The Growing Digital Divide: Implications for an Open Research Agenda

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1. INTRODUCTION

That portion of the Internet known as the World Wide Web has been riding an exponential growth curve since 1994 (Network Wizards 1999; Rutkowski 1998), coinciding with the introduction of NCSA's graphically-based software interface Mosaic for "browsing" the World Wide Web (Hoffman, Novak, and Chatterjee 1995).

Currently, over 43 million hosts are connected to the Internet worldwide (Network Wizards 1999). In terms of individual users, somewhere between 40 to 80 million adults (eStats 1999) in the United States alone have access to around 800 million unique pages of content (Lawrence and Giles 1999), globally distributed on arguably one of the most important communication innovations in history.

Enthusiasm for the anticipated social dividends of this "revolution in democratic communication" (Hoffman 1996) that will "harness the powerful forces of science and technology"(Clinton 1997a) for all members of our society appears boundless. The Internet is expected to do no less than virtually transform society. Nowhere is this confidence expressed more clearly than in President Clinton's aggressive objective to wire every classroom and library in the country by the year 2000 (NetDay 1998), followed by every home by the year 2007, so that "every 12-year-old can log onto the Internet" (Clinton 1997b).

Yet even as the Internet races ambitiously toward critical mass, some social scientists have begun to examine carefully the policy implications of *current* demographic patterns of Internet access and usage (Hoffman and Novak, 1998; Hoffman, Kalsbeek, and Novak 1996; Hoffman, Novak, and Venkatesh 1997; Katz and Aspden 1997; Wilhelm 1998). For while Clinton's "Call to Action for American Education" (Clinton 1997a) may likely guarantee universal access for our nation's next generation, are the approximately 200 million Americans presently over the age of 16 equally likely to have access to the Internet? The findings thus far are both obvious and surprising, with important implications for social science research and public policy.

Looming large is the concern that the Internet may not scale *economically* (Keller 1996), leading to what Lloyd Morrisett, the former president of the Markle Foundation, has called a "digital divide" between the information "haves" and "have-nots." For example, although almost 70 percent of the schools in this country have at least one computer connected to the Internet, less

than 15 percent of classrooms have Internet access (Harmon 1997). Not surprisingly, access is not distributed randomly, but correlated strongly with income and education (Coley, Cradler, and Engel 1997). A recent study of Internet use among college freshman (Sax, Astin, Korn, and Mahoney 1998) found that nearly 83 percent of all new college students report using the Internet for school work, and almost two-thirds use email to communicate. Yet, closer examination suggests a disturbing disparity in access. While 90.2 percent of private college freshman use the Internet for research, only 77.6 percent of students entering public black colleges report doing so. Similarly, although 80.1 percent of private college freshman use email regularly, only 41.4 percent of students attending black public colleges do.

Further, although numerous studies (CyberAtlas 1999; Maraganore and Morrisette 1998) suggest that the gender gap in Internet use appears to be closing over time and that Internet users are increasingly coming from the ranks of those with lower education and income (Pew Research Center 1998), the perception persists that the gap for race is not decreasing (Abrams 1997).

This paper is organized as follows. First, we review the most recent research investigating the digital divide. Our review highlights studies focusing on key differences in PC ownership, Internet access and Web usage between whites and African Americans in the United States. Next, we use this research to formulate a series of discussion and policy points relevant to the development of an open research agenda concerning the socioeconomic impact of the Internet and electronic commerce in the United States and globally. Finally, we conclude with several comments regarding the likely consequences of a continuing digital divide and the importance of ensuring access for the next generation.

