

What is the digital divide?

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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 emails¹ on the U.S.-based listserv digitaldividenetwork², 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 (except 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 1⁶ shows just a few of the many names and sources for conceptions of this phenomenon.

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 included 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 Class society | Wilson 1987 Attali 1991, McChesney 1996, Perelman 1998, Dyer-Witthoford 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. McChesney⁹ 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-Witthoford 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 see on satellite TV broadcasts from Paris, Los Angeles or Toyko.¹⁰

Distinct from the discussions of class society in the information technology revolution is 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 Williams¹³ 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 cybpower, 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.

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

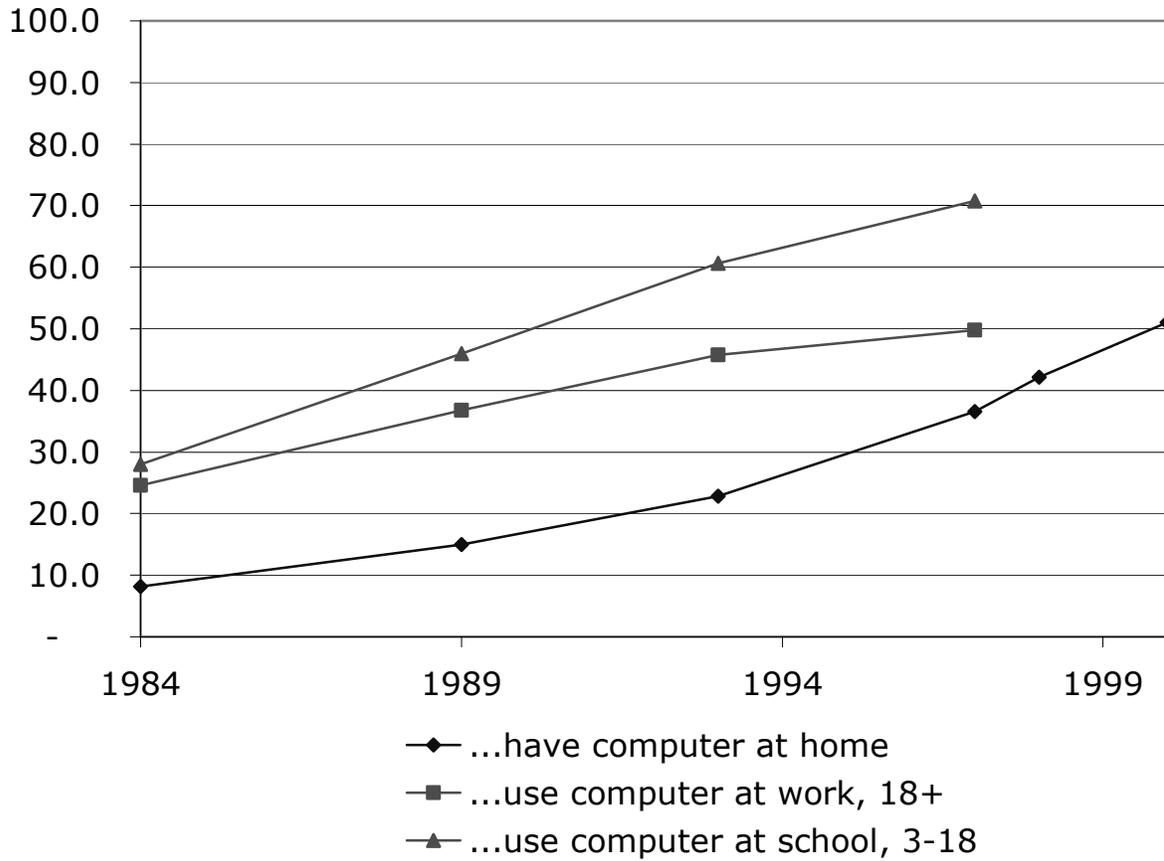
| Concept | Measure |
|--------------------|---|
| Personal computing | Percent of households with computer at home |
| Private computing | Percent of adults 18 and older using a computer at work |
| Public computing | Percent of children age 3-18 using a computer at school |

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.

