

Digital Citizenship: Parameters of the Digital Divide

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Abstract

As part of a National Science Foundation-funded study, we analyze data from a 2002 Midwest urban random sample survey ($n = 167$ adults) of differential access to and uses of computer technology. Factor analysis revealed three dimensions of attitudes toward technology (desire for computer skills, information power, computer use) and two factors regarding government role (digital government, computer access equity). A well-fitted structural equation (LISREL) path model ($GFI = .98$; $AGFI = .94$; $NFI = .90$) showed several key results. As education declined, desire for computer skills increased. Respondents with higher levels of education were more likely to use computers at home and work. Non-whites were more likely to report technological information as key to citizen empowerment, computers should be accessible to all citizens, and increased interest in learning computer skills. Interest in developing computer skills was positively associated with digital citizenship. Viewing technology as a source of informational power was positively related to digital government and computer access equity. Three statistically significant indirect effects were found.

Introduction

Citizenship is increasingly mediated by digital communication (Larsen & Rainie, 2002; Lessig, 2000; Fountain 2001). The emergence of digital government substantively changes the manner in which citizens can engage democracy and the prerequisites for equitable participation (Jordan, 1999; Moore, 1999; Wilhelm, 2000). While Internet access is steadily expanding (NTIA, 2002), the ability to take advantage of increasing access hinges on the Information Technology Literacy (ITL) levels among citizens (Lenhart, 2000). Among certain more economically vulnerable groups, community members often lack basic skills and concepts required when navigating an expanding electronic interface with government. Whereas IT should make it easier for all citizens to conduct their routine business with the government, research has shown that income and education are among the variables that correlate positively with levels of access to and familiarity with computers and the Internet (NTIA 2000). Race, age, language, and disabilities also are significant predictors of IT access and familiarity, controlling for socioeconomic status (Cooper, 2000; Goslee, 1998).

Sample

This research is based on a 2002 random sample mail survey of adult (age 18 and above) respondents ($n = 167$) in a moderate-size Midwestern city. Women and men were equally represented. Three percent of respondents reported not completing high school, 17% a high school degree, 10% some job training following high school, 33% 1 to 2 years of college education, and 37% a 4-year degree or at least some work toward a graduate degree. The majority of respondents were employed; 61% reported full-time employment, 9% part-time employment, 10% unemployed or laid off, and 20% various other working arrangements. Eighty-one percent owned an apartment or house, 13% rented, and 6% reported shared living or other residential arrangements. The treatment group consisted of 66 respondents, who were randomly selected from a low-income urban population. They received a mail questionnaire in addition to a brochure inviting them to attend free computer classes. The remaining participants (101) were a randomly selected control group. The response rate was low for the treatment and control groups (3%; 6%, respectively). Participants in an ITL treatment group (see Shulman et al., 2002) had significantly more frequent responses at both extremes of software use and had a significantly greater response rate at the "low skill" level for distance education, with the control group having more access to

or making greater use of word processing, email, computers, printers, CD-ROMs, DVDs, scanners, experience using the Internet, and use of a computer at work or school. In addition, members of the control group are more likely to be homeowners.

Measures

The following variables were employed in statistical analysis. Education was treated as a continuous variable. Response categories were coded 1 'non-completion of high school,' 2 'high school diploma,' 3 'trade school,' 4 '1-2 years of college,' 5 'undergraduate degree,' and 6 'graduate or professional degree.' The mean value was 4.03; higher values reflect increased levels of education. Race was a dichotomous variable, with response categories 0 'white' and 1 'non-white.' Non-whites comprised 37% of the sample. Desire for Computer Skills was a factor score constructed of 4 items assessing interest in learning basic computer skills, e-mail, and the Internet, as well as desire for computer instruction. Individual item response categories ranged from 1 'strongly disagree' to 4 'strongly agree.' Higher values indicate a stronger interest in obtaining computer skills and instruction. Unless otherwise indicated, all factor scores were obtained by principal components extraction and varimax rotation, with the Anderson-Rubin procedure used to produce z-score summary values of each resulting factor, and missing values were replaced by mean substitution. This method produces factors uncorrelated with each other, with mean zero and standard deviation one, except for the digital government factor, for which the square root transformation was used to induce normality.

