference, the declaration **QUOROM** was written. This declaration consists of a **"quality control protocol"** and a **"fluid diagram."** The protocol describes the best way to present: a summary, an introduction, methods, results, and discussion of a meta - analysis report; while the diagram describes the minimal necessary stages to do a meta - analysis in Clinical Controlled Essays (CCE). This guidance can be use with any meta - analysis study.

Regarding this summary, it is important to mention that it should be presented to the reader in such a way as to give him a general view of the content. Consequently, it should include: objectives, design (meta - analysis), statistical methods, main measurements of results, the results and conclusion.

An aspect that should be stressed is the emphasis done in **QUOROM** that "the quality of the reports is not the same as the meta - analysis quality (internal validity). This depends more on the scientific intrinsic value than in the way his methods are done explicit (which is QUOROM´s main declaration). For the first point, it is necessary to know both, the techniques to do a systematic revision and the topic studied; moreover, it is important to have experience as a researcher. This cannot be obtained with guidance or recommendations alone, even though, it can help" (2000).

This statement done by QUOROM reminds us again about the need to review a study as a team, and of course, of the relevance of having an Information Professional present, even in the results´publishing stage. An Information Professional will help in this last stage because the meta - analytical results and conclusions need to be communicated in an effective and scientific way. Furthermore, it is important to know the information flow to be able to locate such works in the pertinent publishing, according to the topic.

- **The Information Professional's Role in the Information's Analysis Processes.**

In this area, it is proposed that a certain level of minimal knowledge is necessary to allow the **Information Professional** to act as **the one that transmits knowledge.** This is based on what national and foreign specialist state about the need of a **Modern Information Professional in the Society of Knowledge.**

Finally, **"The Role of Bibliographic Revisions in the Society of Information"** is analyzed based on the mining techniques (data mining, text mining, database mining). All of these belong to the informetric science based on current conceptions of this science as the instrumental discipline of Information Science.

From Engels´ material's dialectic cited by Rosental, M. and Iudin, P. (1964) who write: **"Transit of the quantitative and qualitative changes",** they state: "All modifications are **transformations from quantity to quality.** The consequence of a quantitative change is the amount of movement, regardless of its form that is inherent to what is communicated or the body. This is a strong proof of the dialectic character of nature's development as passage from quantitative to qualitative changes…".

The Analysis, Synthesis and Integration of Information (from now on abbreviated to **Information Analyses**) in Information Science are processes from quantitative to qualitative changes.

From the current information through analyses, synthesis, and integration what is "old" is being extinguished while what is "new" is being increased. In other words, knowledge is extracted from current information through a **distillation process.** This process consists of adding value to the different stages of the model of information elaboration towards knowledge in actions.

METHODOLOGICAL META-ANALYTICAL VARIABLE FROM THE PERSPECTIVE OF AN INFORMATION PROFESSIONAL

ACCTIONS

STAGE I
“CONSULT”

- DEFINE
- IDENTIFY
- LOCATE
- CONSENT
- RETRIEVE

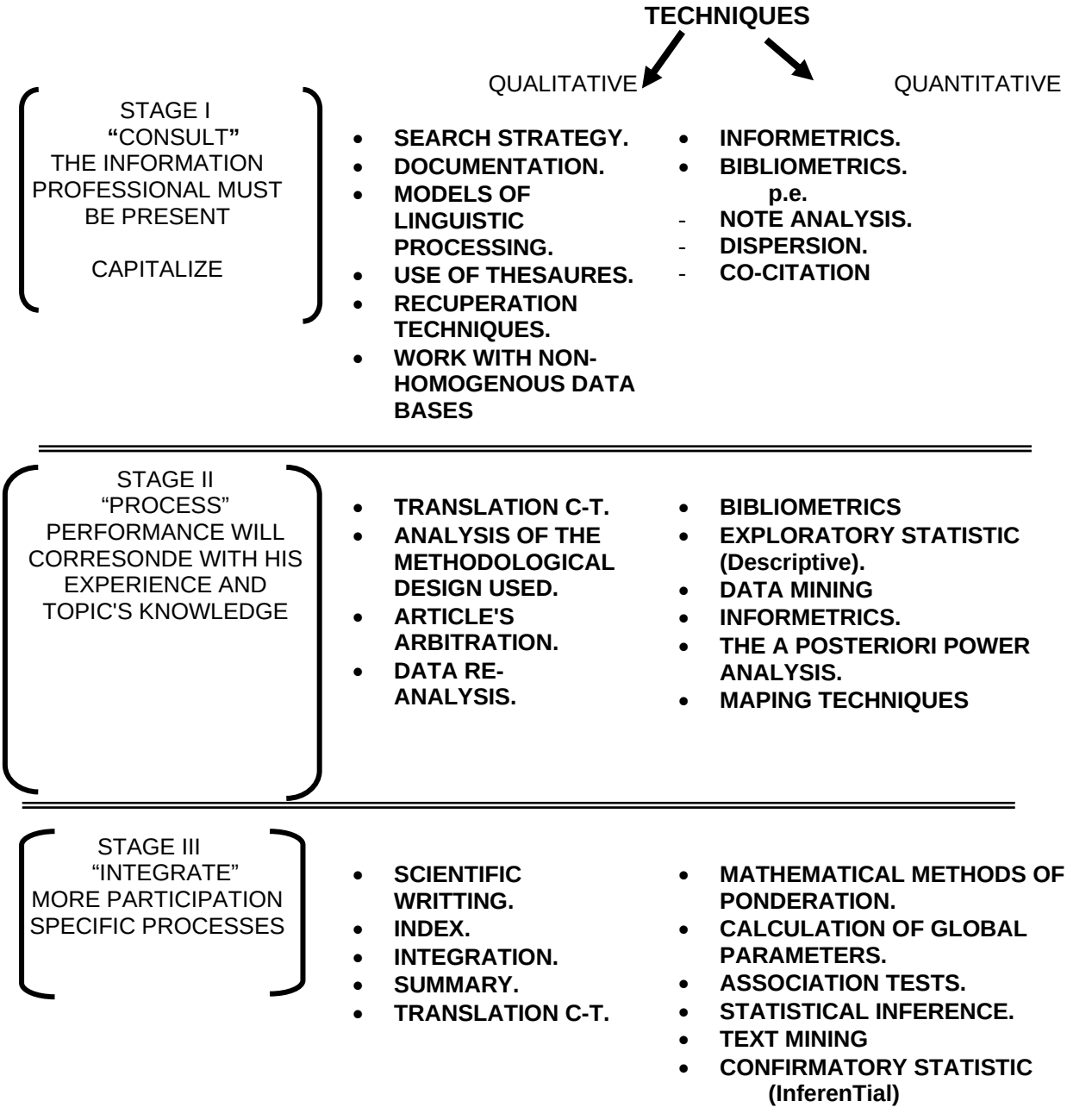
STAGE II
“PROCESS”

- DESCRIBE.
- PROCESS.
- EVALUATE[TECHNICAL-SCIENTIFIC]
- SYNTHESIZE.
- QUALITATIVE INVENTORY
- QUANTITATIVE INVENTORY
- SCIENTIFIC ARBITRATION

STAGE III
“INTEGRATE"

- NORMALIZE.
- CODIFY
- PONDERATE.
- INTEGRATE SYNERGICALLY
- DISSEMINATE.

INFORMATION PROFESSIONAL TECHNIQUES AND ROLE
ACCORDING TO STAGES.



General Conclusion.

The Informatization and Information process in Cuban Society is based on a net of literate people that are the **Intellectual Capital.** This has allowed a rapid introduction and availability of these technologies.

The country, based on its scientific and technological advances is not only able to produce but to consume "cutting edge information." This is a result of the country's advances and discoveries with options of the meta - analyses of scientific information.

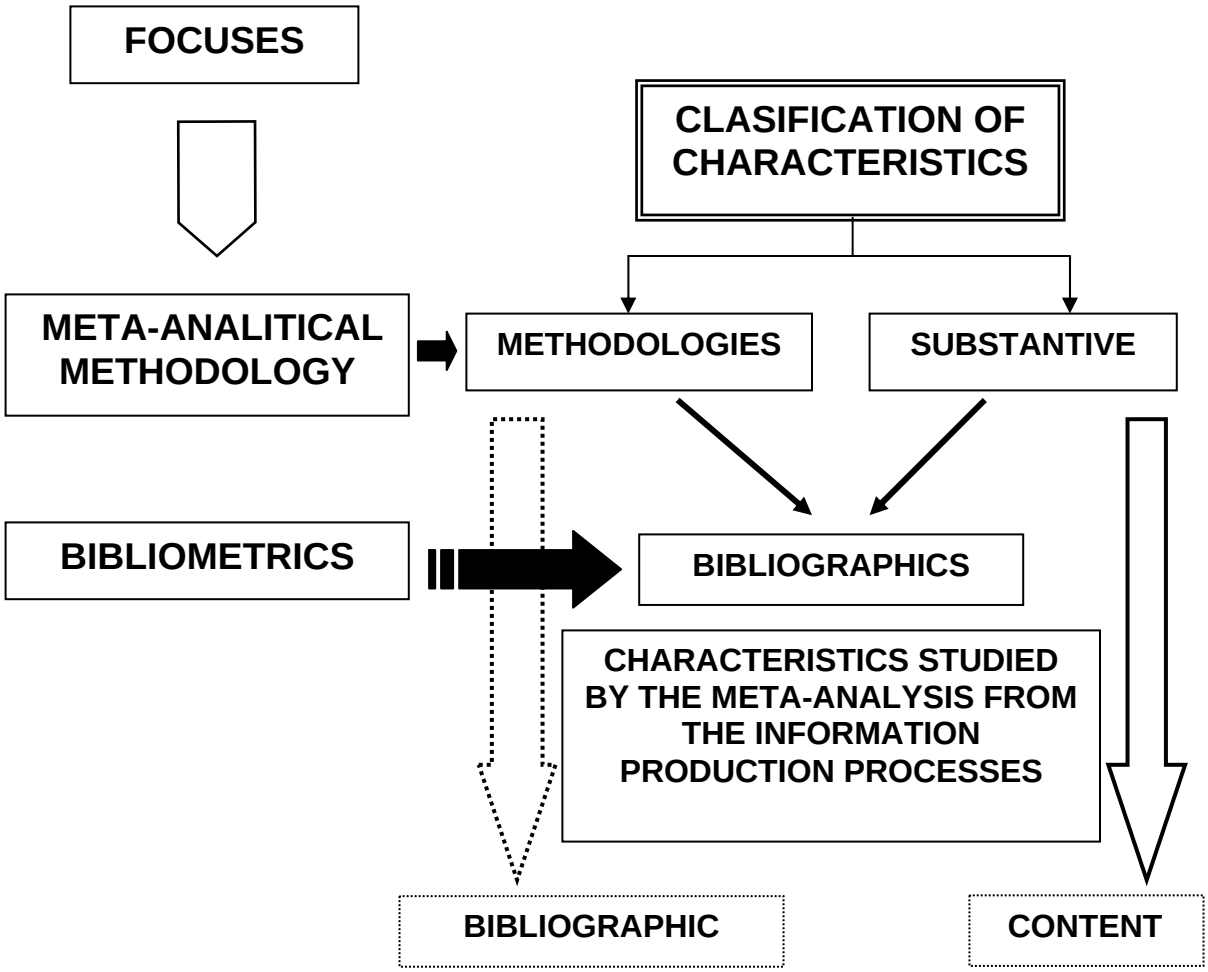
"The Technology for Analyzing the Integral Development of a Specific Subject" enables a systematic analysis in order to obtain very valuable data. As one of its components, the meta - analyses is a kind of process that makes very clear the difference between **document analysis** and **information analysis.**

In the document analyses, the complexity and intensity of the intellectual work is lower than in the information analysis. In this technological process of preparation and delivery of a meta - analytical result, it is necessary to have a multidisciplinary team. On this team, all the players have a specific role in order to achieve a greater objectivity in the research.

The inclusion of **the a Posteriori Analysis of the Statistical Power** allows the study of a possible dependency between results and methodological quality of the information that it is analyzed.

The focus on **"The Technology for Analyzing the Integral Development of a Specific Subject"** should be systematic and complete. It should adequately combine different methodologies and techniques to process literature (continent) and information (content). These should also have the basic content of Library Science and Informetric to detect the information flow necessary to achieve a more complete research. This focus has not been used in any meta - analytical methodologies since its creation is not related to the theory of information production (IPP) as it is proposed in this paper. In addition, it does not usually include anything related to the efficiency of decision making on this topic to include valuable scientific and technological elements from a benchmarking perspective.

Characteristics studied by the meta - analytical methodology from the Perspective of the Information Production Processes. Summary Graphic:



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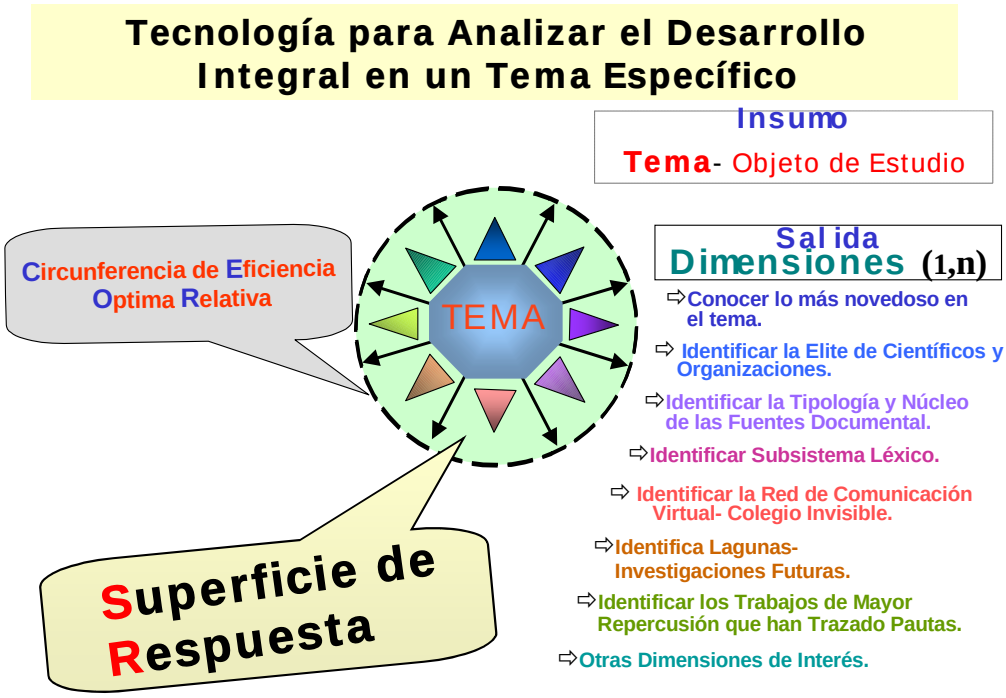

