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Access, skills, economic opportunities, and democratic participation: Connecting four facets of the digital divide through research

Abstract: In exploring many of the divides that constitute the Digital Divide, this study examines skills, attitudes, and experiences of the individuals most likely to be affected by a lack of computer access and skill. As social scientist Robert Putnam argues, disparities in information and communication technologies access and skills may represent a “cyberapartheid” that diminishes the store of bridging social capital necessary for connecting disparate elements of society. This presentation will report findings from a telephone survey in the United States of 1,100 adults living in low-income U.S. census tracts. A control group of 600 adults living in the general population was also surveyed. Results of this survey, as analyzed using multivariate regression techniques, provide guidance for policy makers, funding agencies, and to program providers such as public libraries.

Résumé: En explorant plusieurs des fossés qui constituent le fossé numérique, cette étude examine les compétences, les comportements et les expériences des individus pouvant être les plus touchés par un manque d'accès et de compétences informatiques. Comme le démontre Robert Putnam, spécialiste des sciences sociales, les disparités au niveau de l'accès des technologies de l'information et de la communication et des compétences associées pourraient représenter une « cyber-apartheid » qui diminue la possibilité de combler le capital social nécessaire à la réunion des différents éléments disparates de la société. Cette présentation rapporte les conclusions d'un sondage téléphonique effectué aux États-Unis auprès de 1100 adultes ayant un faible revenu. Un groupe de contrôle de 600 adultes répartis dans la population générale a également été recensé. Les résultats de ce sondage, grâce à l'analyse utilisant les techniques de régression multivariée, fournissent des informations utiles aux politiciens, aux organismes subventionnaires et aux fournisseurs de programmes comme les bibliothèques publiques.

1. INTRODUCTION

The topic of the Digital Divide, if we are to think of it as a mighty network of researchers, policy makers, advocates, and victims, has many hubs. Buchanan asserts that in social networks, the bridges between hubs, those that serve as the connections between groups that may have little day-to-day interaction, these bridges are the most important in keeping a network functioning and growing (Buchanan 2002). Just a few years ago, the Digital Divide network was thought to be of singular focus. The focus was access to technology. While useful in expressing the drastic and dramatic inequities between rich and poor in a culture as tied to computer technology as we are to our automobiles, access to technology alone is not the only dimension of the Digital Divide. We all know that access to books, public education, and public libraries, makes us all equally capable, or, perhaps, not. In the era of the short attention span, those alarmed by the evolution of the Information Have Nots into the churning waters of the Digital Divide have used

the “Access to Technology Soap Box” as a means of communicating with those who were in a position to actually do something about the problem. Most everyone understands what we mean by “access,” but try to explain information literacy or the effect of the Internet on the direct democracy to an average person. As an issue, the Digital Divide concerns many disciplines and professions—sociology, communication studies, library and information science, political science, public policy, philosophy, economics, and geography; similarly, the research that has used the Digital Divide as either reason or theme, is also found in many disciplines and professions. Whether one views Digital Divide scholarship as a new phenomenon or an old phenomenon with a new name, finding the bridges to link these disciplines and efforts together is, or, should be, extremely important. This importance is due to the necessity of keeping the Digital Divide network growing, and, hopefully, doing some good in the world. The premise of this research team, a premise made evident in the results, is that an interdisciplinary approach to understanding the Digital Divide is absolutely necessary to creating workable, real-world solutions. After all, the day-to-day life of a victim of the Digital Divide cannot be classified as simply an economic problem, or simply a political problem, or simply an education problem.

2. BACKGROUND

This presentation is based upon some of the processes and results of an interdisciplinary project at Kent State University, Kent, Ohio, USA. The members of the research team are: Mary Stansbury, School of Library & Information Science, Karen Mossberger, and Caroline Tolbert, Department of Political Science. The team acquired funding of over \$103,000 to collect the data and have time to analyze the results and write. The writing has resulted in a book, currently in production with Georgetown University Press, titled *Virtual Inequality: Beyond the Digital Divide* (Mossberger, Tolbert, & Stansbury, In Press), which is scheduled for publication in August, 2003.

The primary research question of the project was as follows: Which demographic factors are most likely to be related to a lack of Information and Communications Technology (ICT) access, skills and experiences? A secondary research questions was as follows: What relationships exist between ICT access and skills and participation in the democratic process and economic opportunities?