The Technological Information Power construct was a factor score of 4 items. Individual item response categories ranged from 1 'strongly disagree' to 4 'strongly agree.' These variables measured the need to improve citizens' computer access to, and knowledge and use of, technology to stay up-to-date about current affairs and to interface with government. Higher values indicate a greater desire to increase information technology power. Computer Use was a factor score of two items that assessed use of a computer at home and work. Individual item response categories ranged from 1 'strongly disagree' to 4 'strongly agree.' Higher values indicate that respondents make greater use of computers. Digital Government was a factor score of 5 items, with individual response categories ranging from 1 'strongly disagree' to 4 'strongly agree.' Respondents indicated their beliefs regarding whether governmental information was accessible to the majority via the Internet, the Internet was an appropriate forum for elections, the Internet empowered citizens to participate in politics, computers could solve unequal participation in politics, and citizens used computers effectively. Higher values reflect higher levels of digital government. Computer Access Equity was a factor score of 2 items that measured belief in equal access to computers and desire to provide computers to people without financial means. Higher values indicate increasing support for computer access for all citizens.

Results

Principal factors extraction with varimax rotation was performed with SPSS on the 10 items measuring attitudes toward technology. Three factors were extracted: desire for computer skills, technological information power, and computer use. Of the four items that comprised the computer skills factor, the desire to learn basic skills, e-mail, and the Internet had the more robust factor loadings (range from .88 to .91). The computer training item had the lowest loading (.69). Of the four items comprising the technological information power factor, the computers as valuable tools item had the largest factor loading (.79). The remaining three items had moderate loadings: technology should connect people to government (.64); people who lack access to technology are less informed (.67); and technology should be used more efficiently (.69). The computer use factor consisted of two measures, computer use at home (.87) and at work (.89), both with robust factor loadings. Two factors were extracted from the 7 digital government items. Of the five items on the digital government factor, loadings ranged from .47 to .81. The largest factor loadings were for the Internet provides reliable political information (.81) and computers solve unequal participation in government (.79). Elections should be held on the Internet (.72)

also had a moderately strong loading. Most people use computers effectively (.66), and citizens should use the Internet to impact government (.47) had the lowest loadings. On the computer equity factor, the item assessing whether everyone should have computer and Internet access had a less robust loading (.78) than the item regarding whether computers and software should be provided to all citizens (.86).

The pattern of statistically significant ($p < .05$) correlations suggests which variables were relevant predictors in each of the five equations of this system of relationships among the derived factors. There are two exogenous (independent) variables: education and race. Non-whites had less education than their white counterparts ($r = -.31$). Education declined as the desire for computer skills increased ($r = .35$). As education declined, so did positive attitudes toward technological sources of information ($r = -.17$). Computer use was strongly related to greater educational attainment ($r = .32$). Education had a negative relationship with digital government and with computer access equity ($r = -.18$ in each case). Non-whites were more likely to report a desire for computer skills ($r = .25$) and to view technological information as a source of power ($r = .16$). Non-whites reported more positive attitudes toward digital government and computer access equity than did whites ($r = .21$; $r = .22$, respectively). Desire for computer skills was positively related to digital government and computer access equity ($r = .19$; $r = .16$, respectively). Interest in computer skills exhibited strong relationships with digital government ($r = .35$) and computer access equity ($r = .35$).

A structural equation model (estimated using LISREL 8.30 statistical software, using the maximum likelihood procedure) fit the data well. The chi-square lack-of-fit test was nonsignificant ($\chi^2 = 12.61$; $df = 11$; $p = .35$). The Goodness of Fit Index was .98, and the Adjusted Goodness of Fit was .94, while the Normed Fit Index was .90; in all cases, values closer to 1.00 indicate a better fit of the model to the data. Several one-tailed significant results ($p < .05$) were found. (One-tailed results are employed because of the exploratory nature of this analysis, and to maximize the opportunity to discover meaningful indirect effects.) As education declined, the desire for computer skills increased ($\beta = -.30$). Individuals with higher levels of education were more likely to use computers at home and work ($\beta = .33$). Non-whites were more likely to report that technological information was key to citizens' empowerment ($\beta = .17$). Non-whites were more likely to indicate that computers should be accessible to all citizens ($\beta = .18$) and had greater interest in learning computer skills ($\beta = .15$). Interest in developing computer skills was positively associated with digital citizenship ($\beta = .21$). Viewing technology as a source of informational power was positively related to digital government ($\beta = .35$) and computer access equity ($\beta = .32$). Three statistically significant indirect effects were found. A direct effect of race on computer access equity accounts for 78% of the total effect (.18). The indirect path through technological information power accounted for the remainder (.05). Education and race also had indirect effects on digital government. Education decreased support for digital government through desire for computer skills (-.01). The effect of race on digital government was influenced by desire for computer skills, but more so through technological information power (.09).