Figure A

Gratitute

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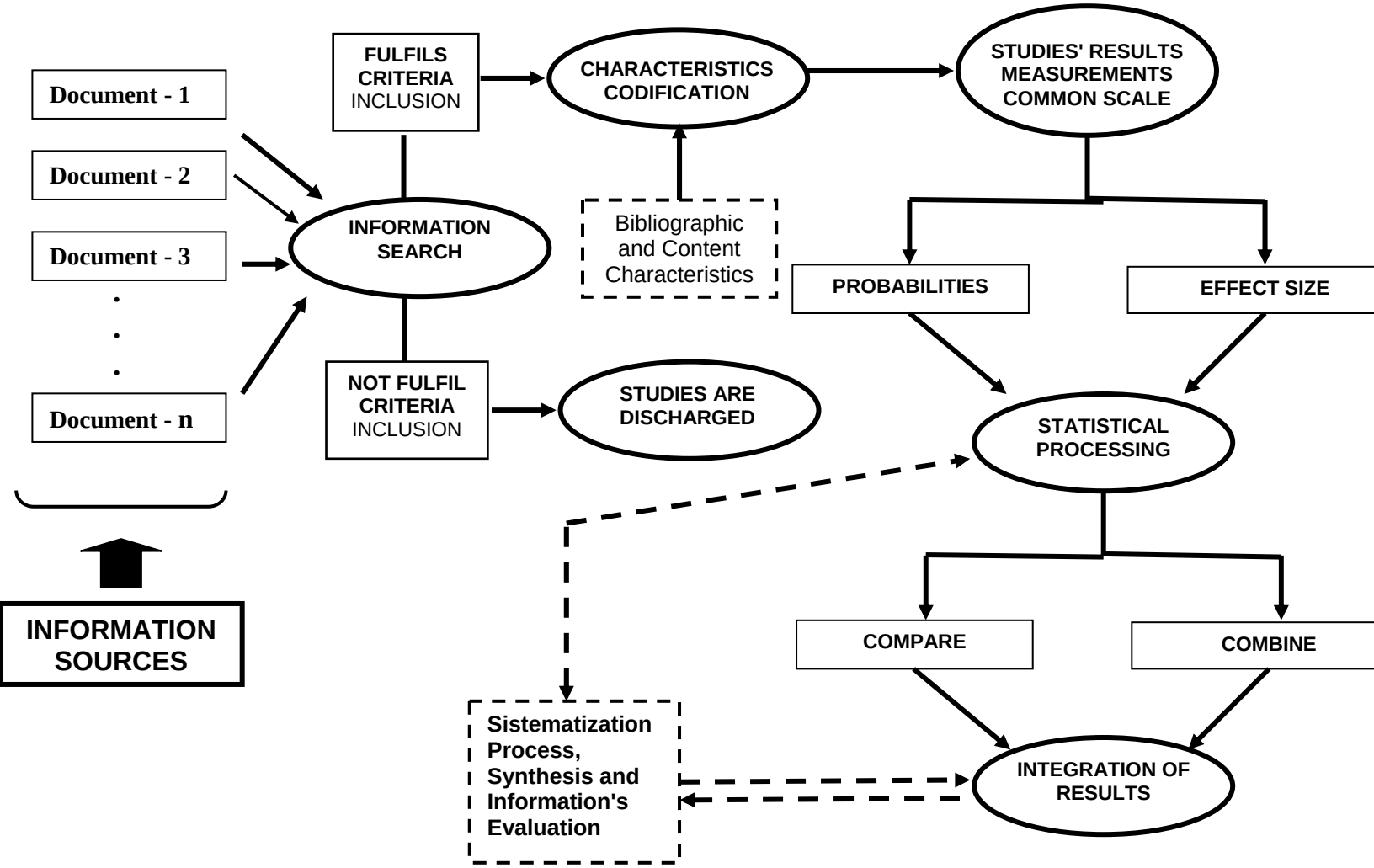
Document - 1
Document - 2
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INFORMATION SOURCES
FULFILS CRITERIA INCLUSION
CHARACTERISTICS CODIFICATION
STUDIES' RESULTS MEASUREMENTS COMMON SCALE
INFORMATION SEARCH
Bibliographic and Content Characteristics
PROBABILITIES
EFFECT SIZE
NOT FULFIL CRITERIA INCLUSION
STUDIES ARE DISCHARGED
STATISTICAL PROCESSING
COMPARE
COMBINE
Sistematization Process, Synthesis and Information's Evaluation
INTEGRATION OF RESULTS

HACIA LA CONSTRUCCIÓN SOCIAL DE LAS TECNOLOGÍAS DE COMUNICACIÓN E INFORMACIÓN EN MÉXICO. CAFETICULTORES Y BRECHAS TECNOLÓGICAS.

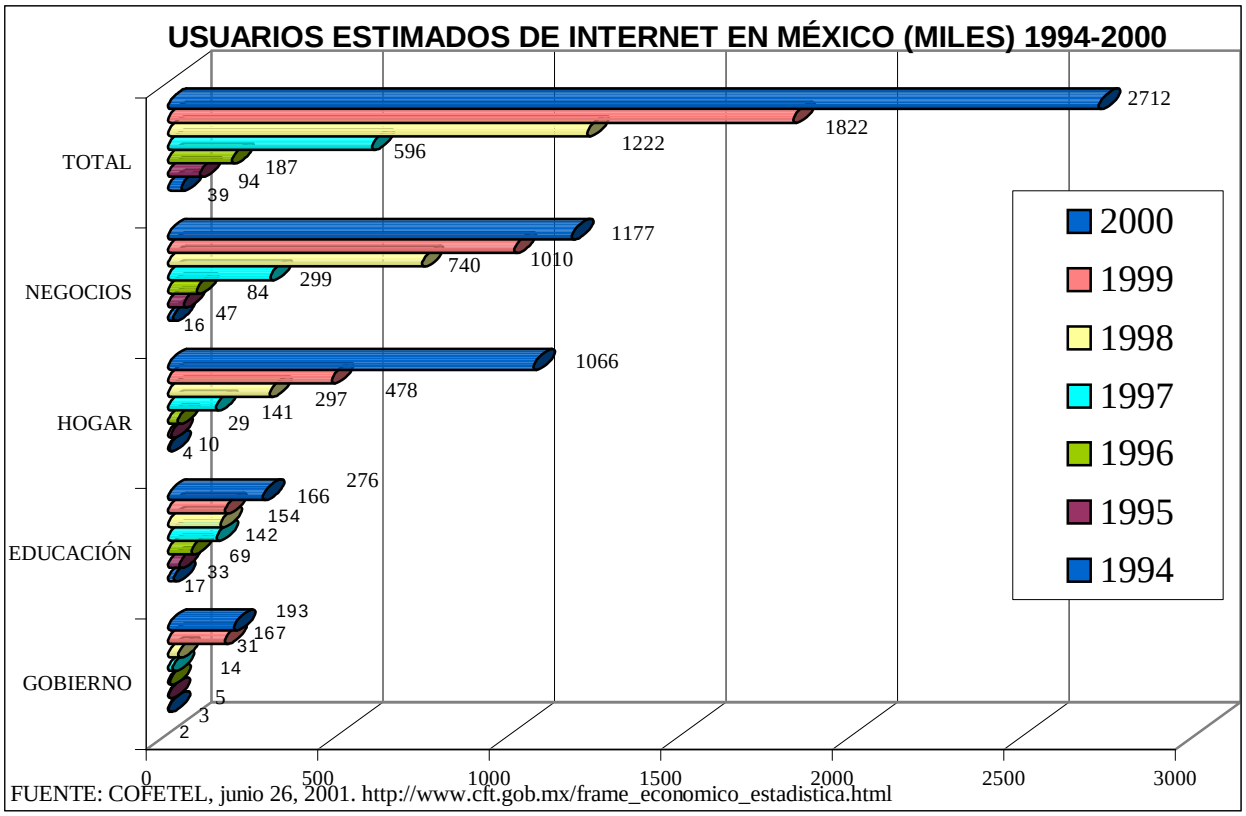
Carmen Pérez Camacho
Julio 15, 2001

No existe un consenso acerca de las ventajas y desventajas que implica el uso de las Tecnologías de Información y Comunicación en los distintos ámbitos de la sociedad. Por ejemplo, ciertos autores argumentan que únicamente las élites de cada país son las beneficiarias directas de cualquier producto de comunicación que entra al mercado acrecentando con ello la barrera que las separa de los demás ciudadanos (Barducci, 2000). En esta lógica, las TIC contribuyen, como dijo Román Gubern en una entrevista, a "incrementar y perpetuar la dualización de las sociedades" (Villalobos, 2000). Frente a estas concepciones existe su contraparte que señala a las TIC como un medio de desarrollo, sobre todo para los grupos que tradicionalmente han sido marginados: campesinos, indígenas, estudiantes de escuelas públicas, etcétera (Cebrían, 1998). Al respecto Credé y Mansell (1998) promueven las TIC como rutas que llevan a la transformación social con beneficios futuros para los países en desarrollo incluyendo empresas, gobierno y sociedad civil.

Por nuestra parte, consideramos que las TIC pueden ser reales instrumentos de cambio a condición de que se tome en cuenta que dichas tecnologías no funcionan de manera aislada; que los beneficios y riesgos relacionados con ellas dependen del contexto social, económico y organizativo en el cual se las aplique. En el caso de México podemos observar que el uso de las TIC, particularmente las computadoras e Internet, han impulsado importantes cambios en la forma en que millones de mexicanos se educan, trabajan, comunican, informan y disfrutan de su tiempo libre.

Ahora bien, a pesar de la trascendencia del proceso y aún cuando en los últimos años se ha incrementado de manera considerable el número de personas que se benefician del uso de semejantes tecnologías, existen todavía bastantes rezagos como lo demuestran los cálculos de la Comisión Federal de Telecomunicaciones (COFETEL) la cual nos indicaba que para el año 2000, sólo había 2 millones 712 mil internautas en México, es decir, apenas el 2.8 por ciento de la población total del

país con la posibilidad de usufructuar las ventaja de las nuevas herramientas de comunicación e información (véase gráfica 1). Cabe destacar, igualmente, que de este grupo de usuarios sólo el 1 por ciento se agrupaba en los llamados *hosts* educativos en comparación con los dedicados al entretenimiento y al comercio lo que nos sugiere un grave sesgo en la oferta de la información que fluye por el ciberespacio, al punto de que se podría hablar de un "analfabetismo virtual" (véase Anexo 1). Estos datos resaltan, aún más, cuando observamos que mientras los Estados Unidos tienen más del 90 por ciento de las escuelas públicas con acceso a Internet, en México tan sólo el



FUENTE: COFETEL, junio 26, 2001. http://www.cft.gob.mx/frame_economico_estadistica.html

6 por ciento cuenta con tal herramienta. Todavía más: mientras que en el primer país el 71 por ciento de los planteles educativos ofrecen entrada a la red en el propio salón de clases, en México cuando mucho se alcanza el 1 por ciento de las escuelas (Avilés, 2001).

Como se puede observar, existe todavía un gran trecho tecnológico por cubrir para alcanzar cifras como las norteamericanas y, aunque en los últimos tiempos, se ha intentado reducirlo mediante la implementación de programas gubernamentales estos se han enfocados a subsanar la problemática de manera un tanto superficial, pues lo

que los caracteriza es el hecho de desdeñar el gran número de factores que se entrecruzan y que es necesario tomar en cuenta para explicar y analizar este fenómeno. En este sentido, la antropología social podría ayudar a conciliar dos aspectos de este proceso: lo técnico y lo sociocultural.

UN ACERCAMIENTO DESDE LA ANTROPOLOGÍA

Sin dejar de reconocer la importancia de lo cuantitativo, hay que hacer una fuerte crítica a la literatura que reduce la explicación de la brecha tecnológica a una descripción general del perfil que tiene el usuario de las TIC (Trejo, 1996 y Gugerli 1997), contabilizando únicamente el uso creciente de la red (Chauvet, 1997; Trejo, 2000; Sánchez, 2001), y una propuesta de conceptos como los de hipertextualidad del lenguaje y la comunicación (Sánchez, 1997; De Kerckhove, 1999 y Wolton, 2000) los cuales, si bien han llevado el fenómeno a un alto nivel de abstracción y generalización, por otra parte se han olvidado del contexto, las circunstancias, la acción y reacción de los actores y, sobre todo, de considerar que aquello catalogado como *virtual* tiene su impacto en lo real, lo palpable, es decir, en el mundo de vida.

Una disciplina que tal vez pueda revitalizar la discusión nos parece que es la antropología social la cual, desde hace mucho tiempo, se ha ocupado de analizar el impacto de la tecnología en sus distintas formas y desde varios enfoques. Por ejemplo, se ha pasado de considerar a la tecnología como medida del grado de desarrollo de las distintas sociedades (donde, por supuesto, el estadio más alto lo constituían las sociedades occidentales con su producción industrial), y de verla sólo como un aspecto más de la cultura material, hasta otra en la cual se le otorga un papel central no sólo en las sociedades llamadas “tradicionales” sino también en la vida cotidiana de las personas en las sociedades complejas. Igualmente, ha cuestionado que las nuevas tecnologías impliquen *per se* impactos negativos y ha minado el determinismo tecnológico alimentado en gran parte por la ideología del desarrollo que divide al planeta en países del "primer mundo" y “subdesarrollados”, poniendo énfasis en las relaciones de poder que determinan las diferencias entre sociedades contemporáneas. Pero, sobre todo, se ha preocupado por considerar a la tecnología como una construcción social en la cual se encuentran involucrados los intereses de distintos grupos sociales, los significados diferentes e incluso opuestos sobre la misma y las negociaciones y cambios sobre los distintos artefactos en todos sus componentes. En este sentido, nos dice Pinch (1997:28):

> No sería satisfactorio si el análisis de un constructivista social de, digamos, un sistema de satélite estuviese basado simplemente en demostrar que el *hardware* final y lo que se supone debe hacer, dependa de una serie de negociaciones entre una compleja red de instituciones y diferentes grupos de usuarios. Un análisis más satisfactorio tendría que demostrar la manera en que estaba inmerso el funcionamiento técnico del sistema en las decisiones sociales y negociaciones.

De manera similar, desde la sociología de la tecnología, Mackay (1997) argumenta que los efectos e importancia de los sistemas técnicos no se encuentran inscritos en su diseño que limita los distintos usos que se le pueden asignar sino que "la tecnología lleva una 'doble vida': una que cumple con los propósitos de sus diseñadores, y otra que funciona a sus espaldas, con consecuencias no intencionales y posibilidades no anticipadas". Así, los artefactos tecnológicos no son puramente utilitarios o funcionales, sino que también sirven como símbolos culturales, y como tales proveen el material para nuestro lenguaje y nuestras formas de pensar, es decir, son transmisores de significados. Esta visión más amplia que considera otros niveles y etapas del análisis de una tecnología (creación, mediación y recepción o la producción, distribución y consumo), y que inciden en el reconocimiento de la importancia que tienen los consumidores en el desarrollo de toda tecnología es, precisamente, lo que creemos que frecuentemente se deja de lado en las propuestas cuantitativistas gubernamentales y privadas de desarrollo informático en México, las cuales sólo miden el progreso e impacto de las TIC por el número de artefactos que se introducen dejando de lado el contexto sociocultural que contempla los significados, percepciones, expectativas e intereses de las personas que deciden adoptar o rechazar las tecnologías[1].

Políticas gubernamentales de desarrollo tecnológico y el sector social en México.

Cabe señalar que, a pesar de las cifras desalentadoras mencionadas al inicio del ensayo, existen esfuerzos gubernamentales y privados por incentivar al sector informático en general y, en particular, el uso de computadoras e Internet en México, lo cual se refleja en el aumento de los Proveedores de Servicios de Internet (ISP), en las reformas al marco jurídico, en el surgimiento de empresas especializadas, en la aparición de una específica fuerza laboral y en la creación de programas gubernamentales *ad hoc* como sería el caso del llamado proyecto “E-México” consistente en un primer momento en enlazar a todas las cabeceras municipales por

[1] Para una discusión más detallada ver Apadurai (1991); Díaz (1997); Bijker y otros (1987); Harris (1997); Kearney (1995); Pfafeenberger (1992 y 1997)

medio de Internet satelital y, en estos momentos, mediante la introducción de las llamadas "Plazas Comunitarias" en las zonas más marginadas del país las cuales funcionarían como centros de computación con servicio de biblioteca tradicional y virtual, educación a distancia vía Internet y como plataforma de proyectos productivos[2].

Tal vez debido a las características del actual gobierno en México, que enfatiza la creación de pequeñas empresas dentro de un contexto de liberalismo con acento en la rentabilidad y la eficiencia, tales proyectos nos parece que continúan dentro de la lógica cuantitativista señalada anteriormente con el riesgo de enfrentar serios problemas al no tomar en cuenta el aspecto sociocultural de la tecnología, como también lo demuestra otro proyecto gubernamental en progreso llamado Programa de Fomento a Empresas Comercializadoras del Sector Agropecuario del Sector Social (PROFECA) de la Secretaria de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación (SAGARPA). Dicho programa federal, iniciado en 1999, si bien se dirige al apoyo de las distintas áreas de la comercialización de empresas dedicadas a la producción de granos básicos y café, también se puede caracterizar como un proyecto centrado en el apoyo tecnológico al medio agropecuario habida cuenta que entre sus objetivos se encuentran: apoyar económicamente en la capacitación de recursos humanos[3] y proporcionar asistencia técnica[4] y equipamiento[5] a empresas que lo soliciten[6].

No obstante que PROFECA ha tenido un papel importante en la dotación de equipamiento y apoyo técnico a fin de que las empresas que agrupa reduzcan la brecha tecnológica que en materia de herramientas de comunicación produce el proceso de globalización, también hay que señalar que estos apoyos son insuficientes pues, además de que el programa sólo otorga una parte de los costos, no contempla el monitoreo y la dedicación completa y especifica a la difusión de las TIC en dicho sector rural. Al hacer un breve análisis del programa visitando a varias organizaciones participantes de los estados de Guanajuato, Chiapas, Veracruz y Oaxaca, pudimos

[2] Para mayor información sobre el llamado proyecto "E-México" ver *El Financiero* del 11 de diciembre del 2000 y para las "plazas comunitarias" ver *El Nacional* del 1 de julio de 2001.

[3] Que incluye desarrollo empresarial, aspectos técnico-operativos, comercialización de granos y desarrollo organizativo de base.

4 Incluye contratación de personal calificado (individual o despacho) durante un año para: operación de programas de comercialización, apoyo a la gestión gerencial y enlaces comerciales a través de Internet.