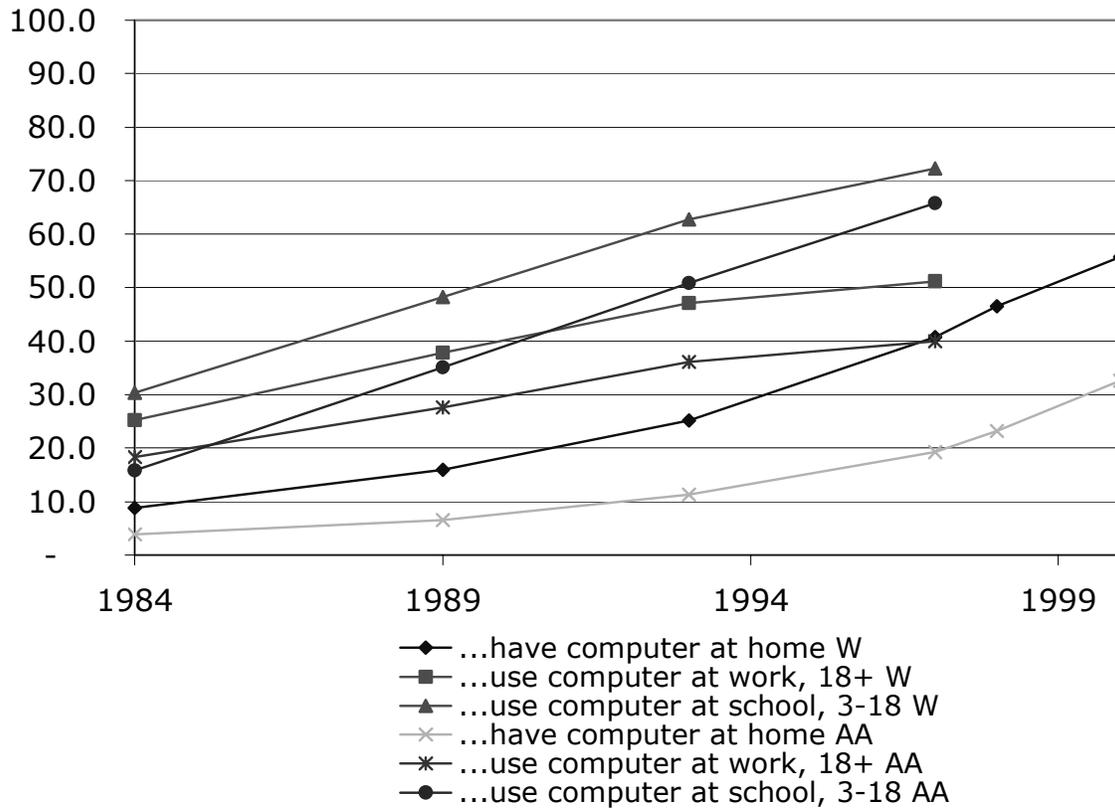
Figure 2. Operationalizing personal, private, and public computing: Percent of U.S. households which...



| 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.

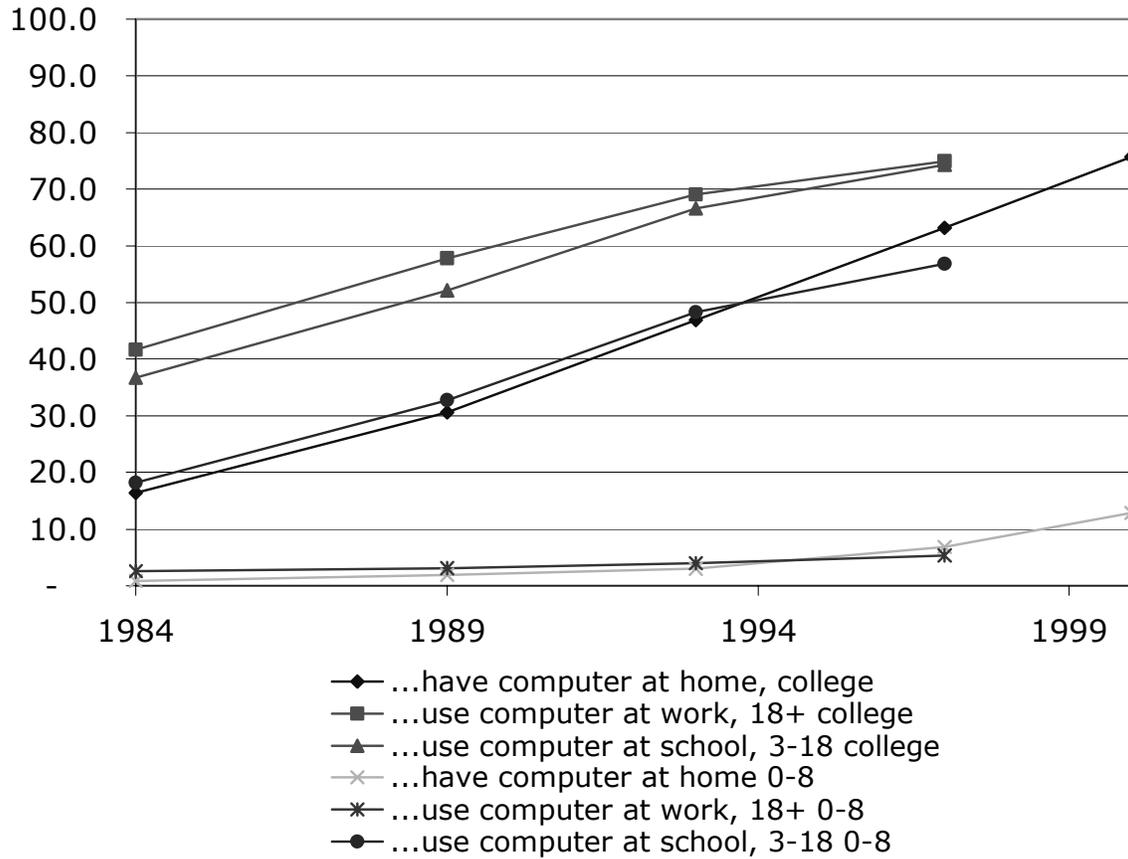
Figure 3. Comparing white and African American households