3. PROJECT METHODOLOGY

A national (USA) random sample of 1190 respondents was drawn from all high poverty census tracts in the 48 states, excluding Alaska and Hawaii. High poverty tracts were defined as those with 50 percent or more of the households living at or below 150% of the federal poverty level. A second national random sample of 655 respondents drawn without regard to the poverty rate of the census tract served as a control group. There were 1837 respondents overall. A telephone survey of both samples was conducted in June and July 2001 by Kent State University’s Computer Assisted Telephone Interviewing (CATI) lab in the Department of Sociology. Respondents were 21 years of age or older. The response rate for individuals in the high poverty

tracts was 92%; the control group response rate was 88%. There were 50 items on the questionnaire, and the questionnaire took 8.5 minutes to complete on average.

The survey questions related to the subject's experiences and attitudes toward access to information and communications technologies (ICTs), ICT skills, and the effect of ICT access, skills, and attitudes as they relate to economic and educational opportunity and democratic participation. In order to compare results with other national surveys, such as some of the Pew Internet and American Life projects and the U.S. Department of Commerce studies, some of the access questions paralleled other studies. For example, subjects were asked, "Do you personally have a home computer?" "In the last month how often did you personally use a computer at: work; home; school; the public library; a community center; a friend or relative's house for any reason?" "Do you have an e-mail address...?"

Some of the attitude questions were "These days, do you think it is necessary for people to use the Internet if they want to keep up with the times?" And, "Would you be willing to go to a [recreation center; senior center; local church; government office; library; public school after hours] to use computers or access the Internet?"

There is very little research describing and analyzing the ICT skills of residents of the USA. Subjects of this study were asked to indicate if they needed help doing any of the following tasks: using the mouse and typing; sending and receiving e-mail; using a web browser; locating information on the Internet; using word processing programs; using spreadsheets; taking a class online; doing homework or a school assignment; and finding books or other information in a public library. Another set of questions in the survey asked subjects to indicate instructional preferences for learning new ICT skills. For example, subjects were asked, "If you need to learn a new computer or Internet skill, how would you prefer to be taught that skill? [have personal (one-on-one) instruction; take a class with group instruction; use online help or tutorials; use printed manuals]."

Questions relating to ICTs and economic opportunities included "Have you ever been turned down for a job because you needed to know more about computers?," and "Do you believe you need to learn new computer skills to get a [promotion; higher paying job; start a small business]. Democratic participation questions included "I would ...[vote in a government election online; register to vote in a government election online; look up information on government services online]." And a question that asked if subjects had used the Internet to search for information on a political candidate or political organization; looked up information on government services or contact a government official; and seen a campaign ad for a candidate running for an elected government office.

Survey response data was loaded into SPSS 10.0 for Windows®; descriptive statistics were examined to guide the next level of data analysis. Multivariate logistic and ordered logistic regression analyses were conducted and regression coefficients from the multivariate models were converted to probabilities using a Monte Carlo simulation technique.

4. RESULTS

4.1. The Access Divide

Our data is consistent with large-sample studies such as the Department of Commerce (2002) in terms of the proportion of individuals who have home access to computers and the Internet. We find that income, education, age, and race/ethnicity all matter for access. This contrasts with well-publicized research based such as the Stanford Institute study (Nie and Erbring 2000), which claims that education and age are the only factors that influence information technology access. We found that, holding all other factors constant, Asian Americans have the highest predicted probability of Internet access (72%), with whites significantly behind (54%). Latinos trail whites (41%), and African Americans have the lowest probability of Internet access (37%). The 35-percentage point difference between African Americans and Asian Americans is comparable to education. When moving from the lowest to the highest education levels, there is a 35-percentage point increase in home Internet access. Varying income from the lowest to the highest category results in a 24-percentage point increase in the probability of home Internet access. While some research suggests the access divide is closing, our data reveals enduring inequalities based on income, education, age, and race/ethnicity.

Of the 1837 respondents, 69% were white non-Hispanic, 19% were African-American, 9% Latino and 1.5% Asian American. Thus, Latinos and blacks comprised 28% of the sample population, compared to 25% of the U.S. population in the 2000 census. Thirty-eight percent of our sample had household incomes below \$30,000. This allows us to make accurate inferences to minority and low-income populations as a whole. The survey generated data that was comparable to large-sample studies. Sixty-one percent of our respondents reported having access to a home computer, and 54% reported having home Internet access. This closely tracks the figures in the U.S. Department of Commerce study conducted in August of 2001 - 66% and 54% for home computer and Internet access, respectively.

Frequencies provide descriptive trends and a first cut at the data in terms of understanding who does and does not have access to information technology. Compared to the 61% of respondents who have home computer access, 58% had an email address through which they can send or receive email. Of the 54% with Internet access, most (83%) accessed the Internet through a telephone line and modem, while a much smaller percent (14%) said they had high-speed Internet access. While these questions on general access are asked by the Department of Commerce surveys, our survey included more detailed questions on alternative ways to access information technology. This is especially important for low-income respondents who do not have a computer or Internet access.