5 Como son equipos de laboratorio, de bodega y de informática.

6 Para poder acceder al apoyo de PROFECA las comercializadoras deben de tener las siguientes características: a) estar legalmente constituida, b) tener como mínimo 100 productores miembros de la organización y c) que el proyecto demuestre viabilidad social, económica y técnica.

darnos cuenta, además, de que hay otros obstáculos que detienen el desarrollo e implementación de estas tecnologías en el campo mexicano como son: los altos costos de equipo, la falta de servicios especializados (como proveedores de Internet), las altas tarifas de las llamadas telefónicas, la carencia de infraestructura mínima (cableado telefónico) y de personal capacitado. Igualmente, se debe hacer notar que muchas de las organizaciones tienen otras prioridades o simplemente desconocen los alcances de dichas herramientas tecnológicas.

Así, aunque las intenciones de PROFECA resultaban estimulantes al dotar de computadoras a las organizaciones participantes resultó que muchas de ellas no las estaban aprovechando por no encontrarles sentido en su contexto, por no encajar en su visión de lo funcional, por sentirlas ajenas a su ocupación de campesinos y, desde luego, por la falta de conocimiento acerca de su manejo, lo cual nos habla nuevamente de una pésima planeación en torno a la modernización tecnológica al no contemplar el ámbito sociocultural en que se encuentran inmersas las organizaciones.

Una buena oportunidad para explorar la forma en que se entretejen estos últimos aspectos con los artefactos técnicos así como de la importancia de este proceso en el objetivo de mejoramiento organizacional, la tuvimos al realizar un diagnóstico sobre la infraestructura de comunicación y de los flujos de información de la Coordinadora Estatal de Productores de Café de Oaxaca (CEPCO), como veremos enseguida.

De cafeticultores y tecnología.

La Coordinadora Estatal de Productores de Café de Oaxaca (CEPCO) es una institución del sector social que agrupa aproximadamente a 23,000 productores indígenas de café (mazatecos, mixes, zapotecos y mixtecos) distribuidos en las siete regiones del estado de Oaxaca[7]. El objetivo del diagnóstico fue el de evaluar las condiciones en que se encontraban las 45 organizaciones afiliadas a CEPCO, no sólo

[7] Oaxaca se encuentra al sur de la República Mexicana y, junto con Chiapas y Guerrero, es considerado uno de los estados más pobres y con mayor presencia de población rural e indígena. Además, en dicho estado se encuentra el municipio con el más bajo índice de Desarrollo Humano de todo el territorio nacional (Coicoyán de las Flores) y el 55.47% de las personas habita en localidades con menos de 2500 habitantes, es decir, tiene pocos centros urbanos (INEGI, 2001). Las regiones en que se encuentra dividido son: Sierra Norte, Sierra Sur, Cañada, Papaloapan, Istmo, Mixteca y Costa (ver mapa 1 y 2).

en materia de infraestructura técnica de comunicación sino también de capital cultural de manera que, su valoración, permitiera soluciones integrales a sus necesidades de intercomunicación en el marco de los mercados globales[8].

Una de las principales conclusiones que se derivaron del diagnóstico realizado, fue el hecho de que las organizaciones socias de CEPCO han seguido un desarrollo tecnológico diferencial condicionado por los siguientes factores:

1. Por las características geográficas locales y regionales donde se ubican las organizaciones debido a que son lugares muy accidentados. Las personas ahí, generalmente se encuentran viviendo en las laderas de las montañas y, aunque son lugares idóneos para el cultivo del café por el clima templado, resultan ser un obstáculo para la transmisión de señales de microondas necesarias para la recepción de señales televisivas, de radio y telefonía celular.

2. Por el deficiente equipamiento de servicios públicos de comunicación en las mismas comunidades, por ejemplo, la densidad telefónica en Oaxaca es una de las más bajas de México con un promedio de 4.1 teléfonos por cada 100 habitantes en las zonas urbanas, cifra que se reduce todavía más en el área rural de tal estado donde, cuando mucho, hay una caseta telefónica por comunidad. En el mismo sentido, más del 80 % de las comunidades dedicadas al cultivo de café no cuenta con señal de televisión abierta conformándose, los menos, con contratar servicios de televisión restringida cuyo pago resulta bastante oneroso (prueba de que unas cuantas personas pueden acceder a este tipo de televisión lo constituye el hecho de que tan sólo el 1.1 por ciento de los habitantes de Oaxaca tienen acceso a este servicio, ver Anexos 2 y 3).

3. Si bien es cierto que buena parte de los problemas de comunicación que presentan tales lugares se derivan de las condiciones geográficas, también hay que señalar que no ha existido la voluntad política para implementar programas de fondo que busquen la interconectividad con el área rural, sobre todo en los últimos tiempos, como lo prueba la existencia de tecnología capaz de superar dichos obstáculos pero que no llega a tales áreas debido a que, por ejemplo, los planes de telefonía gubernamentales y privados continúan privilegiando las zonas urbanas del país (tanto

[8] Para más detalles ver Bueno (2000); Ianni (1986); Lash y Robertson (199) y Long (1996).

en el aspecto de dotación del servicio como de introducción de infraestructura), contribuyendo con ello a agudizar lo que se conoce actualmente como la *digital divide*: un fenómeno que acentúa la brecha tecnológica entre los que tienen la capacidad de usar y usufructuar las nuevas herramientas de comunicación e información y los que por su falta de capital económico y cultural no pueden acceder a ellas.

En efecto, aunque las intenciones del programa de telefonía rural pública (en un principio a cargo del gobierno mexicano a través de su paraestatal Telmex[9]), consistían en vincular la mayor parte de las comunidades en México, debemos hacer notar que tomaba signos de discriminación al dirigirse únicamente a las poblaciones de más de 500 habitantes con lo cual quedaban fuera una multitud de poblaciones y ranchería más pequeñas como las que caracterizan a las comunidades cafetaleras del estado de Oaxaca. A ello hay que sumar la concepción que se tiene de la dotación de tal servicio pues parece predominar la de considerarla más que una inversión en nuevos mercados, la de una ayuda solidaria demostrable por la política de introducción seguida (un sólo teléfono por comunidad), las características del equipo (con base en fuente solar) y el tortuguismo en la solución de los problemas técnicos lo que ha desembocado en la ineficiencia e insuficiencia del servicio, en la instalación de aparatos muy sensibles a las condiciones ambientales (cuando se nubla o llueve mucho, no funcionan) y en lo costoso de su mantenimiento al encontrarse ubicados en lugares remotos.

Los mismos problemas se han presentado no obstante el cambio de situación de la empresa de telefonía (ahora privatizada), con el agravante de que ésta ha disminuido su deber de dotar con el servicio a las poblaciones que todavía no habían recibido el beneficio (cuando Telmex todavía pertenecía al estado) con el argumento de que ya han sido cubiertas las comunidades con las mencionadas características lo cual ha repercutido en el pésimo funcionamiento de la telefonía rural pública.

El abandono del ámbito rural, también se presenta por parte del gobierno federal y estatal encargados de proporcionar teléfonos a los lugares que no cumplen con las características para participar en el programa de telefonía rural. Esto se

[9] Teléfonos de México, la empresa más importante de telefonía e Internet en México en un principio perteneciente al Estado y actualmente en manos privadas.

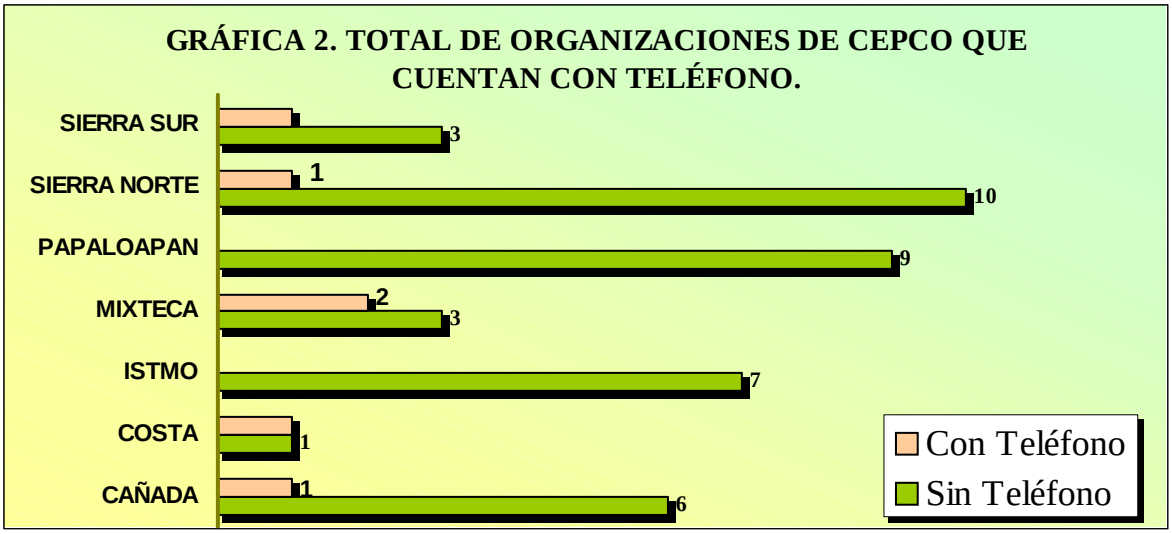
demuestra por el hecho de que ha entrado en un *impasse* un proyecto gubernamental que dotaba de teléfonos satelitales a las micropoblaciones retrasando con ello la entrada de éstas a la intercomunicación y abriendo las puertas a las compañías privadas las cuales, si bien están mejor dotadas de recursos económicos y tecnológicos para proporcionar el servicio también resultan ser más caras para los consumidores.

De ahí, entonces, que no resulte extraño que uno de los principales problemas que sobresalieron en el diagnóstico que realizamos sobre la infraestructura tecnológica con la que cuentan muchos de los lugares donde se ubican las organizaciones socias de CEPCO, sea la de contar con una deficiente comunicación. Igualmente, ello explica que pocas de ellas tengan problemas de comunicación por ubicarse en contextos urbanos que representan mayor rentabilidad para las empresas de telefonía y comunicación en general (computación e Internet, televisión satelital o por cable, telefonía satelital, radiocomunicación, etcétera)

4. Otro factor que ha condicionado el desarrollo diferencial entre las organizaciones de CEPCO ha sido la falta de capital humano capacitado para el manejo de las distintas herramientas de comunicación e información, lo cual seguramente se encuentra relacionado con el atraso educativo que en general presenta el estado de Oaxaca (según cálculos conservadores, l@s oaxaqueñ@s analfabetas mayores de 15 años, constituyen el 27.64 por ciento de la población).

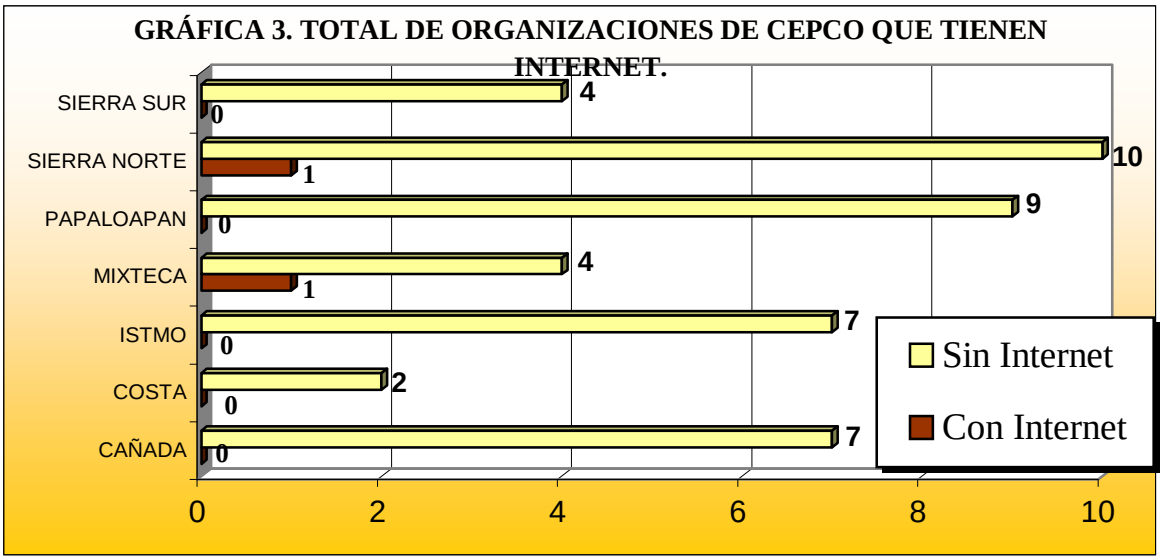
Así, pues, podemos decir que la forma en que se han conjugado todos los elementos mencionados es lo que explica que:

a) De las 45 organizaciones que integran CEPCO sólo el 6 por ciento (es decir, 3 de 45) tienen una línea telefónica por cableado que es la opción más barata de comunicación actualmente y aunque otras 3 organizaciones cuentan con teléfono celular, esto no minimiza el problema, por el contrario, sólo quiere decir que ahí donde funcionan dichos teléfonos, la geografía resulta menos limitante, no obstante, resulta más costosa por el tipo de servicio (ver Gráfica 2).

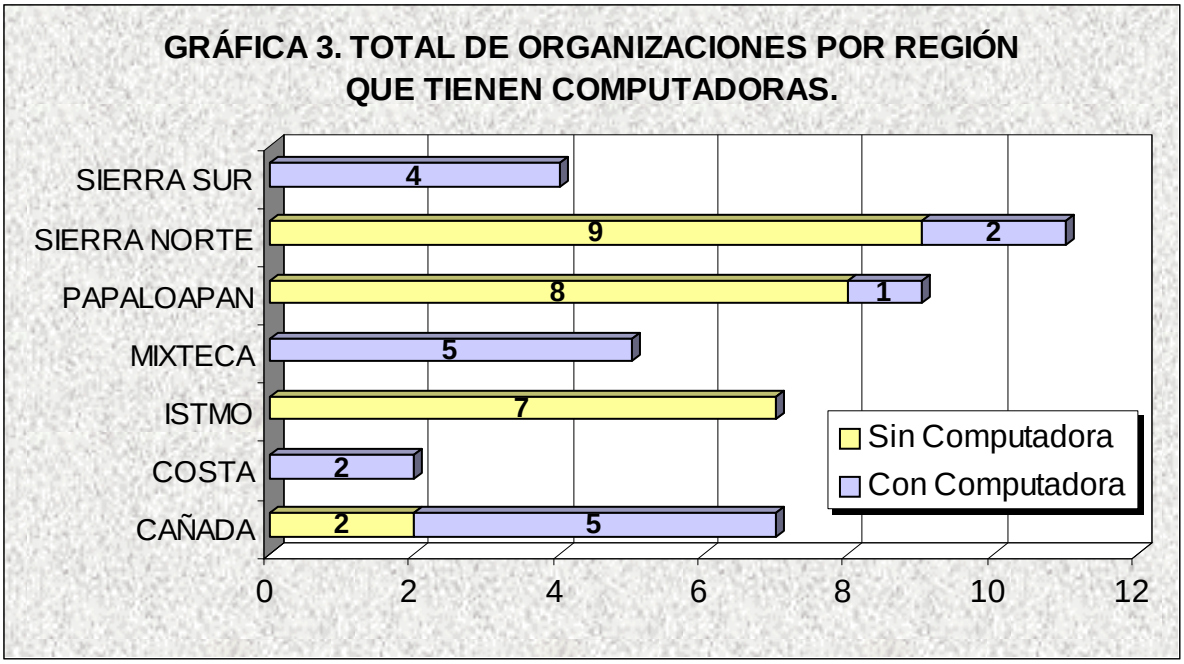


b) En relación con el equipamiento de cómputo y herramientas relacionadas (reguladores, impresoras y *scanners*, entre otras), encontramos que 19 de las 45 organizaciones visitadas (es decir, menos del 50 por ciento), cuentan con uno de ellos. Por otra parte, a pesar de que las características técnicas de las computadoras resultan óptimas respecto a las necesidades de las organizaciones en cuanto al tipo de información que se procesa, hay que hacer notar que, en términos generales, no se está maximizando su capacidad debido a que sólo en 7 de ellas se puede decir que cuentan con personal capacitado (representado por los encargados del área de informática), porque únicamente 4 han recibido cursos básicos de computación y escasas 2 cuentan con Internet (véase Gráfica 3), representando los casos extremos aquellos donde se tiene guardada la computadora, empolvándose o en manos de otras personas por no haber quien la sepa utilizar.

c) Respecto a las fuentes de información, nos parece que la totalidad de las organizaciones se encuentran en una situación de profundo estancamiento debido a que ninguna de ellas recibe o tiene acceso a boletines de información general y mucho menos especializados en café constituyendo un extremo el hecho de que en muchas comunidades, como ya decíamos, ni siquiera se recibe la señal de televisión reduciéndose la oferta a unas cuantas estaciones de radio.



d) Por región, la Mixteca presenta las mejores condiciones de infraestructura de comunicación pues de las organizaciones que agrupa (5), 2 cuentan con servicio telefónico y todas tienen, por lo menos, una computadora. Además algunas cuentan con acceso a Internet personal de informática. Considerando sólo el equipo de cómputo, las organizaciones donde todas lo poseen (además de la región Mixteca), pertenecen a la región de la Costa y la Sierra Sur, la última sin embargo, no cuenta con personal capacitado en informática, sólo una de sus organizaciones ha tenido un curso básico de computación y en dos no se hace uso de ellas. En la Cañada, por otra parte, se localizan dos agrupaciones con más de una computadora. En contraste, y tomadas en conjunto, sólo 2 organizaciones de las 13 que agrupan tales regiones tienen teléfono y uno de éstos es celular reafirmándose lo mencionado acerca de la determinación de los factores geográficos y de política telefónica tanto pública como privada.