2. RECENT RESEARCH ON THE DIGITAL DIVIDE

Katz and Aspden (1997) reported evidence of what Lloyd Morrisett of the Markle Foundation has termed a "digital divide," with Internet users being generally wealthier and more highly educated. Sparrow and Vedantham (1995) summarize the broader information technology situation as follows:

> "Information technologies include basic telephone service, personal computing, and computer networking. Although these technologies are becoming everyday conveniences for many Americans, some communities are being left out. Disparities exist in levels of access between rich and poor and between suburban and inner-city residents." (p.19)

Hoffman and Novak (1998) examined racial differences in Internet access and use at a single time point and found in 1997 that, overall, whites were significantly more likely than African Americans to have a home computer in their household and also slightly more likely to have PC access at work. Whites were also significantly more likely to have ever used the Web at home, whereas African Americans were slightly more likely to have ever used the Web at school. As one might expect, increasing levels of income corresponded to an increased likelihood of owning a home computer, regardless of race. Although income explained race differences in computer

ownership and Web use, education did not. That is, they found that whites were still more likely to own a home computer than were African Americans and to have used the Web recently, despite controlling for differences in education.

Their most striking findings, however, were for students. Hoffman and Novak (1998) found no differences among white and African American students when students had a home computer. However, among students without a computer in the home, white students were much more likely than African American students to have used the Web, and also more likely to have used the Web at locations other than home, work or school. They concluded that "access translates into usage," and that whites are more likely than African Americans to use the Web because they are more likely to have access.

Babb (1998) investigated home computer ownership and Internet use among low-income individuals and minorities. She found that African Americans and Hispanics were less likely to own computers, even after adjusting for income and education and termed this finding, consistent across seven different data sets under examination, "the single most important finding" of her study.

The gap between whites and African Americans in computer ownership has been cited as the key explanation for corresponding gaps in Web usage. A Yankelovich Monitor study (*Interactive Daily* 1997) "suggests that what bars entry to cyberspace among African Americans is owning a home PC, not lack of interest in the Internet." However, a Forrester Research study (Walsh 1999) cites "technology optimism" as an important predictor of technology adoption. Further research is required to understand these increasing gaps in access and usage.

A number of reasons have been provided in the popular press for the gap between whites and African Americans in computer ownership. Price and value are often cited as explanaations. For example, Malcolm CasSelle, co-founder of NetNoir, stated, "African Americans just don't perceive the value of the Internet. Many blacks would pay $500 for a TV, and you could get a computer, though maybe not a top-of-the line one, for not much more than that" (Holmes 1997). Similarly, Larry Irving, assistant secretary of Commerce, noted that WebTV is in the under-$500 price rang,e and "laptop and PC prices are coming down. As that continues to happen, the Internet will become more prevalent in the African American community" (Holmes 1997).

In 1998, the Commerce Department's National Telecommunications and Information Administration (McConnaughey and Lader 1998) analyzed data on computer penetration rates from the October 1997 Census Current Population Survey (CPS) as part of an ongoing examination of the digital divide. This analysis represented an update from their 1995 study of similar data from the November 1994 CPS. The authors concluded that the gap between the technology "haves" and "have-nots" had *increased* between 1994 and 1997, with African Americans and Hispanics actually farther behind whites in terms of home computer ownership and Internet access and with an even wider gap between individuals at upper and lower income levels.

The NTIA examined the digital divide again a year later (Department of Commerce 1999), using Census data from December 1998. Although they found that more Americans than ever before

were connected to the Internet, the data clearly showed a persistent digital divide between the "information rich" and the "information poor." Upper income households were much more likely to have Internet access and PCs at home. Further, whites were more likely than blacks or Hispanics to have Internet access. Additionally, rural Americans were less likely to have Internet access than Americans in urban locations. The report also revealed that, compared to 1994, gaps in home Internet access had widened between whites and African Americans.

Hoffman, Novak and Schlosser (1999) systematically investigated differences over time in home computer ownership, Internet access and usage between whites and African Americans in the United States. Their comparative analysis is based on primary data from three population projectable, nationally representative surveys of Internet use among Americans (Nielsen Media Research 1997a; 1997b; 1998), including the first survey on Internet use to collect data on race and ethnicity (Hoffman, Kalsbeek, and Novak 1996; Nielsen Media Research 1997a).

In terms of Internet access, use, and PC ownership across three time points (January 1997, September 1997, and June 1998), Hoffman, Novak, and Schlosser (1999) found that the digital divide continues. Web users in general were wealthier, while those without Internet access in general were poorer. Similarly for education, Web users were better educated, while those without access were most likely to have a high school education or less. These effects were more pronounced for African Americans than whites and persisted over time. Further, differences in Internet access, having ever used the Web, and home computer ownership between whites and African Americans actually increased over time.