Discussion

The results of this research provide some unique insights into attitudes toward technology and the role of government. These findings indicate that community members, particularly in economically and racially vulnerable groups, lack basic computer skills; whereas educationally advantaged groups report greater use of computers in their daily lives. Although Internet access is expanding, citizens must have a baseline of ITL to take advantage of it. Information technology permits some citizens to conduct their routine business with the government more easily; by and large, it appears to be widening the gap between the IT literate and those without basic navigational skills. As this gap widens, non-whites are significantly more likely to believe informational technology is a valuable source of power which translates into a somewhat greater belief in computer access equity. On balance, nonwhites report significantly more desire than do whites for equal access to computers and the Internet. . Positive attitudes

toward technology, an intervening variable, correlates with respondents being more likely to report a need to provide computers to the public and an acknowledgement of the changing face of government; race also has some influence on digital government.

This study also makes clear that there is a direct linkage between a desire for computer proficiency and digital citizenship. These findings suggest that there is a need for innovative IT research and education to eliminate new and existing social divisions. Potentially, service-learning is a well-suited intervention to bridge the divide between disenfranchised groups and digital citizenry; quasi-experimental assessments of the effects of service learning interventions on ITL are underway. A limitation of the present study is that its results are based on a survey conducted in a Midwestern city and therefore may not generalize to other regions or to rural or suburban populations. This study has explored some key considerations regarding how the digital divide may be reduced and greater technological equity established.

References

- Cooper, M.N. (2000). *Disconnected, disadvantaged, and disenfranchised: Explorations in the digital divide* <http://www.consumersunion.org/pdf/disconnect.pdf> [Last accessed on February 23, 2003].
- Fountain, J. (2001). *Building the virtual state: Information technology and institutional change*. Washington, DC: Brookings Institution Press.
- Goslee, S. (1998). *Losing ground bit by bit: Low-income communities in the information age* <http://www.benton.org/Library/Low-Income/home.html> [Last accessed on February 23, 2003].
- Jordan, T. (1999). *Cyberpower: The culture and politics of cyberspace and the Internet*. New York, NY: Routledge.
- Larsen, E., & Rainie, L. (2002). *The rise of the e-citizen: How people use government agencies' Web sites* http://www.pewinternet.org/reports/pdfs/PIP_Govt_Website_Rpt.pdf [Last accessed on February 23, 2003].
- Lenhart, A. (2000). *Who's not online* <http://www.pewinternet.org/reports/toc.asp?Report=21> [Last accessed on February 23, 2003].
- Lessig, L. (2000). *Code and other laws of cyberspace*. New York, NY: Basic Books.
- Moore, R.K. (1999). Democracy and cyberspace. In B.N. Hague & B.D. Loader (Eds.), *Digital democracy: Discourse and decision making in the information age* (pp. 39-59). New York, NY: Routledge.
- National Telecommunications and Information Administration. (2002). *A nation online: How Americans are expanding their use of the Internet* <http://www.ntia.doc.gov/ntiahome/dn/> [Last accessed on February 23, 2003].
- Shulman, S.W., Beisser, S., Larson, T., & Shelley, M. (2002). Digital citizenship: Lessons learned as service-learning meets the digital divide. In *Proceedings of the second national conference on digital government research*. Los Angeles, CA: DGRC.
- Wilhelm, A.G. (2000). *Democracy in the digital age: Challenges to political life in cyberspace*. New York, NY: Routledge.