A diferencia de todo lo anterior, en las restantes tres regiones del Estado de Oaxaca (Istmo, Papaloapan y Sierra Norte), donde se encuentran ubicadas 27 de las 45 organizaciones de CEPCO (es decir, el 60 por ciento), únicamente 3 de ellas tienen computadora, constituyendo el caso extremo la región Istmo donde ninguna de las 7 organizaciones que la conforman tiene dicha herramienta y el Papaloapan donde únicamente 1 de 9 la posee (ver gráfica 3). Igualmente, sólo 1 de las 27 organizaciones tiene teléfono propio, y esto debido a que su oficina está en la ciudad de Oaxaca. Otra evidencia de la mayor precariedad de estas organizaciones resulta el hecho de que se mantienen las mismas correlaciones negativas para rubros más tradicionales ligados al manejo de la información y datos, por ejemplo: de las 27 organizaciones mencionadas sólo 5 reportan ser dueñas de máquinas de escribir mecánicas, además, entre dicho grupo de regiones se encuentra la única organización que ni siquiera cuenta con una caseta de telefonía rural pública en la comunidad.

e) En relación con el aspecto cualitativo del problema, es decir, sobre la apropiación, recepción y opinión sobre las ventajas y desventajas de utilizar e implementar nuevas herramientas tecnológicas de comunicación e información, particularmente computadoras e Internet, las entrevistas revelan que aún cuando no constituyen instrumentos familiares sí se tiene una idea (aunque mínima) de lo que

son y lo que representarían para el trabajo en la organización como se deduce del hecho de que sólo 8 personas entrevistadas, de un total de 70, declararan no saber absolutamente nada (coincidentemente, tres de ellas pertenecen a organizaciones del Papaloapan, una de las regiones con menores recursos de informática y de comunicación propios).

De las opiniones que podemos catalogar como favorables a las nuevas tecnologías de comunicación e información predominan las que ven ventajas por su capacidad de almacenar, manejar y controlar grandes volúmenes de datos, porque permiten acceder a mayor información, porque sirven para interrelacionarnos y porque permiten realizar distintos tipos de trabajos con mejor presentación. Finalmente, entre las desventajas que los entrevistados manifestaron se encuentra principalmente la falta de capacitación y los altos costos del mantenimiento de las TIC.

Conclusiones

En México, actualmente, se vive un periodo de vertiginosos cambios tecnológicos y sus repercusiones parecen tener un sello diferenciado para cada sector social. El campo mexicano, como parte del mismo proceso, no está al margen de todas las transformaciones provocadas por la globalización y la innovación de tecnologías de la información. Un ejemplo de la revaloración de las mismas tomando en consideración el contexto sociocultural resulta el caso de CEPCO institución que no obstante sus esfuerzos por “subirse” al tren tecnológico presenta serios problemas de infraestructura técnica para lograr la competitividad a lo que se agrega la insuficiencia de apoyo estatal para obtener créditos accesibles, insumos y asesoría técnica, entre otras cosas.

El énfasis en el papel del Estado no es gratuito pues, como dice Castells (1999), es un factor decisivo en el progreso de las tecnologías, ya que expresa y organiza las fuerzas sociales y culturales que dominan en un espacio y tiempo dados. Y, aunque el papel de los estados ha sido fuertemente cuestionado, es necesario replantear que aún tienen obligaciones sociales, las cuales deben canalizarse para un mejor impulso y apoyo a sectores sociales que tienen dificultades para acceder no sólo a tecnologías comunicativas sino a otras muchas más. Así, los proyectos y programas

gubernamentales deben de ir más allá de su posición cuantitativista, ya que dotar de computadoras a las comunidades rurales e indígenas no resuelve los problemas de marginalidad si no se contemplan las condiciones socioeconómicas y culturales en que se desarrollan. Es necesario implementar políticas integrales, que no sean sólo paliativos pero, sobre todo, que contemplen la posibilidad real de involucrar a la iniciativa privada para que apoye al sector rural (para el caso que nos ocupa, por ejemplo, mediante convenios atractivos para que las compañías de telecomunicación inviertan en el sector rural).

La tarea de la antropología social en la comprensión del problema, por su parte, nos parece importante desde el momento en que plantea entender a la tecnología como una construcción social contribuyendo con ello a desmitificar el determinismo tecnológico y, al mismo tiempo, ayudando a revalorar el aspecto sociocultural donde las expectativas, opiniones y significados que le otorgan las personas a las TIC tienen la misma importancia que los propios aspectos técnicos. Es necesario, entonces, reflexionar que el uso de computadoras e Internet no sólo tiene que ver con mejores condiciones de infraestructura sino también con el ánimo, acceso y formas de apropiación de las personas respecto a las herramientas tecnológicas.

Finalmente, a pesar de la falta de consenso sobre las ventajas de las TIC, desde nuestro punto de vista, nosotros consideramos que sí pueden ayudar a disminuir la brecha social existente en México, sólo que esta tarea se debe llevar acabo tomando en cuenta el contexto sociocultural en todos los niveles: local, regional y estatal. En pocas palabras y parafraseando a Llambí (1999), las posibilidades y limitaciones de una tecnología comunicativa se hallan tanto en la materialidad de los equipos, como en sus contextos sociales, económicos, sociales, políticos y culturales.

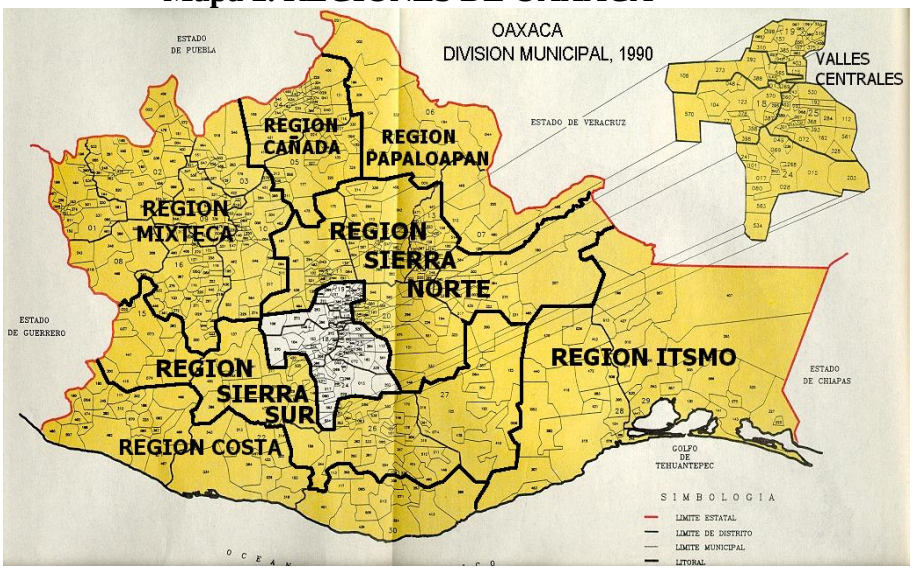
Anexo 1.CANTIDAD DE HOSTS[10] EN MÉXICO

Fecha	com.mx	edu.mx	.mx	gob.mx	org.mx	net.mx	Total mx	com	net	org	errores / otros	Total	Ptje no .mx
31-JAN-1999	19,318	1,540	38,120	1,187	510	38,811	99,486	1,445	3,493	18	516	104,958	5.21%
31-JAN-2000	31,013	1,584	43,414	1,693	1,292	210,268	289,264	4,366	14,166	330	547	308,673	6.29%
31-JAN-2001	53,441	1,626	50,188	1,038	1,519	452,485	560,297	6,209	31,431	347	1,122	599,406	6.52%

Fuente: http://www.nic.mx/nic/plsql/nic.nic_IniEst?X=0&Y=0

Mapa 1. El estado de Oaxaca

Mapa 2. REGIONES DE OAXACA



[10] Se define como un hosts todos aquellos equipos conectados a la red. Estos pueden ser servidores, PC's, impresoras, todos ellos con una dirección de IP única. No representa el número de dominio y no hay una relación directa que se aplique a todas las clasificaciones, pero observar su comportamiento en el tiempo es un buen indicador del crecimiento que Internet pueda tener o no en un lugar especifico.

Anexo 2: TELEVISIÓN RESTRINGIDA

ENTIDAD FEDERATIVA	SUSCRIPTORES							PARTICIPACIÓN PORCENTUAL EN EL TOTAL NACIONAL				
	JUN-1998	DIC-1998	JUN-1999	DIC-1999	JUN-2000 p/	DIC-2000	JUN-1998	DIC-1998	JUN-1999	DIC-1999	JUN-2000 p/	DIC-2000
NACIONAL	**1,762,455**	**1,899,975**	**2,069,416**	**2,339,647**	**2,420,978**	**2,595,072**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Aguascalientes	19,096	20,618	20,439	21,554	22,786	28,933	1.1	1.1	1.0	0.9	0.9	1.1
Baja California	65,834	67,896	70,020	72,200	74,560	81,556	3.7	3.6	3.4	3.1	3.1	3.1
Baja C. Sur	0	0	0	0	0	957	0.0	0.0	0.0	0.0	0.0	0.0
Campeche	17,417	18,177	19,107	18,957	19,305	18,990	1.0	1.0	0.9	0.8	0.8	0.7
Coahuila	51,607	54,694	54,900	48,973	49,259	79,680	2.9	2.9	2.7	2.1	2.0	3.1
Colima	24,073	24,006	23,863	24,963	25,027	23,641	1.4	1.3	1.2	1.1	1.0	0.9
Chiapas	14,429	21,013	21,617	22,970	24,658	26,812	0.8	1.1	1.0	1.0	1.0	1.0
Chihuahua	33,614	39,036	39,930	54,887	59,486	67,759	1.9	2.1	1.9	2.3	2.5	2.6
Distrito Federal	417,032	496,313	565,278	621,896	631,762	609,600	23.7	26.1	27.3	26.6	26.1	23.5
Durango	5,319	5,814	5,797	8,626	9,761	13,993	0.3	0.3	0.3	0.4	0.4	0.5
Guanajuato	81,812	89,038	98,193	112,349	116,303	126,916	4.6	4.7	4.7	4.8	4.8	4.9
Guerrero	28,596	44,340	46,581	48,735	51,159	55,482	1.6	2.3	2.3	2.1	2.1	2.1
Hidalgo	31,149	30,842	34,200	35,634	34,648	38,587	1.8	1.6	1.7	1.5	1.4	1.5
Jalisco	178,771	172,188	197,150	225,413	234,892	254,262	10.1	9.1	9.5	9.6	9.7	9.8
México	36,108	37,585	42,238	54,876	71,791	82,981	2.0	2.0	2.0	2.3	3.0	3.2
Michoacán	110,770	116,068	115,300	138,179	146,566	153,840	6.3	6.1	5.6	5.9	6.1	5.9
Morelos	29,947	29,947	30,902	32,855	34,460	39,982	1.7	1.6	1.5	1.4	1.4	1.5
Nayarit	7,512	8,293	9,321	9,746	11,274	16,040	0.4	0.4	0.5	0.4	0.5	0.6
Nuevo león	102,623	84,429	97,804	129,244	130,316	132,607	5.8	4.4	4.7	5.5	5.4	5.1
Oaxaca	9,804	12,363	12,877	17,523	22,329	27,715	0.6	0.7	0.6	0.7	0.9	1.1
Puebla	51,153	55,284	66,437	68,347	74,769	78,769	2.9	2.9	3.2	2.9	3.1	3.0
Querétaro	29,185	26,371	33,514	45,332	20,717	55,328	1.7	1.4	1.6	1.9	0.9	2.1
Quintana roo	23,454	30,942	27,463	31,224	29,235	34,016	1.3	1.6	1.3	1.3	1.2	1.3
San luis potosí	38,030	40,358	43,405	40,616	42,999	36,916	2.2	2.1	2.1	1.7	1.8	1.4
Sinaloa	47,975	52,748	51,156	63,887	62,646	65,392	2.7	2.8	2.5	2.7	2.6	2.5
Sonora	82,090	79,107	81,615	84,845	89,322	92,773	4.7	4.2	3.9	3.6	3.7	3.6
Tabasco	31,890	31,495	36,276	35,153	34,477	36,400	1.8	1.7	1.8	1.5	1.4	1.4
Tamaulipas	43,679	56,322	54,683	82,297	88,413	89,697	2.5	3.0	2.6	3.5	3.7	3.5
Tlaxcala	12,181	12,664	13,688	15,703	16,409	17,776	0.7	0.7	0.7	0.7	0.7	0.7
Veracruz	94,330	94,422	104,215	118,791	124,650	135,500	5.4	5.0	5.0	5.1	5.1	5.2
Yucatán	32,085	34,385	36,339	36,651	41,909	45,857	1.8	1.8	1.8	1.6	1.7	1.8
Zacatecas	10,890	13,217	15,108	17,221	25,090	26,315	0.6	0.7	0.7	0.7	1.0	1.0

FUENTE: COFETEL. http://www.cft.gob.mx
p/: Cifras preliminares a partir de la fecha que se indica.
1/ Incluye zona conurbada del Estado de México.
Nota: Incluye Televisión por Cable y TV vía Microondas (MMDS).

Anexo 3. DENSIDAD TELEFÓNICA POR ENTIDAD FEDERATIVA LÍNEAS TELEFÓNICAS FIJAS EN SERVICIO POR CADA CIEN HABITANTES1990 - 2000

Entidad federativa	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000 p/
Nacional	6.4	7.0	7.8	8.6	9.4	9.6	9.5	9.8	10.3	11.2	12.5
Aguascalientes	5.7	6.8	7.7	8.3	9.3	9.8	9.1	9.5	9.8	10.8	11.9
Baja california	9.4	10.1	11.0	12.6	13.5	14.2	14.8	15.4	15.1	16.9	18.1
Baja california sur	8.6	9.6	10.6	11.6	12.7	12.5	12.0	12.5	13.3	14.6	16.6
Campeche	3.3	3.5	3.9	4.6	5.3	5.3	5.2	5.3	5.5	5.9	6.6
Coahuila	7.5	8.2	8.9	9.5	10.5	10.5	10.5	10.8	11.5	12.7	13.9
Colima	7.4	7.9	8.8	9.8	10.7	10.8	10.6	10.9	11.7	12.9	14.5
Chiapas	1.6	1.8	2.0	2.3	2.5	2.7	2.7	2.7	3.0	3.2	3.6
Chihuahua	7.6	8.3	9.3	10.1	10.8	11.0	10.5	11.1	11.6	12.6	13.6
Distrito federal	18.3	20.7	21.4	23.6	25.6	25.9	25.5	26.5	27.7	29.8	33.4
Durango	4.4	4.8	5.7	6.2	6.8	7.0	6.8	7.1	7.7	8.7	9.5
Guanajuato	4.1	4.5	4.9	5.5	6.1	6.3	6.3	6.6	7.2	8.0	9.1
Guerrero	3.3	3.6	4.1	4.4	4.8	5.0	5.0	5.2	5.5	6.0	7.0
Hidalgo	2.8	3.2	3.7	4.1	4.5	4.7	4.6	4.7	5.1	5.5	6.1
Jalisco	7.8	8.7	10.0	11.1	12.1	12.3	12.2	12.6	13.3	14.4	16.6
México	4.7	4.8	5.9	7.0	8.0	8.5	8.4	8.7	9.3	10.2	11.4
Michoacán	3.7	4.3	4.7	5.1	5.7	6.0	6.1	6.4	6.9	7.5	8.1
Morelos	7.2	7.7	8.5	9.0	9.8	10.3	10.2	10.4	10.8	11.6	12.5
Nayarit	4.0	4.7	5.4	6.3	7.0	6.9	6.8	7.1	7.2	8.1	9.1
Nuevo león	11.6	12.7	14.1	15.4	16.9	16.8	16.5	17.0	17.8	19.6	21.8
Oaxaca	1.6	1.8	2.2	2.4	2.6	2.8	2.9	3.1	3.4	3.7	4.1
Puebla	3.8	4.2	4.6	5.1	5.7	5.8	6.0	6.2	6.7	7.3	8.1
Querétaro	4.1	4.8	5.5	6.8	7.9	8.1	8.1	8.5	8.9	10.0	11.1
Quintana roo	5.0	5.8	6.8	7.5	8.1	8.2	8.3	8.2	9.0	9.8	11.4
San Luis Potosí	4.2	4.7	5.1	5.4	5.8	5.8	5.9	6.0	6.4	7.1	7.8
Sinaloa	5.5	6.2	7.1	8.0	8.7	8.5	8.0	8.0	8.5	9.4	10.4
Sonora	7.5	8.4	9.3	10.4	11.0	10.8	10.0	10.1	11.7	12.6	13.7
Tabasco	3.1	3.6	4.0	4.2	4.5	4.5	4.4	4.4	4.7	5.0	5.4
Tamaulipas	7.7	8.4	9.2	9.9	10.7	10.9	10.9	11.1	11.7	12.9	13.9
Tlaxcala	2.1	2.3	3.1	3.6	4.5	4.9	4.7	5.0	5.3	5.9	6.7
Veracruz	4.0	4.2	4.6	5.0	5.5	5.5	5.4	5.5	5.8	6.3	7.0
Yucatán	5.3	5.9	6.5	7.1	8.0	8.0	7.8	7.9	8.3	8.8	9.5
Zacatecas	2.1	2.3	2.8	3.4	3.9	4.2	4.3	4.5	4.9	5.5	6.5

Nota: A partir de 1999, Incluye a los nuevos concesionarios de telefonía local.
FUENTE: COFETEL, con información proporcionada por los concesionarios. http://www.cft.gob.mx

Título:

"La Informatización e Información en el proyecto social cubano desde la óptica de un Profesional de la Información".