However, among recent Web users, who by definition have access somewhere, they found that the gaps in usage had largely disappeared. Over time, African Americans were nearly as likely to be long-term users as their white counterparts, and used the Web just as recently and frequently. African Americans were more likely to be among the newest users. Additionally, African Americans' use of the Web from home, work, school and other locations appears to be increasing.

Among other results, they reported that men were still more likely to have ever used the Internet than women, but that, consistent with other surveys, the gender gap is closing rapidly. However, white men and women were more likely to have access, use and own PCs than their African American counterparts. Further, although the percentage of white men and women owning a PC has increased, it has not increased for African American men and women.

Students were more likely to have access, ever used and own computers than non-students and that rate is increasing. However, white students were more likely to have access and ever used the Web than African American students, and also more likely to own home computers. Without a home PC, the gaps appear to be increasing between white and African American students.

Not surprisingly, increasing levels of education lead to higher levels of access, use, home PC ownership and PC access at work. But Hoffman, Novak, and Schlosser (1999) found that these levels were higher for whites than African Americans and persisted even after adjusting for education. Also not surprisingly, higher income corresponded to higher levels of access, use, home PC ownership and PC access at work. At incomes below $40,000, whites were more likely

than African Americans to have Internet access, own or use a PC, whereas the gaps greatly diminished at incomes above $40,000.
In terms of e-commerce, whites were more likely to shop and search online, although the gap in online purchasing - but not searching for things to buy - is largely disappearing.

Interestingly, some have suggested that United States policy itself may be a contributing factor in the growing digital divide. Cooper and Kimmelman (1999) argue that the Telecommunications Act of 1996 has had the unintended and unfortunate consequence of increasing the division between the telecommunications "haves" and "have-nots." As evidence, they point to 1) increased concentration and less competition in the telecommunications and cable industries, 2) significant increases or flat prices, instead of declines, in cable, long distance, and local phone rates, and 3) a growing disparity among those market segments employing heavy use of telecommunications networks like the Internet and those whose use is more modest.

3. DEVELOPING A RESEARCH AGENDA

We now raise a series of points for further discussion. We believe these issues represent the most pressing unanswered questions concerning access and the impact of the digital divide on the emerging digital economy.

Computers in the Home

While previous research has shown that inequalities in Internet access in schools persist (Educational Testing Service 1997, Sax, et. al. 1998), the research reviewed here suggests that inequalities in Internet access at home may be even more problematic. The role of access to the Internet at home needs to be much more clearly understood (Abrams 1997).

Whites are more likely to have access to the Internet and to have ever used the Web than African Americans and these gaps appear to be *increasing* over time. Probing deeply, we have discovered that among recent Web users, who by definition have access, the gaps in Web use have been *decreasing* over time. Over time, there appear to no or only slight differences between whites and African Americans in how recently they had used the Web, how frequently, or in their length of time online.

Gaps in general Web access and use between African-Americans and whites appear to be driven by whether or not there is a computer present in the home. Access to a personal computer, whether at home, work, school or somewhere else, is important because it is currently the dominant mechanism by which individuals can access the Internet. We believe that access translates into usage. Overall, individuals who own a home computer are much more likely than others to use the Web. This suggests that programs that encourage home computer ownership (see, for example, Roberts 1997) and the adoption of inexpensive devices that enable Internet access over the television should be aggressively pursued, especially for African Americans.

Morrisette (1999) forecasts that by the year 2003, over half of all households in the United States will have access to the Internet, but that PC penetration could stall at 60 percent of households. Research is necessary to understand what motivates individual-level adoption of home computers and related technologies, as well Internet adoption, both within and outside the home. Additionally, research is required to understand the long-term impact of home computer ownership on Internet access and use.

Katz and Aspden (1997) investigated the role of social and work networks in introducing people to the Internet. The dominant three ways people were originally introduced to the Internet were 1) taught by friends or family, 2) learned at work, and 3) self taught. Formal coursework was the *least* often mentioned way people were introduced to the Internet. Long term Internet users were most likely to have learned at work; for recent Internet users, friends/family and self-taught were equally important. These results reinforce the importance of the presence of a computer at home, or the opportunity to access the Web from locations other than the home, in stimulating Web use.