| | 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 | connectivity (in one locale) |
| + | - | - | 5 | |
| - | + | - | 6 | exclusion |
| - | - | + | 7 | |
| - | - | - | 8 | |

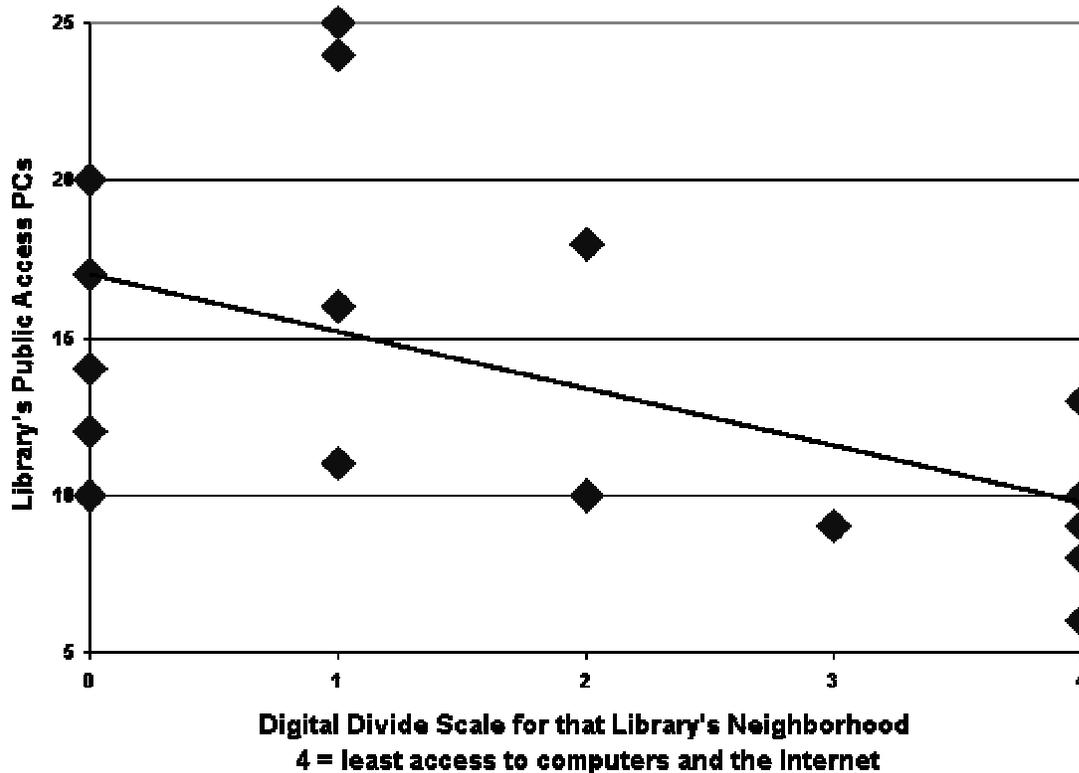


In the dynamic societies across the globe today, one can postulate that people are moving from exclusion to netizenship through various middle stages. Each movement, each stage is far more complex than computer ownership, yes or no, or computer use, yes or no. Past and future research from a variety 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 absence, 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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