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RESUMEN

El trabajo "***La Informatización e Información en el proyecto social cubano desde la óptica de un Profesional de la Información***", consta de dos partes: la primera tiene como objetivo, analizar los factores que han propiciado los resultados alcanzados en la introducción y generalización de éstas tecnologías, teniendo como punto de partida la "**Campaña de Alfabetización**" desarrollada en el año 1961, que condujo a la eliminación del analfabetismo prevaleciente en la población cubana, y propició la base para la continúa capacitación y superación escolar y cultural de la población, en coordinación con el **Sistema Nacional de Educación**; en la actualidad y bajo la óptica de una **Estrategia Gubernamental para la Informatización e Información de la Sociedad Cubana**, se enfocan los esfuerzos tanto en la infra-estrutura, como en la info-estructura necesarias para el continuo desarrollo de la sociedad en su conjunto.

En la segunda parte, a partir de la **hiper-inflación informacional**, se propone una **"Tecnología para Analizar el Desarrollo Integral en un Tema Específico"** (**TADITE**) -que tiene su eje en la teoría de los **"Procesos de Producción de Información** (**PPI**)**"-**, se estudia uno de sus elementos: la **Metodología Meta-Analítica**, a la que se le adiciona ***el estudio (análisis) de la Potencia Estadística a Posteriori***, como ***criterio de estratificación (clusterización-clustering) de la calidad metodológica de la información*** para su análisis, síntesis y posterior integración sinérgica de la información; se analiza además, el **Rol del Profesional de la Información** en dicha Tecnología.

Conclusiones: Los resultados alcanzados en los procesos de la informatización e información de la sociedad cubana, tienen sus cimientos en la creación de una *red de personas alfabetizadas*, como elemento decisivo en dicho proceso, lo ha posibilitado la rápida introducción y generalización de estas tecnologías, a partir de contar con una **red de conocimientos**, que facilita -a diferencia de otros países en vías de desarrollo- además, de consumir información, también producir información de punta como resultado de los avances y descubrimientos científico-técnicos del país, que incluye, el monitoreo, análisis y evaluación de aquellos logros de la ciencia y tecnología internacionales que se adecuen mejor a las condiciones objetivas imperantes; La propuesta de la **"Tecnología para Analizar el Desempeño Integral en un Tema Específico"** posibilita a partir de la información pública, su análisis sistemático e integral, obteniéndose información de alto valor agregado.

En esta era de proliferación y abundancia de publicaciones ..., la capacidad personal de lectura y absorción de información sigue siendo la misma. Reducir la gran masa de información a piezas masticables es asunto esencial para la digestión.

Mulrow Cynthia D[1].

Parte I. La Educación en Cuba. Una introducción necesaria.

El sistema de enseñanza desde el primer nivel hasta el cuarto nivel en Cuba -como una de las conquistas sociales alcanzadas en las últimas cuatro décadas, es completamente gratuito- desde el punto de vista organizativo, existen dos ministerios rectores de tal empeño: el Ministerio de Educación (MINED) responsable de la enseñanza desde el Círculo Infantil (guardería) hasta la enseñanza Pre-Universitaria (*high school*), además, de la enseñanza Técnico-Profesional –de nivel medio (high school with technical specialization)-, y; el Ministerio de Educación Superior (MES) encargado de la dirección metodológica y de la formación de los Profesionales en la Enseñanza Superior, al cual se subordinan las universidades cubanas.

En 1961 se elimina el analfabetismo prevaleciente en Cuba, mediante una **Campaña de Alfabetización** con alcance nacional, en la que participaron decenas de miles de estudiantes y trabajadores como profesores voluntarios (alfabetizadores), creándose así -estratégicamente- cimientos sólidos, para el ulterior desarrollo educacional y científico-tecnológico de la sociedad cubana.

A modo de ejemplo, de 6000 médicos que había antes de 1959, Cuba se quedó con tan sólo 3000 médicos, el resto emigró hacia otros países, teniendo hoy día más de 60 000 médicos, que ha permitido elevar la atención sanitaria, o sea, calidad de la vida hasta llegar a formar médicos para otros países (entre ellos, para las minorías étnicas de EEUU) en la Universidad Internacional de Medicina, donde se preparan futuros médicos de más de 30 países.

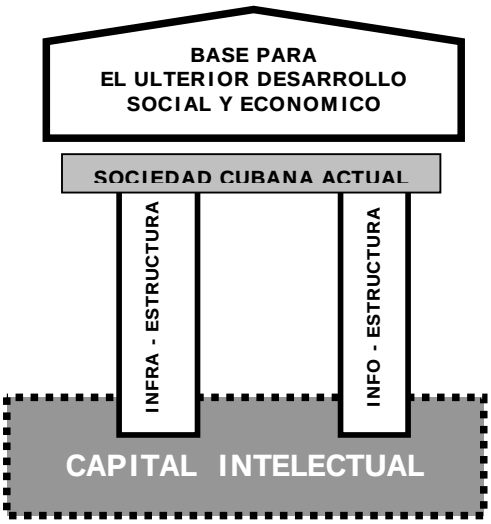
De una población estimada en más de 11 millones de habitantes en 2001 están matriculados todos los niños y adolescentes (en edad escolar) en algún tipo de enseñanza (además, enseñanza artística, técnico-profesional, especializada -para discapacitados-, etc.) para ello, a pesar de las limitaciones económicas, el Estado Cubano destina cuantiosos recursos económicos (humanos, financieros y materiales) como parte de la estrategia para fomentar en la población una cultural integral, lo que se extiende también a todo ciudadano que desee estudiar en la enseñanza superior, sea tecnológica o universitaria, a través de las diferentes modalidades (cursos regular diurno, cursos para trabajadores y otros) sin costo alguno.

Esta estrategia crea las bases necesarias para llevar a cabo el proceso de informatización e información de la sociedad cubana con el apoyo gubernamental, con vista a la imprescindible alfabetización informacional y cultura Informacional (*information literacy*) del ciudadano y la posterior superación continuada en dichas tecnologías, complementándose a través de una campaña titulada "**Universidad para Todos**" utilizando multimedios (la televisión nacional como soporte fundamental; videos, materiales impresos de apoyo en formato tradicional a precios muy módicos, accesibles a todo ciudadano), donde se imparten conocimientos necesarios por prestigiosos profesores, lo que facilita interactuar de forma integral con todos los medios y tipos de fuentes de información, incluyendo el acceso a las fuentes de información en Internet. Esto forma parte del programa nacional para la **masificación de la cultura**, que incluye el estudio de lenguas extranjeras (inglés y

[1] **Mulrow Cynthia D**. El artículo de revisión en la literatura médica actual. Bol. Of Sanit Panam 114(5), 1993. 437-445 pp.

francés) como otra opción, además de las existentes academias de lenguas, como forma de salvar las barreras lingüísticas respecto a la literatura e información cultural, científica y tecnológica de los países altamente desarrollados.

De esta forma, Cuba creó su imprescindible y más valioso recurso estratégico: el **capital intelectual**, como base cardinal para los procesos de informatización e información de la sociedad cubana en su conjunto en pos de la equidad en el uso de las tecnologías.



- ***Algunos elementos de la informatización e Información de la Sociedad Cubana.***

Tal vez, los inicios de la informatización e información en la sociedad Cubana se pueden enmarcar a principios de la década del 70 del pasado siglo; por primera vez en el país se diseña y construye por cubanos mini-computadoras marca CID; se instala una planta para la producción de componentes electrónicos, dándose muestra desde entonces de las potencialidades del capital intelectual ya existente; se importan masivamente computadoras. Se creó, además de la carrera universitaria de Cibernética, la de Informática (léase Ciencia de la Computación) e Información Científico-Técnica (léase Bibliotecología y Ciencia de la Información, actualmente).

Como parte del perfeccionamiento de la política nacional para la informatización e información de la sociedad cubana, se crea el **Ministerio de Informática y Comunicaciones** como organismo rector de tal empeño, no obstante en dicha estrategia gubernamental (de la Informatización e Información de la Sociedad Cubana), participa todas las instituciones, organizaciones no gubernamentales y la sociedad en su conjunto.

El **Ministerio de Educación Superior** (MES) como organismo rector metodológico de las universidades cubanas dispone de una red nacional (REDUNIV) que facilita la conexión inter-universidades y con el resto de las organizaciones nacionales del país pertenecientes a otras redes, dota cada año de modernas tecnologías con vista a disponer de la base material indispensable, tanto para la docencia como para la producción e investigación científica, tratando de alcanzar progresivamente una mejor relación alumno-computadora.

Los programas docentes relacionados con las **Nuevas Tecnologías de Información y Comunicación**[2] (**NTIyC**) existen en todas las carreras universitarias. Acorde con las necesidades de cada una de ellas, se generaliza a todo el país los estudios universitarios de perfil afín a ellas como soporte necesario para crear el capital intelectual indispensable para posterior desarrollo continuado sostenible.

Existen en cada Centro de Educación Superior cubano al menos una Intranet, con información pertinente a la institución, todos los centros tienen acceso a Internet. Se desarrolla, además, concursos nacionales con temas relativos a las **NTIyC** para impulsar los procesos de informatización e información de las universidades como parte de la política nacional, con amplia repercusión en el país.

[2] **Nota:** Se utiliza el término de "Nuevas Tecnologías ..." no por ser **NUEVAS**, sino por su **constante desarrollo sostenible**.

El **Ministerio de Educación** (MINED) como organismo Rector Metodológico de la Enseñanza Primaria, Preuniversitaria (léase secundaria) y Tecnológica dirige y apoya *Investigaciones Pedagógicas* para la introducción de forma orgánica y científica, de las **NTIyC** desde los primeros grados de enseñanza, dosificando tanto "el tiempo alumno frente a la PC" como "el contenido y nivel de complejidad" que deben recibir según el nivel y edad de los educandos (entre otros factores a tener en cuenta), de manera que las **NTIyC** constituyan complemento del resto de las asignaturas a partir de la utilización de software desarrollados básicamente en el país y como base para el posterior desarrollo del proceso enseñanza-aprendizaje; no obstante, los alumnos como cualquier ciudadano, puede según sus intereses, asistir a los cursos que se imparten de manera independiente en las instituciones de los Joven Club de Computación, diseminados por todo el país, hasta nivel de municipio.

Otro factor condicionante de la estrategia, lo constituye el Programa Nacional de Electrificación de Todas las Escuelas Primarias que, además, se equipan de televisores y videos (como parte de la campaña de masificación de la cultura), de computadoras de última generación como parte del proceso de informatización de la sociedad cubana. Existe una red informática de alcance nacional de dicho ministerio, interconectada al resto de las redes existentes.

El **Ministerio de Salud Pública** (MINSAP) participa activamente en los procesos de la informatización e información de la sociedad cubana como parte de los esfuerzos continuados y sostenibles de brindar una mejor atención sanitaria a la población. Su red, **INFOMED**, (http://www.sld.cu) -reconocida por el Secretario General de las Naciones Unidad (ONU) como un ejemplo de red de salud en países en vías de desarrollo-, están interconectadas todas las Intranets de las universidades médicas cubanas, generalizándose la creación de redes locales en hospitales, policlínicas y consultorios de los médicos de familia y su interconexión. Posibilita, además, el acceso a diferentes bases de datos biomédicas nacionales (CUMED, CUBACIENCIAS, etc.) y extranjeras. Se desarrolla un importante trabajo relativo a los contenidos de la información necesarios para la superación técnico profesional del personal médico y paramédico. Su acceso es totalmente gratuito, al igual que en las redes informáticas anteriores,.

El Proyecto "Joven Club de Computación".

Existe una red de instituciones de los "**Joven Club de Computación**" que surgen en 1987 en los cuales, se imparten a todo ciudadano, sin distinción de edad y nivel escolar, cursos sistemáticos y gratuitos relativos a contenidos de Software (enseñanza de la programación, uso de paquetes, etc.) y Hardware (mantenimiento, construcción y desarrollo). Desde su surgimiento hasta la fecha, se han impartido cursos a más de 250 000 personas.

Por su alcance y distribución, existe al menos, un "**Joven Club de Computación**" en cada uno de los 169 municipios del país, los que se caracterizan por estar dotados de computadoras de última generación, conectadas a la Red Nacional (http://www.jcce.org.cu/). Esta organización convoca de manera sistemática concursos competitivos y no competitivos de carácter nacional, con el objetivo del intercambio de experiencias, así como premiar los mejores trabajos (software y hardware) que se realizan en estos centros a lo largo del país –el concurso más reciente se celebró en Mayo del 2001. Siendo, **Infoclub** -la convención nacional competitiva de los Joven Club.

Muchas organizaciones del país se benefician directamente en el plano organizativo de la infraestructura tecnológica que ofrecen los Club, además de los resultados de los trabajos, gran parte de los mismos se introducen y generalizan en la práctica social.

- ***Algunas reflexiones sobre la infraestructura e infoestructura actuales.***

La estrategia nacional requiere de importantes recursos económicos, en tal sentido, aún es insuficiente el número de computadoras a partir de la cultura informacional existente; esta última, marcha más rápido que la base material disponible (hardware) y que puede adquirir el país. Además, el ancho de banda necesario en la actualidad no es homogéneo en todo el país, por lo que los enlaces no tienen todos igual velocidad, aunque las redes sí tienen conexión a Internet.

A partir del capital intelectual desarrollado en el país (como el más importante recurso estratégico nacional) se confeccionan software de propósitos específicos, como parte de los esfuerzos que aseguren el continuo desarrollo del proceso de informatización e información del país, así como la creación y desarrollo de equipos para el diagnóstico y tratamiento de enfermedades, que van desde el equipo SUMA (para el análisis clínico masivo de la población) hasta las operaciones neuroquirúrgicas de mínimo acceso asistidas por computadoras.

Es importante destacar como elemento de la informatización la creación del laboratorio nacional de protección de datos con el objetivo de culturizar a la población cubana sobre la amenaza de los virus informáticos, además, dicho centro desarrolla paquetes de programas antivirus. Se utilizan diversos medios de comunicación para alertar a los usuarios de la presencia en el país de nuevos virus informáticos.

Se realizan otros esfuerzos similares en cada uno de los organismos gubernamentales y ONG existentes en el país, lo cual sería interminable su descripción, pero es menester subrayar que sus acciones se enmarcan en la política nacional de informatización e información de la sociedad cubana, en cuya infraestructura e infoestructura se toma en consideración las posibilidades que ofrece la infraestructura de los Joven Club de Computación.

Parte II. La Sociedad de la Información desde la óptica de un Profesional de la Información.

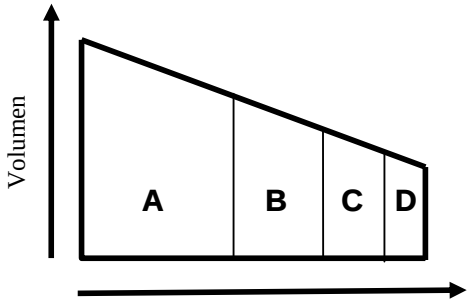
Un rasgo distintivo del desarrollo alcanzado por la humanidad en los procesos cognoscitivos, investigativos y de toma de decisión, lo constituye la importancia que se le concede a la información ***como recurso estratégico para el desarrollo*****,** de ahí surge -tal vez- el término que identifica el período actual: Sociedad de la Información[3], caracterizada por:

- ✓ la **sobrecarga de información**,
- ✓ la **polución informacional,**
- ✓ la **desigual calidad de la información** publicada o inédita, y

3 **Nota**: Aunque en la actualidad la **INFORMACION** juega un rol decisivo, es conocido que en todo el desarrollo de la humanidad esta ha tenido un papel importante, pero no al nivel actual.