Insight into the importance of reducing this gap in Web use between whites and African-Americans is provided by Anderson and Melchior's (1995) discussion of *information redlining*. Information redlining signifies the relegation of minorities into situations where satisfying their information needs is weighed against their economic and social worth. From the minority point of view, this is both an access issue and a form of discrimination. The new technologies of information are not simply tools of private communication as a telephone is, or tools of entertainment as a television is. They provide direct access to information sources that are essential in making social choices and keeping track of developments not only in the world at large, but also within their immediate neighborhoods. Unless the neighborhoods are properly served, there is no way out of information redlining for most of these disadvantaged groups. Research on this topic is warranted.

There are also interesting differences in media use between whites and African Americans that also deserve further probing. For example, although the rate of home PC ownership among African Americans is flat or even decreasing, the rates of cable and satellite dish penetration are increasing dramatically for African Americans. At a minimum, these results suggest that African Americans may make better immediate prospects than whites for Internet access through cable modems and satellite technology.

Web Use Outside of the Home

In addition to gaps in home computer ownership, the implications of differential Internet access at locations outside the home, including school, the workplace and other locations needs to be clearly understood. Research suggests that additional access points stimulate usage. Further research is necessary to understand the impact of multiple access points on Web use, particularly for individuals who have no access at home.

Public-private initiatives such as Bell Atlantic's efforts in Union City and Bill Gates announcement of a $200 million gift to provide library access to the Internet are a step in the right direction (Abrams 1997). It has also been noted that "community networks and public access terminals offer great potential for African-American communities" (Sheppard 1997). Further, the recent roll-out of E-rate funds (Schools and Libraries Corporation 1998) provides a significant opportunity for researchers to understand the factors important in stimulating Web usage among those least likely to have access.

School Web Use

The role of Web access in the schools, compared to other locations, needs to be clearly understood. Students enjoy the highest levels of Internet access and Web use, especially when there are computers in their households. However, white students are still more likely than African American students to have access and to use the Internet, and these gaps persist over time. Indeed, our findings closely parallel statistics comparing student Internet use at private universities and black public colleges (Sax, et. al. 1998). As a recent report by the Educational Testing Service (1997) makes clear:

- There are major differences among schools in their access to different kinds of educational technology.
- Students attending poor and high-minority schools have less access to most types of technology than students attending other schools.
- It will cost about $15 billion, approximately $300 per student to make all our schools "technology rich." This is five times what we currently spend on technology, but only 5% of total education spending.

Anderson and Melchior (1995) cited lack of proper education as an important barrier to technology access and adoption. Access to technology does not make much sense unless people are properly educated in using the technologies. Our data do not speak to the quality of the hardware/network connections, or the quality of information technology education that is provided by school. As noted by the ETS report, creation of educational opportunities requires financial commitment that cannot be generated by the minority groups from within their resources.

Comparisons of All Racial/Ethnic Groups

Comparison among additional minority groups, in particular, Hispanics, Asian-Americans and Native Americans, are required. Understanding the differences in Internet access and use among *all* racial and ethnic groups in the United States is required for a comprehensive understanding of technology adoption and its impact on the digital economy. Subsequent studies need to oversample members of minority groups. This is required so that there will be sufficient numbers of all minority groups to perform post-stratification adjustments to create weights that yield population-projectable results for each minority group.

Differences in Search Behavior

Reasons for the gap between African-Americans and whites in Web search behavior need to be clearly understood. Such differences could have important implications for the ultimate success of commercial efforts online. White Web users are more likely to report searching for product or service-related information than African Americans. One possibility is that despite sites such as NetNoir[1] and Black Entertainment Television[2], general purpose search agents may not be perceived as an effective way to locate Web content that is compelling to African-American users (*New Media Week* 1997). This suggests the development of search engines and portals targeted to the interests of racial/ethnic groups.