The survey allowed respondents the opportunity to identify multiple locations for access to computers and the Internet. Almost equal percentages of respondents used a computer at home (54%) and at work (49%). However, of employed respondents, 65% used the computer at work. Relatively small percentages of respondents (15%) used the computer at a school or a public library. More than a quarter of those surveyed, however, used the computer at a friend or relative's house (26%), underscoring the interpersonal nature of information technology use.

A parallel story emerges when examining venues for Internet access. Compared to the 54% of respondents that use the Internet at home, 34% used the Internet at work (56% of employed respondents used the Internet at work), while roughly ten percent use the Internet at a school (11%) or a public library (10%). Twenty percent used the Internet at a friend or relative's house, double public access rates at libraries and schools. For the general population, usage of information technology at home, however, far outweighed usage at other locations, even work. This finding underscores the importance of measuring home Internet access, not just access to the Internet, which includes home, work, school or library access. Privacy concerns may make home the ideal location for use of computers and the Internet.

In terms of access to the Internet in public libraries, the most extensive report to date is of a 1998 national survey of public library Internet connectivity (U.S. National Commission on Libraries and Information Science, 1999). Based on a sample of 2,500 of the 15,718 public libraries in the United States, the survey found that 83.6% of public library outlets have Internet connectivity, 73.3% provide public Internet access but only 45.3% provide graphical public access to the Internet at speeds of 56kbps or greater (iii). While poverty did not seem to be a determinant in availability of Internet access, rural libraries are noticeably behind suburban and urban libraries in offering Internet access, with only 67.6% of rural public libraries providing public access as compared to 76.7% of suburban libraries and 84% of urban libraries. While connectivity levels are impressive, it is important to note that 27.7% of all public libraries either are not connected (16.4%) or do not provide public access (10.3%) (U.S. National Commission on Libraries and Information Science, 9).

Questions on use of information technology outside of the home are the most important for those without access. Of respondents without a home computer (710), 30% use the computer at work, 9% at school, and 13% at the library. Twenty-four percent used a computer at a friend's house. These frequencies are comparable to the overall population. The data suggests patterns of computer use outside the home do not differ significantly among those with and without a home computer. Or those individuals without a home computer are not using public access more than those with home access. This finding may have important implications for public policy. Of respondents without Internet access at home (841), 17.5% indicated they use the Internet at work, 7% at school, 9% at the library and 16% at a friend's house. These figures are lower than the percentages for the overall sample/population. The data suggest that work or friends/relatives are the most common venues to access information technology outside of the home, regardless of home access.

When examining frequency of access, home and work emerge as the dominant locations for sustained usage of information technology. When asked about the rate of access to computers and the Internet at varying locations, home and work are associated with more frequent access to information technology than a friend or relative's house, schools or public libraries. When asked, "last month, how often did you use a computer at home," 14% reported low usage (1-10 times), 20% moderate usages (11-30 times), and 17% high usage (31-100 times), while 5% reported very high usage (more than 100 times). Higher frequency of computer use was reported at work over the past month than at home; 8% reported low use (1-10 times), 12% moderate use (11-30 times), 17% high use (31-100 times) and 12% very high use of over 100 times. In contrast, frequency of access was much lower at a friend or relative's house; 22% reported low use (1-10

times), 2% moderate use (11-30 times) and less than one percent of the respondents high or very high use over the last month. Frequency of access at public libraries was even lower. Only 12% reported low usage, 1.5% moderate usage and less than one percent high or very high usage. While friends, relatives and libraries may provide exposure to information technology, work or home access is associated with consistent use.

4.2. The Skills Divide

Information technology requires two types of skill – technological fluency and information literacy. Data from the survey indicate that gaps are quite pronounced in simple technical fluency skills. As income goes down, assistance with fundamental technological skills is needed. The lower the educational attainment, the more assistance is needed. Women, African Americans, and Latinos more frequently report needing assistance. As age increases, more assistance is necessary.

The lack of fundamental technology-related skills, such as using a mouse and typing, using e-mail, locating information on the web or Internet, and using a word processing and spreadsheet programs, is a clear indicator of the need for programmatic support for training. Limited education among non-users points to potential problems in information literacy, that is the ability to find, understand, evaluate, and use information. The absence of more advanced skills needed for taking a course online implies that electronic instruction may serve an exclusive audience, although individuals with limited education could ostensibly benefit from such services.