- ✓ el **carácter acumulativo de la información y el conocimiento**.

La **hiper-inflación informacional**[4] resultante (y su efecto: **infoxicación**[5]), constituye uno de los resultados directos del progreso acelerado de las ciencias, reflejado además, en las **NTI**y**C** –y que se expresa en una de las propiedades de la información científica que señalan Mikhailov AI, Chernii AI y Guiliarevskii RS. (1976): **Acumulatividad de la información científica**, que se relaciona estrechamente con el fenómeno de la concentración de la misma (información científica) en el tiempo, a través de cuatro estadios de elaboración informacional: **A**- *surgimiento de hechos científicos*; **B-** *teorías, concepciones e hipótesis científicas*; **C-** *conjunto de teorías, leyes, conceptos e hipótesis, que constituyen la base del conocimiento de las ciencias*; y **D-** *la información científica del carácter de la concepción del mundo*.



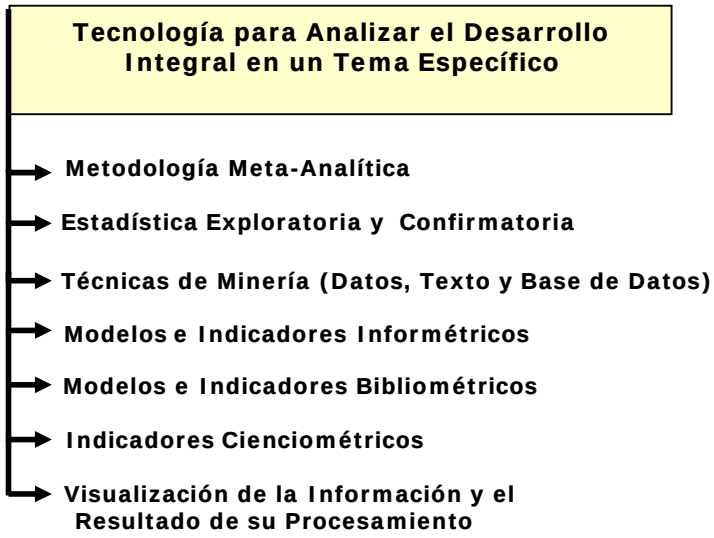
Nivel de Concentración en el Tiempo

A partir de lo anterior, se hace necesario el empleo de manera coherente de herramientas que posibiliten el re-análisis científico del contenido de la información (literatura blanca y gris), con el objetivo de "*identificar la información sustantiva de la general", "identificar el conocimiento público desconocido"*, y *"el papel y lugar de cada equipo de investigación",* a fin de estructurar **Sistemas de Vigilancia Científica y Tecnológica**; para lo cual se propone: la **"Tecnología para Analizar el Desarrollo Integral en un Tema Específico"**.

4 **Nota:** Hiper-Inflación Informacional- término propuesto por el autor para identificar la situación actual.
5 URL: http://www.infonomia.com consultado en: Enero 2001.

❑ *Tecnología para Analizar el Desarrollo Integral en un Tema Específico*. **TADITE**

En el esquema adyacente, se presentan las herramientas que componen la **Tecnología** (Figura A) propuesta, de las cuales, sólo se analizará la **Metodología Meta-Analítica**[6], en el marco de la Teoría de los **Procesos de Producción de Información (PPI)** expuesta por Egghe L. y Rousseau R. (1990), a esta Metodología se le incluye a diferencia de la meta-analítica existente, ***el análisis de la Potencia Estadística a Posteriori***, como **criterio de estratificación (clusterización-clustering) de la calidad metodológica de la información** *(investigación realizada),* con el objetivo de aumentar la consistencia de los resultados de dicho proceso (análisis de la Información). en este contexto, además, se analiza el Rol del Profesional de la Información dentro de los procesos de análisis de información.



Como herramienta computacional (informática) para el procesamiento de las características bibliográficas y de contenido de las fuentes de información, se utiliza el software de propósito específico: bibliométrico, informétrico y cienciométrico, denominado **INFOCAM**[7] (diseñado y aplicándose desde 1994); entre sus posibilidades, además de las funciones comunes de todo software de gestión de base de datos, así como del análisis estadístico y elaboración de gráficos, costa de los siguiente módulos: Gestión de Bases de Datos-BD (crea y facilita la conversión a diferentes formatos de las BD), Modelos Informétricos (Bradford, Lotka, Leimkhuhler, etc.), Análisis de Citas y Análisis de Texto. Dicho software se ha utilizado para el procesamiento de grandes volúmenes de información en investigaciones, tesis doctorales, tesinas de maestrías, etc.

6 **Nota:** El Meta-Análisis fue propuesto en 1976 por el científico Glass Gene (1976) y Glass G y Smith (1981)

7 Morales-Morejón, M.; Barquín-Cuesta, J.P. INFOCAM: software de propósito bibliométrico, informétrico y cienciométrico. Registrado en el CENDA, La Habana, 1998.

❑ Procesos de Producción de Información (PPI).

Todo proceso de análisis de información, incluida la metodología meta-analítica, puede estudiarse, a partir de lo postulado por Egghe L. y Rousseau R. (1990), sobre la teoría de los Procesos de Producción de Información.

Un **PPI** es un terno de la forma:

(**S**, **I**, **V**)

donde:

S - representa la **Fuente de Información** (del inglés ***Source***),
I - representa los **Items (***Características Bibliográficas y de Contenido***)**,
V : S → I para **S = 0** (conjunto nulo o vacío) entonces **I = 0**
Por lo que: **V(S, I) = V(0) = 0**.

V - Función que representa la relación de las Fuentes de Información (**S**) y los ítems (**I**) contenidos en éstas en el Proceso de Producción de Información (**V**)

En la **Metodología Meta-analítica**, se pueden identificar los elementos que forman parte de los **PPI**, como**:**

S - constituye el **conjunto de trabajos** (Doc.) recuperados y que cumplen con los criterios de inclusión (*fuentes de información*).

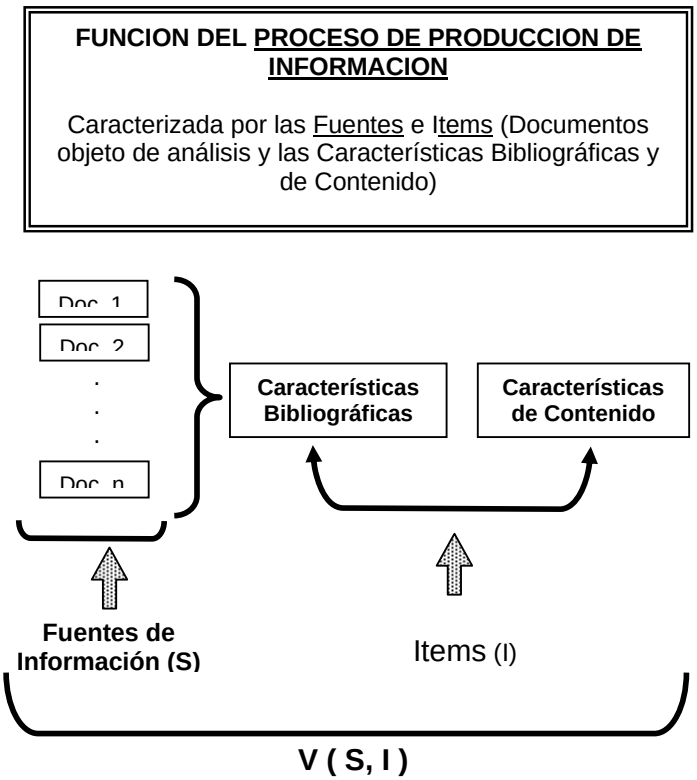
I - están formados por las **Características Bibliográficas y de Contenidos** *(*léase *Características Metodológicas y Sustantivas)***.**

V : S → I Función que representa la relación entre el **conjunto de trabajos** recuperados (*Fuentes de información*) y las **características Bibliográficas y de Contenidos** (*ítems*) identificadas en **la fuente de información**.

La función **V (R, I)** (que representa *el proceso de producción de información- revisión*), depende de las **fuentes de información** "**S**"- trabajos objeto del análisis y síntesis- y **los ítems (I)** -características **Bibliográficas** y **de Contenidos** que se identifican en las *fuentes de información*.

Cuando S=0, entonces se dice que *no existe fuentes de información,* en otras palabras, cuando los trabajos localizados y recuperados, no cumplen los criterios de inclusión, entonces, no es posible identificar en el conjunto nulo **S**, los **ítems** (Características Bibliográficas y de Contenido), lo que imposibilita realizar una revisión meta-analítica, al indefinirse **I**.

En el siguiente esquema, se sintetiza la función **V(S,I)** de los **PPI**, a partir del análisis de la información, empleando la metodología meta-analítica.



Según los autores Egghe L. y Rousseau R. (1990), la teoría de los **Procesos de Producción de Información** (**PPI**) constituye toda la base de la fundamentación teórica de las leyes informétricas y, más específicamente, los **PPI** como textos desde la óptica de la teoría fractal.

Por consiguiente, toda la base matemática que tienen los diferentes métodos y técnicas de análisis de información, léase procesamiento informacional, no es ajeno al profesional moderno de las actividades bibliotecológicas como las de información. Esto, sin dudas, abre nuevos espacios a dicho profesional y más aún en la Sociedad de la Información, como paso previo a la Sociedad del Conocimiento.

En otras palabras, la labor intelectual de las revisiones deben enmarcarse en la labor intelectual de los servicios de vigilancia informacional como apoyo a la actividad de la inteligencia científica y tecnológica mediante métodos y técnicas totalmente éticos, en el análisis de la literatura e información disponible (literatura blanca[8] y gris[9]). Por consiguiente, en este contexto, además, se analiza **el rol del Profesional de la Información dentro de los procesos de análisis de información**.

La elaboración de las revisiones de la literatura y de la información no deben verse solo, de forma puntual, sino también, como una labor sistemática y sostenible en la medida que dicho progreso se incremente y se requiera conocer qué hacen los demás y cómo resuelven los problemas, a fin de contribuir a la optimización del empleo de recursos y asegurar la consecución de los resultados previstos.

Como resultado directo del empleo de las (**NTIyC**) como insustituible herramienta en toda la actividad científica y en específico en la "Bibliotecología y Ciencia de la Información", es posible acceder a volúmenes de información, nunca antes visto por los hombres de ciencia, la **cantidad de información** que los usuarios de la información enfrenta, rebasa las posibilidades individuales de su análisis y asimilación, lo que origina la búsqueda de métodos y técnicas que posibiliten, transformar la "**Cantidad de Información en Calidad de Información**" en función de la generación de conocimientos, descubrir el conocimiento público desconocido, a través del procesamiento lógico abstracto del pensamiento, toda vez que es deseable, como resultado de los procesos de análisis, síntesis e integración sinérgica

8 ***Literatura Blanca***- Aquella que se publicada en forma de artículo, libros, monografía, etc. y puede ser consultada públicamente de forma sistemática.

9 ***Literatura Gris:*** Aquella que es producto de los eventos, congresos, tesis doctorales, tesinas de maestrías, etc, que por lo general, no aparece publicada de forma sistemática

de la información, que prevalezca la dimensión **calidad de información** sobre **cantidad de información**. Todo lo anterior, bajo una metodología que posibilite la replicación. Elemento analizado en el trabajo **"Conocimiento Basado en la Evidencia Informacional"** Avilés-Merens, Morales-Morejón (2000)

❑ La Metodología Meta-analítica con el análisis de potencia a posteriori.

Surgimiento y desarrollo del Meta-análisis.

En la literatura consultada, se utilizan diferentes términos para definir el producto del análisis de información meta-analítico; a saber: **Revisión Cuantitativa**, **Meta-Análisis**, **Revisión Sistemática**, **Revisión de la Literatura**, **Investigación-Revisión Bibliográfica, Revisión Crítica de la Bibliografía**, **Artículo de Revisión, Revisión de Integración de Investigación, Análisis Cuantitativo de Dominios de Investigación, Síntesis cuantitativa,** y **Reseñas** (analíticas y analítico-evaluativas, según sea el tipo de labor intelectual realizado), entre otros, no obstante la mayoría apuesta por el término **REVISIONES META-ANALÍTICAS** en español.

Los antecedentes directo de la metodología según la literatura consultada (Egger M. y Smith Davey, 1997) es el realizado en 1904 por Pearson Karl ("Report on certain enteric fever inoculation statistics"), reconocido como uno de los primeros intentos en las técnicas de análisis cuantitativo de la literatura, esos autores opinan, además, que el trabajo "The powerful placebo" de Beecher H.K., publicado en 1955 en la revista JAMA, constituye "el primer meta-análisis"; por su parte, Dickersin K. y Berlin J.A. (1992), señalan, además del trabajo ya citado de Pearson Karl, los trabajos de: Tippett LHC "The methods for statistics", publicado en 1931; Fisher R.A. en 1932 "Statistical methods for research workers"; Yates F. y Cochran WG. "The analysis of groups of experiments" en 1938; Mosteller F, Bush R. "Selected quantitative techniques" en 1954 y Cochran W.G. con "Problems arising in the analysis of series of similar experiments" en 1937 y "The combination of estimates from different experiments" en 1954, también, la profesora española Gómez Benito J. (1989) refiere: "los conceptos básicos que subyacen al meta-análisis ya fueron empleados por Thorndike (1933) y Ghiselli (1949), pero hasta los trabajos de Light & Smith (1971) no aparecen planteado de forma específica el problema de integrar cuantitativamente los resultados de diferentes estudios".

En nuestra investigación, se ha encontrado el trabajo de Cohen J. (1992) realizado en 1962, en el campo de la psicología, en el que se realiza un "estudio de agregación" (*pooling*) de los trabajos publicados en la "*Journal of Abnormal and Social Psychology*".

Las revisiones meta-analíticas se estructuran desde dos aspectos cardinales, independientemente de las técnicas que se empleen: los enfoques cualitativo y cuantitativo respecto al procesamiento de la literatura y de la información; sobre ello, ampliamente se presenta en la tesis de doctorado Avilés-Merens Rafael (2001), en el que se analiza, de forma pormenorizada, lo relativo a los sesgos que se pueden presentar en el meta-análisis.

La metodología meta-analítica contempla las siguientes etapas principales:

1. **Formulación del problema:** Una vez definido con nitidez **el Problema** objeto de estudio, se pasa en esta primera etapa, a definir **los objetivos** (general y específico), se elaboran **las hipótesis –**las que **s**e pueden definir y re-defenir en diferentes momentos-, además, se plantean las definiciones conceptuales y las operacionales de las variables.
   Se continua con la definición de la Unidad (es) de Observación (es).

2. **Diseño de la Estrategia de Búsqueda de la Información-los estudios primarios.**
   Para la cual, se debe tener presente lo apuntado por Glass Gene *et al.* (1981) al referirse a esta etapa: ***"El modo en que se busca; determina lo que se encuentra; y lo que se encuentra es la base de las conclusiones de la integración de estudios."***

   En esta etapa, se deben combinar diferentes Técnicas o Procedimientos para localizar y recuperar la información, así como, los Criterios de Inclusión, de Exclusión y Eliminación (este último criterio es propuesto por Avilés-Merens en su tesis doctoral para afinar la metodología existente), de los estudios primarios a considerar en el meta-análisis.

   Las técnicas o procedimientos para localizar y recuperar la información están en constante evolución, aunque existe opinión generalizada que dicha labor la pueden asumir los propios usuarios de la información, por la importancia capital (señalada anteriormente) es necesario e insustituible la participación del Profesional de la Información altamente capacitado en dicha labor, ya que dispone por su formación, de los conocimientos de "Organización y Representación de la Información" entre otros, además, de la experiencia que acumula en el constante desempeño profesional diario; lo que constituye una garantía del material recuperado (publicado e inédito). En su tesis doctoral, Avilés-Merens propone un diplomado compuesto por varios módulos relativos a los temas necesarios para dotar a dicho profesional de la calificación integral científica adecuada, desde una óptica infoeconómica.

   Si se tiene en cuenta, además, el caos imperante en InterNet con respecto a la organización y representación digital de la información, como consecuencia de la ***ausencia inicial del Profesional de la Información*** *en el diseño y la organización de las Fuentes de Información en ese ambiente*, las críticas y/o limitaciones que presenta al respecto ***la red de redes***; aunque no es objetivo del presente trabajo, por el espejismo y la repercusión que tiene en esta etapa merece al menos dos líneas, con el propósito fundamental de llamar la atención sobre ello.