Shopping Behavior

There appear to be no differences between African-Americans and whites in the incidence of Web shopping. Is this because race doesn't matter for "lead users?" who are most likely to shop, or is this because commercial Web content better targets racial and ethnic groups than does non-commercial Web content? Previous research (Novak, Hoffman, and Yung 1999) suggests that more skill is required to shop online than to search. However, as noted above, whites are more likely to search for information online than are African Americans. More generally, consumer behavior in the commercial Web environment is complex and only weakly understood. Further research is needed to explore fully the differences in consumer behavior on the Web and their implications for commercialization.

Multicultural Content

Studies investigating the extent of multicultural content on the Web are needed. Another possibility for the gap between African-Americans and whites in Web search behavior is that there is insufficient content of interest to African-Americans. *Interactive Marketing News* (1997) claimed that "while there are about 10 million sites on the Web, there are fewer than 500 sites targeted" to African-Americans. However, others have commented on the multicultural diversity of the Web. Skriloff (1997) reported, "there are thousands of Web sites with content to appeal to Hispanics, African-Americans, Asian-Americans, and other ethnic groups...A Web search for Latino sites, reported in the Feb./March 1997 issue of Latina Magazine, turned up 36,000. Many of these sites are ready-for-prime time with high quality content, graphics, and strategic purpose."

Community Building

Are there different cultural identities for different parts of cyberspace? Schement (1997) notes that by the year 2020, major U.S. cities such as Los Angeles, Chicago, and New York will have

[1] http://www.netnoir.com/
[2] http://www.msbet.com/

increasingly divergent ethnic profiles, and will take on distinctive cultural identities. An important question is whether there are divergent ethnic profiles for areas of cyberspace. While the questions in the three IDS do not allow us to directly address this issue, our analyses provide some preliminary evidence of divergent ethnic profiles for various Web usage situations. For example, African Americans appear to be more likely to use the Web at school and at other locations, and in some cases, are more likely to use the Web at work. How much of this is driven by the lack of a PC in the home and how much by other factors we have yet to hypothesize and investigate?

In addition to facilitating community building at the global level, the Web also facilitates neighborhood-level community building. Schwartz (1996) discusses how the Internet can be used as a vehicle for empowering communities. Anderson and Melchior (1995) raise the issue of the ways in which telecommunications can be used to strengthen communities. Thus, we should expect to find neighborhood Web sites emerging as an important aspect of cyberspace, and that these Web sites will parallel the ethnic profiles of the corresponding physical communities.

Income and Education

Income matters, but only after a certain point. Household income explains race differences in Internet access, use, home computer ownership and PC access at work. In terms of overall access and use, higher household income positively affects access to a computer. But at lower incomes, gaps in access and use between whites and African Americans existed and were increasing. Research is necessary to determine the efforts most likely to be effective to ensure access for lower-income Americans, especially African Americans.

The situation is different with education. As with income, increasing levels of education positively influences access, Web use, PC ownership and PC access at work. However, whites are still more likely than African Americans to have access to and use the Internet, and own a home computer, and these gaps persist even after controlling for educational differences.

The policy implication needs to be carefully considered: To ensure the participation of all Americans in the information revolution, it is critical to improve the educational opportunities for African Americans. How this might best be achieved is an open research question.

4. Concluding Remarks

The consequences to American society of the digital divide in Internet use are expected to be severe (Beaupre and Brand-Williams 1997). Just as A.J. Liebling observed for the freedom of the press (Liebling 1960), the Internet may provide for equal economic opportunity and democratic communication, but only for those with access. The United States economy may also be at risk if a significant segment of our society, lacking equal access to the Internet, wants for the technological skills to keep American firms competitive.

This chapter is intended to stimulate discussion among scholars and policy makers interested in how differences in Internet access and use among different segments in our society affects their ability to participate and reap the rewards of that participation in the emerging digital economy. In summary, we have reviewed the most recent research investigating the relationship of race to Internet access and usage over time. Our objective is twofold: 1) to stimulate an informed discussion among scholars and policy makers interested in the issue of diversity on the Internet, and 2) propose a research agenda that can address the many questions raised by this and related research.

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