The next four tables describe some of our results relating to ICT skill level and demographic factors.

Table 1: Predicted Probabilities by Income

Income	Need More Computer Skills
Low	44.26%(.02)
Medium	37.86%(.01)
High	33.70%(.01)
Difference	6.00%

Standard deviations are in parentheses. To simulate the different levels of income, the variable was set at its minimum, mean and maximum values. Values for education, age and library frequency were set at their mean. Gender was set at female and race at white. Estimations were produced using Clarify: Software for the Interpreting and Presenting Statistical Results. By Michael Tomz, Jason Wittenberg, and Gary King.

Table 2: Predicted Probabilities by Education

Education	Need More Computer Skills
Low	55.40%(.02)
Medium	37.86%(.01)
High	19.68%(.02)
Difference	35.00%

Table 3: Predicted Probabilities by Race

Race	Need More Computer Skills
White	37.86%(.01)
Black	47.19%(.02)
Asian	43.60%(.07)
Latino	43.91%(.03)

Table 4: Predicted Probabilities by Age

Age	Need More Computer Skills
Young	14.53%(.02)
Middle Aged	37.86%(.01)
Elderly	93.98%(.03)
Difference	79.00 %

4.2.1. Statistical Significance

In terms of statistical significance, the groups that are most likely to need assistance with ICT skills are listed below:

- a) the old (52% probability for 61-year olds vs. 20% for 28-year olds);
- b) the less-educated (43% probability for high school diploma vs. 25% for bachelor's degree);
- c) the poor (42% probability vs. 30% for affluent);
- d) African-Americans (45% probability vs. 34% for whites); and,
- e) Latinos (42% probability vs. 34% for non-Latino).

4.3. The Economic Opportunities Divide

Respondents were asked about their attitudes and experiences with information technology use for economic opportunity. Overall, most respondents of all types believe that computer skills are necessary to "keep up." African-American, male, and better-educated respondents are most likely to feel that they need more skills for economic advancement, whereas low-income and unemployed individuals are less likely to agree. An interesting pattern regarding race and ethnicity appears across several indices of technology use and attitudes. African-Americans (and often Latinos) as well as the young are more likely to view information technology in terms of economic opportunity, as demonstrated in both attitudes and actual computer use. Connections with small business or job opportunities may important for promoting technology use in minority communities, although such outreach could be more difficult among the poor and unemployed.

In terms of statistical significance, Latinos and African-Americans are more likely to think that one needs the Internet to "keep up with the times" than whites. There is an 80% probability that Latinos think this; 78% probability for African-Americans; and a 65% probability for whites.

In terms of thinking that "you need more computer skills to get ahead," several groups show statistical significance. These are listed below:

- a) the young (73% probability for 28-year olds vs. 55% for 61-year olds);
- b) African-Americans (76% probability vs. 66% for whites);
- c) Unemployed (74% probability vs. 67% for employed); and,
- d) Women (67% probability vs. 63% for men).

4.4. The Democratic Participation Divide

Consistent with cross-national accounts of the digital divide (Norris 2001), data on willingness to use information technology for political purposes reveal a democratic divide – individuals with higher education and income are more supportive of digital democracy, and are more likely to participate in politics online, than the poor and those with lower education. This research suggests the Internet may be a “double-edged sword,” increasing the gap based on education and income, while reducing the disparities in participation based on age. Overall support for different forms of political participation varied from a low of 48% for online voting, to a high of 78% for searching for government information online. But, factors associated with support for digital democracy are surprisingly similar across various activities. Education emerges as a significant influence for both attitudes about digital democracy and access to information technology. Holding other demographic factors constant, support for online voting and online registration were 33 and 37 percentage points higher among individuals with graduate education compared to those without a high school diploma. This mirrors existing disparities in civic participation, which are largely associated with educational differences. In order to close the democratic divide in cyberspace, as well as traditional politics, education and information literacy will be crucial as well as access.

In terms of statistical significance, the educated, the young, Democrats, and those who voted in the presidential election of 2000, were more likely to support online voting than all other groups. Those most likely to support e-government are the educated, affluent, young, Democrats, Whites, and those who voted in the 2000 presidential election.

5. CONCLUSIONS

5.1. General Conclusions

Overall, respondents express willingness to use public access sites. But, the data show that African Americans and voters are more willing to use computers in public places (for any purpose), after controlling for other factors, while Latinos are less willing than whites to do so. Interestingly enough, education, income, and age are not significant predictors of willingness to use computers in public places. Attitudes about public use vary according to the stated purpose, for example, for job search or voting. Individuals most likely to support government vouchers for computers and Internet access are the young, Democrats, Latinos, African Americans and the poor. Those most supportive of government funding for home access are, with a few exceptions, also those most likely to benefit from such a program.