   Cuando se realiza una búsqueda a través de InterNet, las limitaciones debido a la falta de **Organización Digital de la Información** se manifiesta en la imposibilidad de

identificar un alto por ciento de los trabajos relevantes y pertinentes al tema de interés, además de la proliferación de interfaces disímiles (software), y diferentes tesauros sobre una misma ciencia, las mayores limitaciones radican en la no utilización adecuada del Procesamiento Digital Documental, lo que trae como consecuencia que sólo se pueda recuperar una pequeña parte de la información existente y accesible a través de dicho medio, el resto de la información recuperada, constituye **ruido** para la investigación.

Por lo que el Profesional de la Información, al dominar las leyes informétricas y sus aplicaciones, así como las técnicas de análisis de citas (acoplamiento bibliográfico y cocitaciones bibliográficas), puede lograr una mayor exhaustividad de recuperación documental, en comparación con otros Profesionales sin los conocimientos y experiencias en el uso de las técnicas de búsqueda bibliográfica con el empleo de sistemas de búsqueda y recuperación por palabras clave.

Gómez Benito (1989), recomienda como solución paliativa utilizar las siguientes técnicas de identificación y localización de la información: -**Procedimiento Ascendente** (*ancestry approach*) *(Retrospectivo)*, -**Procedimiento Descendente**. *(Prospectivo),* -**Empleo de "Palabras Claves" o "Descriptores"** (lenguaje controlado), -**Uso de los «colegios invisibles» o «academias invisibles»** como fuente de información inédita y novedosa**,** y **-la Identificación y posterior intercambio con centros o instituciones líderes en el tema de estudio**, posibilita acceder a materiales de gran importancia.

3. **Codificación de los estudios:** En esta etapa, a partir de la identificación de las características (metodológicas, sustantivas y extrínsecas), se tiene como objetivo conocer si los resultados de los estudios primarios están en función de dichas características

   Hunter JE et al. citado por Schwarzer Ralf (1989), plantea: *"la codificación puede ser el 99 por ciento del trabajo en proceso de la integración. Aún este trabajo puede enteramente derrocharse"; "Si la variación (heterogeneidad) es debido únicamente al error de muestreo, todo el esfuerzo (en la codificación) ha sido inútil".*

   Para ejecutar la codificación de los estudios se precisa de la creación de un Grupo de Codificadores y requiere además, de la confección de una *"Guía o Libro de Codificación"* donde estén plasmadas las características objetos de codificación. La codificación debe evaluarse en *términos de validez y fiabilidad*.

   Se propone, agrupar las características objeto de estudio, desde la óptica de Bibliotecología y Ciencias de la Información en: **Características Bibliográficas** y **Características de Contenido**.

Una vez recuperado la información relevante y pertinente objeto de la revisión meta-analítica, **se propone añadir a la metodología existente**: ***el análisis de la potencia estadística a posteriori*** con el propósito de elevar la consistencia y robustez de los resultados, **como criterio para la estratificación de los estudios según la calidad metodológica** (propuesta de Avilés-Merens en su tesis doctoral), lo anterior origina, al menos, 3 meta-análisis con potencia baja, media y alta (según la clasificación de la potencia Estadística a Posteriori de Cohen J. (1992) .

4. **Medida de los resultados**: El objetivo de esta etapa es llevar a **una métrica común** (a una misma escala) los **resultados de los estudios**; se emplean: el **Nivel de**

Significación[10] "p-calculado", – el **Tamaño del Efecto**[11]-TE (*Effect Size*), de cada estudio.

Aunque, el empleo de cada una de ellas conduce a diferentes cálculos, y proporcionan diferente información, ambas medidas están relacionadas, por lo que es factible transformar, por ejemplo: el tamaño del efecto en su correspondiente valor del nivel de significación y viceversa.

Tipos de Tamaños de Efecto: Se han desarrollado diferentes índices del tamaño del efecto, tanto *paramétricos* -para las variables expresadas en una escala de medición cuantitativa o cuasi-cuantitativa, y *no-paramétricos* para las variables expresadas en una escala de medición cualitativa (nominal u ordinal). En el primer grupo, los más utilizados, se basan en la diferencia de medias entre dos condiciones experimentales (tratamientos o intervención) y los basados en el coeficiente de correlación.

En 1984, Cooper citado por Sánchez Meca y Ato García (1989) al referirse al empleo de una o otra medida del resultado de los estudios (nivel de significación o tamaño del efecto) plantean: *"El nivel de significación estadística sólo permite determinar si un efecto experimental es distinto de cero. Por el contrario, el Tamaño del Efecto es capaz de responder a la pregunta: ¿en qué medida es distinto de cero?"* y agregan que: *"y, por ende, la información que proporciona es más cabal para los propósitos perseguidos".*

5. **Análisis e interpretación de los datos**: En esta etapa, ya cuantificados los resultados de los estudios a través de los niveles de significación o los tamaños de los efectos y transformarlos a una métrica común, se sintetizan para obtener un índice global y representativo del conjunto de los resultados que se deben acompañar, además, de estadígrafos de la estadística exploratoria, tales como desviación típica, los cuartiles, rangos, etc.

   Los resultados obtenidos rara vez son homogéneos como para suponer que la medida global es representativa de todos los estudios. **En estas situaciones es precisamente cuando el meta-análisis ofrece su máxima utilidad.** Al buscar las causas que pueden explicar (si las hay) los resultados contradictorios, y detectar lagunas en el conocimiento en una determinada área del saber, lo cual implica, realizar futuras investigaciones en dicho aspecto, con el objetivo de encontrar dichas causas.

   La variabilidad entre los resultados de los estudios puede ser tratada eficazmente cuando se analizan los efectos que determinadas características bibliográficas y/o de contenido (codificadas previamente) que influyen sobre los Tamaños de los Efectos; en este caso los tamaños de los efectos actúan como variable dependiente, mientras que las características de los estudios son las variables independientes.

   La metodología meta-analítica propone diferentes procedimientos (utilizando los métodos estadísticos). Glass GV et al. (1981) proponen el uso de estadísticos descriptivos para sintetizar los resultados globales del meta-análisis, de gran utilidad son los métodos exploratorios propuestos por Tukey: histograma digital (*stem-and leaf*) y gráficos de cajas (*Boxplot*) la estadística con el desarrollo de los métodos exploratorios (enfoque exploratorio de Tukey - *exploratory data analysis*),

[10] ***Nivel de Significación-*** *informa acerca de si los resultados obtenidos han ocurrido por azar.* Strube MJ y Hartman DP. (1983)

[11] ***Tamaño del Efecto-*** *indica la intensidad de la relación o del efecto de interés. Strube MJ y Hartman DP. (1983)*

6. **<u>Publicación del estudio</u>**: Como toda investigación científica, la última fase la constituye la divulgación (publicación) de los resultados obtenidos; de la misma forma finaliza la revisión meta-analítica.

   Por su importancia es objeto de especial atención, por ejemplo, en 1996 un grupo de investigadores-revisores y usuarios del área de las Ciencias Médicas se reúnen en la **"Conferencia sobre Calidad de Elaboración de los Informes de los Meta-análisis** (***QUOROM***)[12]**"** (2000), en dicho encuentro se aborda *"la mejora de la calidad en la elaboración de los informes de los meta-análisis"* (en los meta-análisis de los ensayos clínicos controlados). En dicha conferencia, además, se promulga la declaración ***QUOROM,***: consistente en un ***"protocolo de control de calidad"*** y un ***"diagrama de flujo"***. El *protocolo* describe la mejor forma de presentar: el resumen, la introducción, los métodos, los resultados y la discusión del informe de un meta-análisis; mientras que el *Diagrama* describe las etapas (mínimas) necesarias para la realizar un meta-análisis de Ensayos Clínicos Controlados (ECC). Estos lineamientos, pueden aplicarse a cualquier estudio meta-analítico.

   En relación con el resumen es menester señalar que debiera ser de forma estructurada para dar una visión integral al lector sobre el contenido del mismo, de la forma siguiente: Objetivos; Diseño (Meta-análisis; Estrategia de búsqueda; Métodos estadísticos; Medida principal del resultado; Resultados y Conclusión.

   Un aspecto a destacar es el énfasis que se hace en **QUOROM** respecto a que *"la calidad del informe no es igual a la calidad (validez interna) del meta-análisis. Esto depende más de la valía "intrínseca" del científico que de la medida en que se hacen explícitos sus métodos (a lo que se dedica principalmente la declaración QUOROM). Para lo primero, hay que conocer tanto las técnicas de la revisión sistemática, como el tema de estudio, y tener experiencia investigadora. Ello no se consigue simplemente con guías o recomendaciones, aunque algo puedan ayudar"*. (2000)

   La anterior aseveración, pone de manifiesto, una vez más, la necesidad de elaborar la revisión en equipo de trabajo y, por supuesto, de la participación del Profesional de la Información, incluso, en la etapa de la Publicación de los Resultados, pues hay que saber redactar (y comunicar) conveniente y científicamente los hallazgos y conclusiones que se obtengan en la investigación meta-analítica. Así como conocer el Flujo de Información para poder ubicar dichos trabajos en las publicaciones adecuadas, según el tema que aborda.

❑ Rol del Profesional de la Información dentro de los procesos de Análisis de la Información.

En tal sentido, se propone un diplomado que contempla los acervos mínimos necesarios que posibiliten al **Profesional de la Información,** desempeñarse como "**Infonomista de Inteligencia**", acorde con lo planteado por especialistas nacionales y extranjeros, cuando señalan la necesidad de un **Profesional Moderno de la Información en la Sociedad del Conocimiento**.

Por último, se analiza el "**Papel de las Revisiones Bibliográficas en la Sociedad de la Información**", dentro de las técnicas de minerías *(data mining, text mining, database*

[12] **QUOROM:** *Quality of Reporting of Meta-Analyses*

mining), perteneciente al campo de la Informetría a partir de las concepciones actuales de esta última, como disciplina instrumental de la Ciencia de la Información.

Bajo el prisma de la dialéctica materialista que postula el "**Tránsito de los cambios cuantitativos a los cualitativos**" Engels, citado por Rosental M. y Iudin P (1964), plantea: *"Toda modificación es una **transformación de la cantidad en calidad**, una consecuencia de un cambio cuantitativo de la cantidad de movimiento, cualquiera que sea su forma , que es inherente al cuerpo o lo que es comunicado: prueba notable del carácter dialéctico del desarrollo de la naturaleza, como pasaje de los cambios cuantitativos a los cualitativos..."*

El **Análisis, Síntesis e Integración de la Información** (de manera **abreviada Análisis de la Información**, en lo adelante) en la Ciencia de la Información, constituyen procesos de cambios cuantitativos a cualitativos.

A partir de la información existente mediante el análisis, síntesis e integración se va extinguiendo *"lo viejo"*, a la vez que se acrecienta los elementos de lo nuevo; en otras palabras, se produce la extracción de conocimiento de la información existente mediante el **proceso de su destilación**: agregación de valor en las distintas etapas del modelo de elaboración informacional hacia el conocimiento para las acciones.

VARIANTE METODOLÓGICA META-ANALÍTICA DESDE LA OPTICA DEL PROFESIONAL DE LA INFORMACION

	ACCIONES
ETAPA I "CONSULTAR"	• DEFINIR • IDENTIFICAR • LOCALIZAR • ACCEDER • RECUPERAR
ETAPA II "PROCESAR"	• DESCRIBIR. • PROCESAR. • EVALUAR. [TÉCNICA-CIENTIFICA] • SINTETIZAR. • INVENTARIO CUALITATIVO • INVENTARIO CUANTITATIVO • ARBITRAJE CIENTÍFICO
ETAPA III "INTEGRAR"	• NORMALIZAR. • CODIFICAR. • PONDERAR. • INTEGRAR SINÉRGICAMENTE • DISEMINAR.

TÉCNICAS Y ROL DEL PROFESIONAL DE LA INFORMACIÓN SEGÚN ETAPAS.

A modo de conclusión General.

El proceso de la Informatización e Información de la sociedad cubana, tienen su base en una *red de personas alfabetizadas, instruidas*, que origina el **Capital Intelectual**, el cual ha posibilitado la rápida introducción y generalización de estas tecnologías.

El país, a partir de los avances científicos y tecnológicos, además de consumir información, está en capacidad de producir "información de punta" como resultado de los avances y descubrimientos realizados en el país, con opciones en el meta-análisis de la información científica.

La **"Tecnología para Analizar el Desempeño Integral en un Tema Específico"** posibilita el análisis sistemático, sistémico e integral, obteniéndose información de alto valor agregado. Como uno de los elementos que la integran, el meta-análisis, constituye un tipo de procesamiento que evidencia la diferencia intelectual sustancial entre **análisis documental** y **análisis informacional**.

En el análisis documental la complejidad y la intensidad del trabajo intelectual es menor que en el análisis informacional, por lo que se impone en todo el proceso tecnológico de preparación y entrega del resultado meta-analítico la existencia de un equipo multidisciplinario, en los que sus miembros han de jugar cada uno su rol específico, para lograr mayor objetividad en la investigación.

La inclusión del **Análisis de la Potencia Estadística a Posteriori**, posibilita el estudio de la posible dependencia entre los resultados y la calidad metodológica de la información objeto de análisis.

El enfoque de la **Tecnología para Analizar el Desarrollo Integral en un Tema Específico** debe ser sistémica e integral, en el que se combinen adecuadamente diferentes métodos y técnicas de procesamiento de la literatura (continente) y la información (contenido), en los que deben estar presente, además, los relativos a la Bibliometría e Informetría para detectar un conjunto de regularidades del flujo de información documental para detectar aspectos de interés conducentes a lograr una mayor integridad informacional en el tema; enfoque que no ha estado presente del todo en las metodologías sobre meta-análisis, pues su elaboración no se vincula a la teoría sobre los procesos de producción de información (PPI), tal como se propone en el presente trabajo. Por otra parte, tampoco se considera introducir lo relativo a la eficiencia de desempeño de las unidades de toma decisional en el marco del tema objeto de estudio, para ver el peso de su rol en el mismo así como arrojar elementos científicos y tecnológicos valiosos desde una perspectiva del benchmarking.

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Características objeto de estudio dentro de la metodología meta-analítica desde la óptica de los Procesos de Producción de Información. Gráfico resumen:

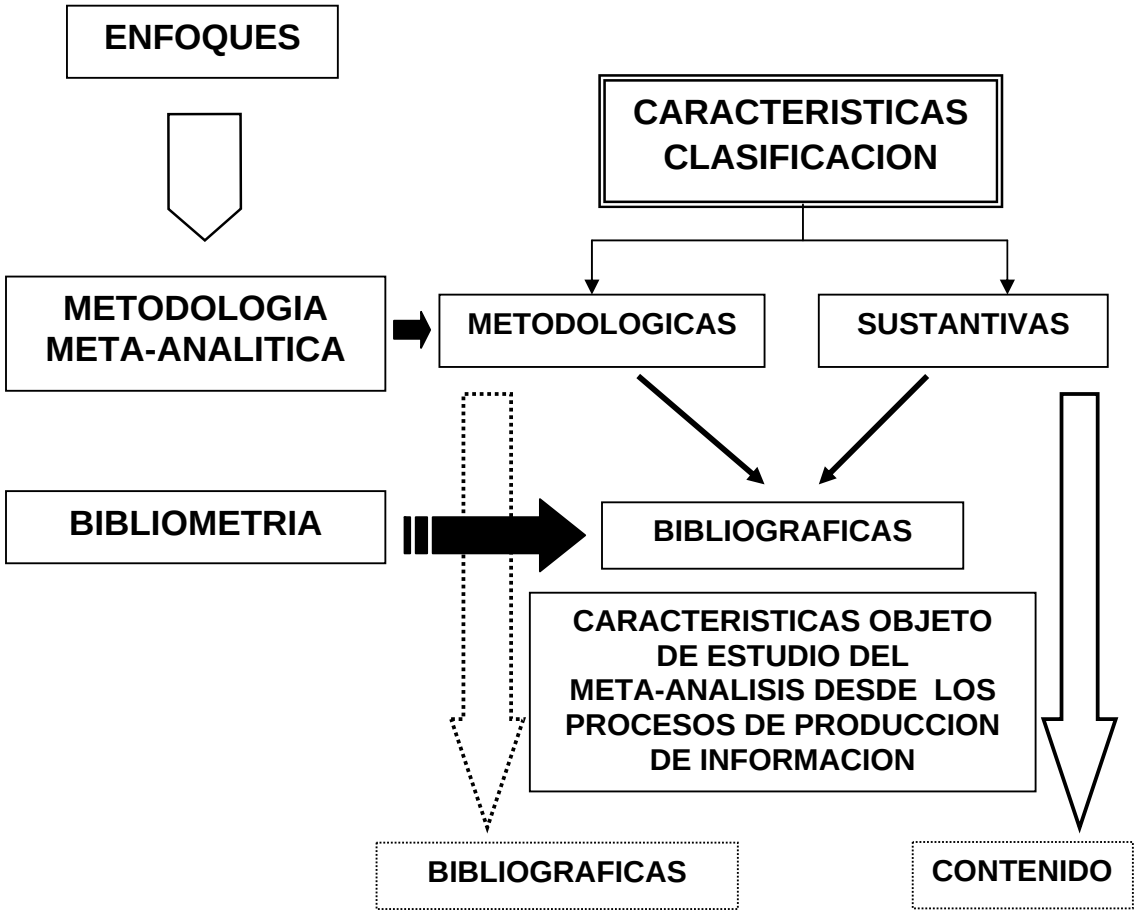

Figura A

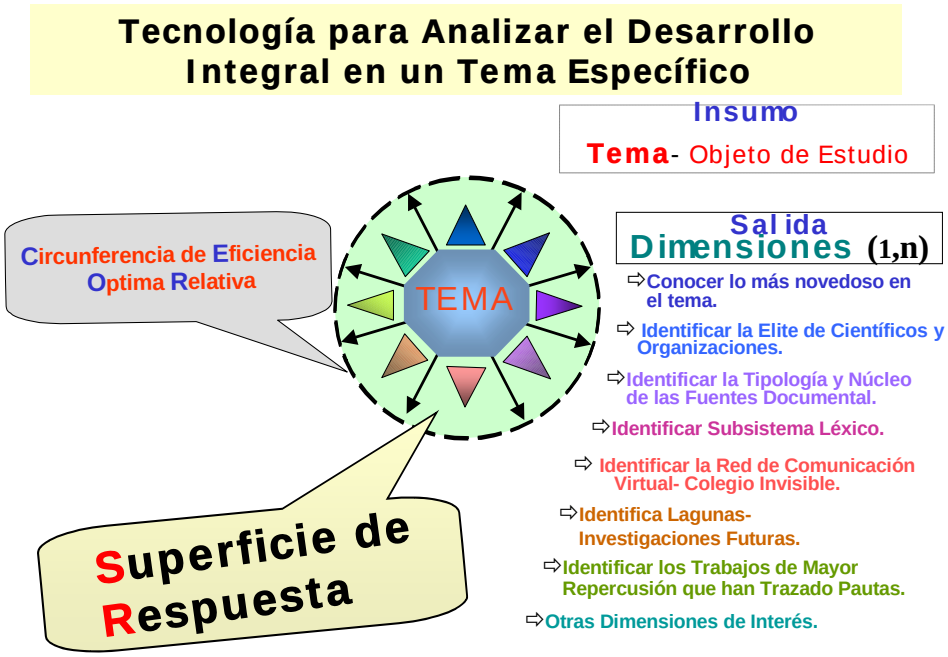

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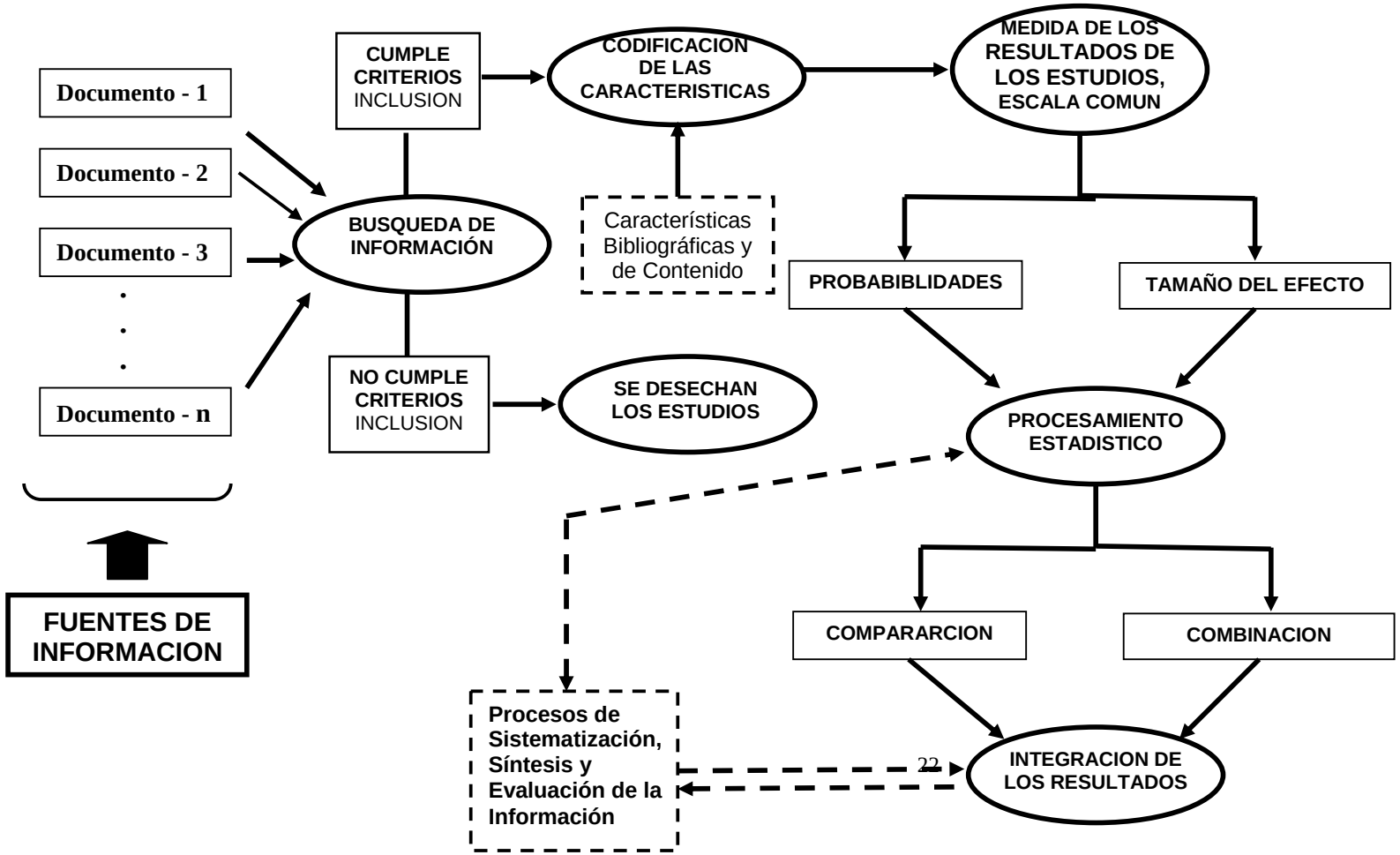
Figura

La ***metodología meta-analítica*** desde el enfoque del ***Flujo Tecnológico del Procesamiento Informacional.***



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Open Source Initiative
http://opensource.org

Free Software Foundation

General Information

About Linux
http://AboutLinux.com

Feedmag
http://www.feedmag.com/oss/ossjournalism.html

Open Directory
http://directory.mozilla.org

Open Source IT
http://www.opensourceit.com

Software in the Public Interest
http://www.spi-inc.org/

News Sites

Geek News
http://www.geeknews.com

Kuro5hin
http://kuro5hin.org

LinuxWorld
http://linuxworld.com

Open Resources News
http://www.openresources.com/news/

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Getting the code

FreeCode
http://www.freecode.com/index.html

Freshmeat
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http://orphansource.org/

SourceForge
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Misc. Good Sites

AppWatch.com – news about OSS applications
http://appwatch.com/Linux/

A Quantitative Profile of a Community of Open Source Linux Developers
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Some Useful Electronic Resources

- **Prairienet Community Network,** a member and donation-supported community information network for Champaign-Urbana and the surrounding East-Central Illinois region, is offered as a community service by the Graduate School of Library and Information Science at the University of Illinois at Urbana-Champaign. [hhtp://www.prairienet.org]

- **Community Connector** is a project of the University of Michigan School of Information that contains directories of CNs, conference announcements, bibliographies of papers, community-building information and other relevant resources. [http://www.si.umich.edu/Community]

- **The Benton Foundation** promotes public interest use of communication technologies and associated social benefits. The foundation advocates research and policy analysis, community action, outreach to nonprofits, and online publishing for the National Information Infrastructure in order to demonstrate the value of communications for solving social problems. Information on the digital divide, resources to help nonprofits effectively use communication technologies, etc. can be found by following the link to Communications Policy & Practice [http://www.benton.org/cpphome.html]

- **The Alliance of Information and Referral Systems (AIRS)** is the professional association for nearly 1,000 programs throughout North America that provide information and referral on human services in their respective communities. [http://www.airs.org]

- **Technology Opportunities Program (TOP)**—formerly the Telecommunications and Information Infrastructure Assistance Program (TIIAP)—of the Office of Telecommunications and Information Applications in the U.S. Dept. of Commerce's National Telecommunications and Information Administration annually awards matching grants to promote effective use of information technology at the local level. [http://www.ntia.doc.gov/otiahome/top/index.html/]

- **Association For Community Networking (AFCN)** is an educational nonprofit corporation dedicated to fostering growth of "Community Networking"–community-based creation & provision of appropriate technology services. [http://www.afcn.net/]

- **Community Technology Centers' Network (CTCNet)** is a network of nonprofit organizations in the US that promotes training, support, and access to computers and the Internet. [http://www.ctcnet.org/]

- **Community Building Resource Exchange** is a project of the Aspen Institute Roundtable on Comprehensive Community Initiatives for Children and Families. It provides a collection of resources and information about innovative community building efforts to revitalize poor neighborhoods and improve the life circumstances of residents and their families. [http://www.commbuild.org/]

- **Morino Institute** is a nonprofit organization that "explores the opportunities and risks of the Internet and the New Economy to advance social change." The website provides resources in four key areas, namely, stimulating entrepreneurship, advancing a more effective philanthropy, closing social divides, and understanding the relationship and impact of the Internet on our society. [http://www.morino.org/]

- **Markle Foundation: Improving life in the information age** works to realize the potential of emerging communications and information technology to create unprecedented opportunities for improving people's lives. Some of the most promising areas for Markle to meet public needs are in the following programs: Policy for a Networked Society, Interactive Media for Children, and Information Technologies for Better Health. [http://www.markle.org/index.stm]

- **Community Tool Box is** created and maintained by the University of Kansas Work Group on Health Promotion and Community Development in Lawrence, KS, and AHEC/Community Partners in Amherst, Massachusetts. The "how-to tools" provided on this website provides guidance on how to do different tasks necessary for community health and development. [http://ctb.lsi.ukans.edu]
- **Free-Nets and Community Networks** is developed by Peter Scott, and provides a directory to community networks across the world and links to relevant resources.

- **Closing the Digital Divide** is a comprehensive clearinghouse for information resources about digital divide issues and efforts to provide all Americans with access to the Internet and other information technologies. [http://www.digitaldivide.gov/]

- **Digital Divide Network: Knowledge to help everyone succeed in the digital age** provides information resources about the digital divide and related issues. [http://www.digitaldividenetwork.org/content/sections/index.cfm]

- **Digital Divide** is a two-part series for PBS that explores how the rapid spread of computer technology is affecting young people across the country. Narrated by Queen Latifah, the series asks the question: is everyone participating equally, if at all, in the Digital Revolution? The series focuses on the many aspects of the digital divide, exploring how the issues plays out in terms of education, employment, race, and gender. [http://www.pbs.org/digitaldivide/]

- **Global Culture: Trade and Technology: Digital Divide Project** is a collaborative venture between the Seattle School District and the University of Washington to create a curriculum for middle school and high school students that begins to engage them in some of the complexities of the digital divide, especially in the global dimensions of these issues. The website provides access to relevant resources.

- **Digital Divide** provides access to articles, reports, chat forums, and other relevant information resources on the gap between minorities and whites in Internet access. [http://racerelations.about.com/newsissues/racerelations/cs/digitaldivide/]

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Digital divide: the portal
http://www.gseis.ucla.edu/faculty/chu/digdiv/

http://www.ed.gov/Technology/digdiv_resources.html

How many people are connected and where ?
http://www.nua.ie/surveys/how_many_online/index.html

ICT's world report
http://www.iicd.org/countries/

Inforiches, infopauvres: le fossé numérique
http://www.cyberhumanisme.org/repertoire/inforiche.html

Bridging the Digital Divide
Knownet.org : The best site about the use of the Internet for community and human developpement. This site contains many very usefull links and informations plus a very interesting philosophy of " knowledge management for developpement
http://www.knownet.org

http://members.tripod.com/knownetwork/internetinfo-news.html

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The fight againbst digital divide from the perspective of the american government
http://www.digitaldivide.gov/

An american network fighting against the digital divide:
http://www.digitaldividenetwork.org

The Benton foundation bridging the digital divide. La fondation Benton lutte contre le fossé numérique http://www.benton.org/

English foundation promoting e democracy and trying to bridge the digital divide.
http://www.citizensonline.org.uk

Equal access for all:
http://www.onlinepolicy.org/

Bridging the digital divide:
http://www.istf.org/

The digital divide on the World Economic Forum site:
http://www.weforum.org/digitaldivide.

Links:
http://www.weforum.org/digitaldivide.nsf/vwAllLinksWeb?OpenView&Start=1&Count=8.

The digital divide between eastern and western Europe:
http://www.cdt.org/international/ceeaccess/report.shtml

Appel français pour la connexion forfaitaire illimitée :
http://www.ifi-france.net/

La fondation internet nouvelle génération : http://www.fing.org. Voir, sur ce site, un article sur le digital divide de Jacques-François Marchandise :
http://www.fing.org/dossier.php3?iddos=998#fractures

Infodev/ worlb Bank/ Chile case study
http://www.infodev.org/library/chile_rural/index.html

Démocratiser l'Internet
http://www.rfi.fr/Kiosque/Mfi/Csa/

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Gaston Zongo,
Information and communication technologies for development in Africa, trends and overview, IDRC/ACACIA, Communities and information Society in Africa, April 2001
http://www.weforum.org/digitaldivide
http://www.igc.apc.org/gk97/gk97.gkd97/entries/743232375.1.html
http://www.aftidev.net/fr/ressourcesliens.html

Development of infratructures: an overview
http://www.bellanet.org/partners/aisi/adf99docs/nicifr.htm

African links about development: ICT's section
http://www.cdt.int.ch/~doc/liensafrique.html
African Internet Infrastructure Information
Information Technologies in Africa (African'ti)
Initiative Acacia (technologies de l'information en Afrique)
Internet and related developments in Africa
Pan African Development Information System [PADIS]
Réseau consultatif sur les stratégies d'information en Afrique (ANAIS)

Réseau Intertropical d'Ordinateur (RIO)
Internet in Africa: statistics

IUT telecom Africa 2001: Bridging the digital divide, 12 -16 November, Johannesburg
http://www.itu.int/AFRICA2001/flash_homepage.html

Internet and development by Dominique Desbois
http://www.ufr-info-p6.jussieu.fr/~creis/serveur/journal/is98_desbois.html

http://www.multimania.com/gning/

Infrastructure nationale de l'information et de la communication en Afrique (National Infrastructure of information and communication for Africa).
http://www.bellanet.org/partners/aisi/adf99docs/nicifr.htm

Digital Divide: Burkina Faso, a case study.
http://news.bbc.co.uk/hi/english/special_report/1999/10/99/information_rich_information_poor/newsid_466000/466651.stm

ICT'S in french western african countries
http://www.oneworld.org/euforic/eadi/97mar_fr.htm
http://www.africanti.org/

African experiences to bridge the digital divide
http://www.anais.org/
http://www.iicd.org/
http://www.iicd.org/countries/

African women and ICT's
http://www.flamme.org/

ICT's in Senegal: studies
http://www.unrisd.org/infotech/publicat/publ.htm

Internet and politic (Senegal)
http://www.primature.sn/lesoleil/marketing.htm

Prices in the market of telecommunication in Senegal
http://www.osiris.sn/chiffres.htm

Multimedia Senegal
http://www.primature.sn/lesoleil/cahiersp.htm#Multimédia

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http://www.primature.sn/lesoleil/universite.htm#virtuelle

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http://www.monde-diplomatique.fr//1996/02/internet.html

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http://www.bmwi-info2000.de/glob_invent_d/index_a.htm
A comprehensive collection of governmental actions and programs on all levels related to ICT (only in German, English site still under construction).

http://www.frauen-technik-impulse.de/index_e.html
Women Give New Impetus to Technology tries to create a broad social dialogue to enable the potential of women to contribute to equal rights in the formation of the technological future.

http://www.digitale-chancen.de
The German *Digital Opportunities Network (Netzwerk Digitale Chancen).* Currently under construction by the Telecommunications Research Group. It will be a comprehensive collection of information about the digital divide and ways to bridge it. A nation-wide database with internet access and learning locations have been already launched.

http://www.webmobil.jugend-nrw.de/
Webmobils for NRW (Webmobile für Nordrhein-Westphalen) A project that brings media competence to the remote areas of North-Rhine Westphalia.

Non-profit registered German association of business and political representatives
http://www.initiatived21.de/home.php3?nav=english/factsheet&teaser=english&text=english/factsheet/factsheet.html

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Appendix:
Research and reports on telecenters in developing countries

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