Home access, while it is ultimately desirable, doesn't address skills. Our research shows that training, technical support, and even basic literacy education may be necessary to take advantage of new technologies. Public access sites in schools, public libraries, or community centers also offer possibilities for providing information about job banks, online courses, and political and government web sites. Public access strategies have weaknesses as well. Our findings also suggest, however, that higher-level skills needed for information literacy, economic opportunity, and political participation require more attention to long-term solutions such as quality education for all youth and ample opportunities for life-long learning.

5.2. Recommendations for Libraries and Other Community Organizations

In the United States, public libraries are commonly viewed as the "on-ramp" to the Information superhighway. However, local, state, and federal funding of programs, equipment, and services related to ICTs is unevenly distributed and is constantly threatened with cuts. For example, funding for Community Technology Centers, a federal program in the USA, is budgeted for \$0 dollars in the President's 2004 budget request. Funding for libraries, particularly school libraries and school librarianship, has risen, however. It seems that public libraries are expected to continue in the role of providing access and information literacy instruction. Because of this expectation, several recommendations and suggestions are provided.

5.2.1. Greater Consistency of Programmatic Support Is Needed

Consider that a company in Silicon Valley typically provides one technical support staff member per every 30 other employees and consider that the ratio of technical support staff to other staff in libraries is generally on the order of one per every 75 staff (ALA 2001, 37). In public schools, technical support is even less widely available. Having inadequate technical support means that when problems arise with a software application or a network connection, that problem gets shunted aside until the help can be found. Shunting aside a technical problem a public library patron is experiencing may mean that the patron hesitates to return to the library and view it as a source of technological access.

The primary source of funding from the United States government is the Library Services and Technology Act (LSTA). LSTA funding is administered through the respective state library agencies. There is a great deal of inconsistency in the effort expended by these state library agencies in assisting individual libraries or library consortia in writing grant proposals for LSTA funds and in the evaluation of the granted project. The state of Ohio, for example, has a number of State Library staff dedicated to assisting public, school, special, and academic libraries through the grant writing process. In a recent evaluation of the State Library of Ohio's LSTA support, the state received extremely high marks. Other state library agencies may not have the resources devoted to such support. Minnesota, for example, has recently decided to close its state library agency due to state budget cuts. While this may not impact the amount of LSTA money that the state of Minnesota receives, it will certainly impact the approach that is used to distribute this money.

A similar concern can be expressed about Community Technology Centers as the distribution of federal money is extremely uneven if examined on a state-by-state basis. Massachusetts has a high number of CTCs per capita as compared to Arizona or New Mexico.

In addition to federal programs that provide support to libraries and Community Technology Centers, inconsistency in terms of public library funding at the state and local levels certainly affects the availability of computer technology and support for using this technology. For example, the state of New Jersey mandates the provision of a public library in every incorporated municipality; these libraries are supported by local operating levies. Ohio provides some support for public libraries using a portion of the state income tax receipts although in recent times this portion has been diminished considerably. Other states have no such mandates and only local operating levies provide support for the public library. If public libraries are going to be relied upon to provide the “safety net” for the Digital Divide, then surely a more consistent approach to public library funding should be developed.

While it appears that there is strong support from the Bush administration to increase the dollar amount for LSTA and even an announcement of a special grant program to encourage people to become librarians, it is disingenuous to expect that the communities that need funding the most will have the staff resources to write a grant proposal and support a technology program.

5.2.2. Acquisition of Skills Needs to Occur Within the Context of Everyday Problem-solving

While a lack of technical support staff and a lack of consistency in funding for libraries and technology centers are certainly difficult issues, even more critical is the integration of computer technology skills into everyday problem solving. If one were to examine the curriculum of a thousand public school districts in the United States, one would see that there is really very little integration of technology into the K-12 curriculum except in the most affluent school districts. The reason for this is simple: if you have only one computer per classroom, students will use it as a reference source and not a tool. Similarly, if a public library makes available its computers for searching for information in only 30-minute time slots, there is little chance that significant problem solving will occur.

As with all aspects of lifelong learning, using computer technology to solve problems is most useful when the problem has real meaning to the individual. K-12 education must be able to provide problem-solving laboratories in an equitable fashion. Likewise, public libraries and Community Technology Centers should be able to provide access to and support for uses of computer technology that have meaning beyond the walls of the library or technology center.

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